Securities Losses and the Bank Collateral Channel of Monetary Transmission*

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Abstract

We show that losses on banks' securities portfolios matter for the transmission mechanism of monetary policy even in the absence of financial stability concerns. When banks experience losses in their pledgeable securities, their ability to tap liquidity through the interbank market is impaired, and they subsequently reduce illiquid corporate lending, regardless of whether the securities were recorded at market or historical value. These effects are less pronounced for banks with abundant collateral and reserves and for banks that receive liquidity through their group's internal capital market. Our results highlight a collateral channel in the bank-based transmission of monetary policy.

Keywords: Monetary policy tightening; interbank market; securities losses; banking groups; foreign banks.

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The collapse of Silicon Valley Bank has highlighted the effects of banks' securities losses, driven by monetary tightening, on financial stability. Depending on a bank's level of capitalization and structure of liabilities, monetary tightening, through securities losses, may lead to self-fulfilling bank runs or even insolvency (Jiang et al., 2024). Policymakers and academics often overlook the effects of securities losses when banks are well-capitalized or when security valuations do not impact the bank's regulatory capital.

This paper shows that securities losses can reduce credit supply in well-capitalized banking systems, even when they do not directly affect regulatory capital. Banks face inherent liquidity risk due to the maturity mismatch between assets and liabilities (Diamond and Rajan, 2001, 2005). To manage negative liquidity shocks, they pledge securities as collateral in interbank markets and with the central bank. The erosion of collateral values could be particularly consequential for liquidity management because banks routinely rely on repo transactions to absorb liquidity shocks. When securities lose value, banks' borrowing capacity declines, constraining their ability to absorb liquidity shocks. We conjecture that, to limit their exposure to future shocks, banks reduce the share of illiquid loans on their balance sheets when collateral values fall. Consequently, due to banks' precautionary behavior, a collateral-based bank lending channel of monetary policy can arise: by affecting collateral valuations, an increase in the policy rate tightens banks' collateral constraints and reduces the credit supply.

We examine how collateral constraints shape the transmission of monetary policy through banks, exploiting euro-area loan-level data on interbank borrowing, corporate lending, and banks' security portfolios.[1] Anticipation of monetary tightening in the second and third quarters of 2022 – preceding the European Central Bank (ECB)'s first rate hike in July 2022 – triggered sharp valuation losses on banks' securities holdings.[2] Banks with larger exposures to long-duration securities experienced larger securities losses.[3] Consistent with a collateral

[1]Banks in the euro area fund about 14% of their liabilities in the interbank market, which also plays a crucial role for banks' liquidity risk management.

[2]These losses were likely amplified by limited fiscal consolidation following the COVID-19 pandemic. While we view the securities losses as largely driven by monetary tightening, we study the effects of these losses on bank lending and the transmission of the monetary policy stance, regardless of their specific determinants, which are not central to the hypothesis we aim to test.

[3]To capture valuation losses while abstracting from subsequent portfolio adjustments, we compute losses using each bank's securities portfolio as of 2022q1, prior to the monetary tightening. The dynamics of losses

channel, we show that banks incurring larger securities losses obtain significantly less credit in the interbank market and contract the supply of credit. A one-standard-deviation increase in losses is associated with a 3.76% decline in interbank credit and a 2.5% decline in corporate lending.

We further document the relevance of the collateral channel by exploiting cross-sectional differences among banks. First, we show that only losses in pledgeable securities affect banks' access to the interbank market. Losses in non-pledgeable securities have a negligible impact, suggesting that the effects are not driven by a decrease in banks' net worth. This interpretation is further supported by the finding that losses on pledgeable securities negatively affect borrowing through the repo market, with no impact on access to the unsecured market.

Second, we observe that banks that have already pledged a larger share of their securities experience a more pronounced reduction in interbank borrowing. This again suggests that the effects are driven by a binding collateral constraint limiting banks' ability to insure against liquidity shocks. Consistent with this result, we find no evidence that banks' regulatory capital drives our results: the impact of securities losses is not stronger for less capitalized banks, supporting the conclusion that collateral constraints, rather than regulatory capital and reduced creditworthiness, are the primary mechanism restricting access to liquidity during periods in which banks are well capitalized.

Third, we examine whether securities losses have a greater impact on interbank market access when they affect regulatory capital. To this end, we compare the effects of securities classified as available-for-sale (AFS) that are marked to market with those of securities held to maturity (HTM) that are valued at historical (book) value. We find that losses on both AFS and HTM securities negatively affect a bank's access to interbank credit.[4] This suggests that the effects are not solely driven by regulatory capital considerations.

are very similar when we use the securities actually held at the beginning of each quarter, indicating that banks did not meaningfully sell long-duration securities during the tightening cycle, consistent with evidence from the U.S. (Fuster et al., 2024). Accounting for banks' portfolio rebalancing, therefore, does not affect our results. In addition, a substantial share of euro-area banks' securities are classified as held-to-maturity (HTM), with the median bank having 72% of its securities in HTM portfolios. Under HTM accounting rules, these securities cannot be sold without supervisory approval.

[4]Repos are typically considered secured debt, and the pledged securities remain on the borrower's balance sheet. Their HTM classification is therefore not contradicted by pledging. See Office of the Comptroller of the Currency, Bank Accounting Advisory Series: Topic 1A – Investments in Debt and Equity Securities (Washington, DC: U.S. Department of the Treasury, August 2025), p. 26.

Fourth, we take into account that some banks in our sample are part of banking groups (i.e., share the same holding company), while others operate as stand-alone banks. We conjecture that the former should be able to access liquidity through internal capital markets without pledging collateral and consequently be less negatively affected by the loss in value of their pledgeable securities. We show that, indeed, within-group interbank loans partially isolate subsidiaries located in the same country as the headquarters (i.e., domestic subsidiaries) from the effects of securities losses. The headquarters and other subsidiaries of the same group extend larger loans to domestic subsidiaries that have experienced larger securities losses. Integration within the banking group, however, appears to be incomplete. Subsidiaries located within the Eurozone but in a different country from the headquarters (i.e., foreign subsidiaries) do not obtain liquidity support from their within-group lenders when they experience securities losses. This suggests that the existence of national deposit insurance schemes, which create local liquidity pools and ring-fencing, renders the banking union incomplete.

Finally, we investigate whether banks with larger securities losses on their pledgeable securities holdings reduce lending to firms, and whether intra-group liquidity support mitigates this effect for subsidiaries of banking groups. Using granular credit registry data and controlling for firm-level credit demand following the methodology of Khwaja and Mian (2008), we find that banks experiencing larger securities losses reduce their corporate lending more than less affected banks. The contraction in credit is economically meaningful – a one-standard-deviation increase in securities losses is associated with a 2.5% decline in lending – and applies to securities losses on both mark-to-market and held-to-maturity valued securities. Importantly, firms appear unable to substitute for banks with less exposure to securities losses and consequently experience a comparable decrease in total bank credit. Consistent with the collateral channel, the reduction in lending is sharper for banks with high ex ante collateral utilization, weaker ex ante liquidity positions, and less stable funding. This highlights how constrained liquidity access can amplify the impact of monetary tightening on corporate credit supply and, more generally, affect credit conditions for a given monetary policy stance. Furthermore, we find that banks with larger securities losses also charge higher interest rates and grant new loans with shorter maturities, consistent with a

reduction in credit supply. Our evidence on the importance of the collateral channel remains robust when controlling for deposit outflows, which may also be driven by monetary tightening in line with the deposits channel of monetary policy (Drechsler et al., 2017).[5] The findings are also robust to controlling for banks' interest-rate-risk hedging and the quality of their loan portfolios.

Access to liquidity through the interbank markets and intra-group borrowing affects the credit supply to the corporate sector, with heterogeneous impacts across different types of banks. Domestic subsidiaries of banking groups are partially shielded from the negative effects of securities losses through intra-group loans. As a result, they contract their lending less than stand-alone banks that experienced a similarly strong adverse shock to the value of their security portfolios. However, due to interbank market segmentation affecting within-group loans, foreign subsidiaries of banking groups do not benefit from such support and contract lending to the same extent as stand-alone banks. These findings underscore that liquidity redistribution within banking groups is segmented along national lines, contributing to uneven monetary policy transmission within the euro area.

We make several contributions to the literature. First, we contribute to the literature on the collateral channel. The influential theories of Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) highlight how changes in the value of collateral amplify the credit cycle. Empirical studies have shown that a non-financial firm's ability to post collateral affects its access to debt and investment (Chaney et al., 2012; Cvijanović, 2014; Adelino et al., 2015; Bahaj et al., 2020, 2022). To the best of our knowledge, we are the first to highlight the relevance of a *bank-based* collateral channel, which operates through changes in liquidity in banks' assets. The mechanism we propose does not operate through banks' ability to borrow and expand their balance sheets, as in Kiyotaki and Moore (1997), but rather through banks' precautionary behavior: the possibility of future negative liquidity shocks affects banks' behavior in a manner similar to the model of Gertler and Kiyotaki (2015). As shown in the model of Bianchi and Bigio (2022), the supply of credit to the corporate sector can be constrained by the anticipation of frictions in accessing the interbank market, which in our

[5]Specifically, results remain unchanged when controlling for both the interaction between a bank's deposit share and the policy rate changes, as well as for the actual change in deposits over the quarter.

empirical application arises from collateral losses. Insofar as banks' ability to withstand negative liquidity shocks constrains their credit supply, our results complement those of Altavilla et al. (2025). While Altavilla et al. (2025) consider the positive effects of excess reserves on the credit supply, we uncover a distinct mechanism: when collateral values fall, and banks' ability to borrow in the interbank market becomes constrained, banks respond by reducing the illiquidity of their balance sheets, and consequently they tighten the credit supply.

Second, we contribute to a growing body of literature that explores the transmission mechanism of monetary policy. Using bank balance-sheet data (Kashyap and Stein, 2000) highlight that the impact of monetary policy is stronger for smaller banks with less liquidity in their balance sheets. The collateral channel of monetary policy we propose highlights a mechanism for why banks with less liquid balance sheets are more exposed to monetary tightening. However, instead of using balance sheet data, we use credit registry data, which allows us to control for corporate credit demand. In this respect, we contribute to the strand of the literature that leverages credit registry data to study the transmission mechanism of monetary policy (e.g., Jiménez et al., 2012). A few papers in this literature have exploited heterogeneity in banks' securities holdings to capture cross-sectional differences in exposure to monetary policy shocks (e.g., Rodnyansky and Darmouni, 2017; Acharya et al., 2018; Gomez et al., 2021; Jasova et al., 2024; Greenwald et al., 2024). While others have highlighted the effects of securities losses on bank net worth and regulatory capital, we are the first to show that the lower value of pledgeable securities reduces banks' access to the interbank market and that this matters for corporate credit.

In addition, thanks to the granularity of our data and the comprehensive coverage of banks in the euro area, we can contribute to the debate on the circumstances under which decreases in the valuation of securities holdings affect bank lending (Greenwald et al., 2024). We show that even banks that classified their securities as held-to-maturity and applied historical cost accounting were negatively affected by securities losses. The reason is that these losses tighten banks' collateral constraints and restrict their access to the interbank market, independent of their impact on regulatory capital. Accordingly, we provide evidence that the impact of monetary policy through securities losses operates beyond the net-worth

and capital-regulation channels, highlighting the distinct role of collateral constraints.

Finally, we contribute to the literature on the international transmission of bank liquidity shocks. Prior research demonstrates that international banks transmit shocks to their foreign subsidiaries (e.g., Peek and Rosengren, 2000; Schnabl, 2012) and that US banks can access liquidity from foreign subsidiaries during periods of funding stress (Cetorelli and Goldberg, 2012a). Moreover, internal capital markets within global banking groups have been shown to play a crucial role in how liquidity and monetary policy shocks in advanced economies affect lending to emerging markets (Cetorelli and Goldberg, 2012a; Morais et al., 2019). Domestically, multi-market banks have also been found to transmit positive liquidity shocks within their U.S. branch networks (Gilje et al., 2016) and negative shocks outside their core markets, defined as areas without branches (Cortés and Strahan, 2017). A strand of this literature studies the lending channel of monetary policy in stand-alone banks and financial conglomerates (e.g., Campello, 2002; Cetorelli and Goldberg, 2012a). We make two important innovations. First, while existing contributions rely on banks' balance sheets to measure outstanding credit, the granularity of our credit registry data allows us to compare the workings of internal and external capital markets and their effects on bank lending while controlling for corporate credit demand (Khwaja and Mian, 2008). Second, we highlight how different access to internal capital markets influences the strength of monetary policy transmission for domestic and foreign subsidiaries of a banking group. We find that being part of a banking group attenuates the effect of monetary policy shocks on the credit supply of domestic subsidiaries. However, the headquarters' propensity to provide liquidity to foreign subsidiaries facing securities losses is limited. Consequently, foreign subsidiaries remain more exposed to monetary policy shocks and contract lending, just as stand-alone banks do. Our results reveal an organizational pecking order within euro area credit groups that, differently from U.S. global banks (Cetorelli and Goldberg, 2012b), do not appear to allocate liquidity according to subsidiaries' investment opportunities.

1 Data

We utilize various data sources to assess the impact of securities losses on the transmission of monetary policy.

First, we rely on the Securities Holdings Statistics (SHS-G). SHS-G provides information on debt securities holdings at the ISIN-bank-quarter level and includes the amount held, book value, market value, and the accounting classification of each instrument. The accounting classification enables us to determine whether the bank reports a given security at amortized cost (book value) or at fair value (marked to market). We focus on banks' holdings of fixed-income securities issued in the Eurozone and denominated in euros, and define the securities accepted as collateral by the ECB as pledgeable.

Second, we utilize loan-level data from the European System of Central Banks' AnaCredit (AC) credit register, established in 2018, to study bank lending to non-financial firms (NFCs). AC contains granular information on borrower characteristics (e.g., location, industry), loan types, loan terms (e.g., loan size, maturity, interest rate, issuance date), and a bank's outstanding credit to a given borrower. This level of detail allows us to track how banks adjust their corporate lending in response to securities losses.

Third, we exploit a novel and less-explored part of AC that covers interbank lending between euro area banks. Similar to the corporate part of the credit registry, we observe individual credit exposures, loan transactions, and loan terms, covering both secured and unsecured interbank lending. Importantly, the data are available at the unconsolidated level, which enables us to identify credit flows also between banks within the same banking group. This unique feature allows us to study how securities losses impact banks' ability to borrow in interbank markets and to distinguish between liquidity support across unrelated banks and internal capital market transactions within banking groups.[6]

Finally, we complement our analysis with bank-level data from the Individual Balance Sheet Items (IBSI) database, regulatory Common Reporting (COREP) data, and Financial Reporting (FINREP) data, all maintained by the ECB. IBSI database contains monthly-level

[6]Banks in the euro area borrow also from non-bank financial intermediaries, whose loans we do not observe through AC. Altavilla et al. (2025) suggest that the behavior of banks and other financial intermediaries in the money market is very similar.

information on banks' granular asset and liability items. We use time-varying variables, such as total assets, the deposits-to-total-assets ratio, the equity ratio, and the liquidity ratio, at the bank subsidiary level. COREP data contains information on prudential requirements under Capital Requirements Regulation/Directive (CRR/CRD), including bank capital adequacy ratios and liquidity requirements, such as the Net Stable Funding Ratio (NSFR) and the Liquidity Coverage Ratio (LCR). FINREP provides additional detailed balance sheet information, including data on banks' derivative positions, interest-rate-risk hedging activities, and non-performing loans, which allows us to control for these factors in our analysis.

2 Determinants of Banks' Securities Losses

Inflationary pressures have characterized the period following the COVID-19 pandemic in both the US and the euro area. The ECB began tightening its monetary policy stance to curb emerging inflation pressure in the third quarter of 2022, raising the three key policy rates by 50 basis points on July 21, 2022. As a consequence of this decision, the interest rates on the main refinancing operations, the marginal lending facility, and the deposit facility were increased to 0.50%, 0.75%, and 0.00%, respectively. The initial rate increase was followed by nine interest rate hikes during our sample period, which ends in September 2023 – the month of the final rate increase in this tightening cycle. The ECB also began quantitative tightening in March 2023, further tightening the monetary policy stance.

Alongside concerns about fiscal consolidation, the tightening cycle led to a repricing of securities in banks' portfolios, and banks that held relatively more long-term securities experienced larger losses. While we view the securities losses as largely driven by monetary tightening, we study the effects of these losses on bank lending and the transmission of the monetary policy stance, regardless of their specific determinants, which are not central to the hypothesis we aim to test.[7] Overall, euro area banks proved resilient to securities losses and continued to report Common Equity Tier 1 (CET1) capital ratios well above the requirements (Enria, 2023). Yet, the securities losses negatively affected the liquidity of their

[7] Our empirical specifications control non-parametrically for any effect of political and country risk (associated to the lack of fiscal consolidation) on the demand for credit by banks and non-financial corporations, as we always absorb country shocks through interactions of country and time fixed effects, making the determinants of bank-level securities losses unimportant.

assets as the proportion of illiquid loans increased. Considering that interbank borrowing finances roughly 14% of bank assets in the euro area, tighter collateral constraints could have led banks to scale back the supply of illiquid loans for precautionary reasons.

Data from the ECB's SHS-G allow us to compute losses on banks' securities portfolios and evaluate whether a more binding collateral constraint due to securities losses negatively affects bank lending. We abstract from interest-rate-risk financial hedging because banks cannot pledge the financial instruments they use to hedge against borrowing.[8] In our robustness tests, we also control for interest-rate-risk hedging using information on banks' interest-rate derivatives.

We compute securities losses for 2,862 bank subsidiaries belonging to 498 banking groups operating across 19 euro area (EA) countries during the sample period from January 2022 to September 2023 (Figure 7 Panel A). EA banks hold a substantial amount of fixed-income securities on their balance sheets, averaging EUR 3.2 billion, or 18% of total assets as of 2022q1.

A key advantage of our detailed security-level data is that it enables us to measure the total value change in a bank's securities portfolio by capturing fluctuations in individual security prices. Furthermore, the granularity of the SHS-G data allows us to distinguish whether, in each bank's portfolio, a security is classified as available for sale (AFS), and consequently marked to market, or held to maturity (HTM), and consequently booked at historical value. As of the end of the first quarter of 2022, most securities are reported as HTM (65%), while a smaller share (35%) is classified as AFS. This composition differs from the evidence on large bank holding companies (BHCs) in the US, where the 29 largest BHCs classify 60% of their security portfolios as AFS (Greenwald et al., 2024). The difference in the proportion of AFS and HTM securities in banks' portfolios could be due to institutional differences between the US and EA banking sectors, as well as the fact that our sample covers a total of 498 banking groups, revealing important aggregate trends as well as cross-sectional variation that go beyond the largest EA banks.

We use the SHS-G data to compute a bank's overall securities losses as well as its securities losses in the AFS and HTM components of its portfolio. We further distinguish between

[8] Interest rate risk hedging would decrease the effects of securities losses through the net worth channel.

losses affecting pledgeable securities, defined as those accepted as collateral by the ECB, and other securities. Securities eligible within the ECB collateral framework are typically also accepted as collateral in the repo market, where lenders impose higher haircuts (Jasova et al., 2024).

To capture securities losses while abstracting from banks' subsequent portfolio adjustments, we fix portfolios at their 2022q1 composition, prior to the monetary policy tightening. This approach addresses potential endogeneity concerns arising from banks rebalancing their holdings after the policy announcement.[9]

Holding constant the bank's securities holdings, we cumulate the price changes over the period 2022q1 – 2023q3 and compute the cumulative securities losses as follows:

$$\text{Securities Losses}_{b,t} = \frac{\sum_s \left(-\frac{P^s_t - P^s_{2022q1}}{P^s_{2022q1}} \times \text{Value Held}^s_{b,2022q1} \right)}{\text{Total Assets}_{b,2022q1}} \tag{1}$$

Our measure considers all the losses accruing to a bank b on the securities s it held at the end of the first quarter of 2022, up to month t, as a share of total assets. Panel B of 1 presents detailed summary statistics of securities losses across banks over the sample. As evident from Figure 1, which plots the time-series dynamics of these losses (blue line), the losses were concentrated in the second and third quarters of 2022. The dynamics of securities losses are very similar if we consider the losses accrued on the securities that banks actually held at the beginning of each quarter (red line). This is consistent with evidence from the U.S., which shows that banks likewise avoided selling long-duration securities (Fuster et al., 2024).[10]

As of the third quarter of 2023, banks suffered, on average, securities losses of 1% of their total assets or 12% of their total equity. Figure 2, Panel A, further summarizes the distribution of overall losses on security portfolios as a share of total assets, highlighting the significant cross-sectional variation in these losses. In Panel B, we decompose the losses in the HTM and AFS portfolios, holding the classification constant as of the first quarter of

[9]By treating a bank's ex-ante securities holdings as fixed, we do not incur the problem that banks more negatively affected by the monetary policy tightening may opportunistically choose to mark a larger fraction of their securities holdings as HTM to avoid mark-to-market accounting for AFS securities (Granja, 2023). As shown in Figure A1 in the Appendix, there is no evidence that this was the case in the euro area.

[10]Considering banks' portfolio rebalancing does not affect our results as shown in Table A4.

2022, and find that the largest securities losses are associated with HTM holdings. HTM losses, on average, amount to 0.84% of total assets (9.8% of total equity), while the mean AFS losses are four times smaller and amount to 0.21% of total assets (2.5% of total equity). In addition to average losses, we also observe a lower dispersion of AFS losses, reflecting the fact that EA banks are generally more likely to hold securities as HTM.

Securities losses also vary significantly by bank type. Figure 3 shows the distribution of losses separately for subsidiaries of banking groups (Panel A), stand-alone banks (Panel B), and for domestic and foreign subsidiaries of banking groups (Panels C and D, respectively). On average, banks within banking groups experienced losses of 1.1% of total assets, nearly double the 0.57% incurred by stand-alone banks. Within banking groups, domestic subsidiaries suffered losses more than twice those of foreign subsidiaries (1.2% vs. 0.56% of total assets).

The large securities losses banks have experienced are linked to the fact that they hold a significant portion of their assets in securities – particularly long-duration securities, which are sensitive to interest rate changes. Figure 4 shows the distribution of securities holdings across banks, expressed as a share of total assets, as of the first quarter of 2021 – prior to the start of the ECB's monetary tightening. Panel A displays all securities holdings, while Panel B focuses on a subset of long-term securities with a maturity greater than three years. There is substantial cross-sectional variation in banks' securities holdings. On average, securities represent 18.4% of bank assets, with long-term securities accounting for 6.6%.

There is also notable heterogeneity in securities holdings and associated losses across Euro area countries (see Figures 5 and 6). Banks in peripheral countries, such as Italy, Spain, Portugal, and Greece, hold significantly more securities on average than those in core countries like Germany and France. These holdings are concentrated in long-term securities with maturities over three years and are more exposed to swings in sovereign risk. Consequently, banks in peripheral countries were more exposed to the ECB's monetary tightening and incurred the largest losses.

In the empirical analysis, we will absorb country-specific shocks by including the interaction of a bank's country and time fixed effects, thus abstracting from country shocks affecting the demand for credit. As shown in Table 2, securities losses are large for banks with large

holdings of securities. Columns 1 to 7 show that securities losses are not correlated with other banks' characteristics, such as capitalization, reliance on deposits, or excess reserve holdings (excess liquidity), which will help identify their effects on the bank's access to the interbank market and the supply of credit to the corporate sector. In columns 8 to 13, securities holdings, in turn, are negatively correlated with banks' excess reserve holdings, suggesting that securities are a substitute for excess liquidity. Moreover, banks with high securities holdings borrow more in the interbank market and from the central bank, indicating that securities holdings are a crucial means of accessing liquidity.

In what follows, we exploit cross-sectional variation in securities losses across banks within a country to identify their effects. Specifically, we analyze how changes in the value of those securities subsequently influence banks' behavior in the interbank market and their lending to firms.

3 Stand-Alone Banks and Banking Groups within the Euro Area

To evaluate the relevance of the collateral channel in the bank-based transmission of monetary policy, we exploit not only cross-sectional differences in securities losses that impair banks' ability to post collateral, but also banks' ability to substitute the interbank market with liquidity transfers from other subsidiaries of the same banking group. We conjecture that banks that are part of banking groups, unlike stand-alone banks, can utilize the internal capital market to access liquidity, thereby mitigating the effects of securities losses on their borrowing capacity.

We also consider that while banking groups in the EA encompass subsidiaries in many EA countries, deposit insurance schemes remain national, segmenting capital requirements and liquidity pools along national borders. The extent to which these foreign subsidiaries can benefit from an internal capital market is thus an empirical question.

For these reasons, we categorize banks into three distinct groups: i) stand-alone banks, which are not part of any banking group, ii) domestic subsidiaries, which are banks that are part of a banking group and are located in the same country as the headquarters, and iii) foreign subsidiaries, which are banks owned by a banking group headquartered in another

EA country. The sample comprises 1,832 stand-alone banks, 644 domestic subsidiaries, and 386 foreign subsidiaries.

Table 1, Panel A summarizes the descriptive statistics of the EA banking sector. Domestic and foreign subsidiaries collectively belong to 108 banking groups operating in the EA. On average, there are about 151 banks per country, with a median of 26 banks per country. In a median country, there are ten stand-alone banks, six domestic subsidiaries, and nine foreign subsidiaries; banking group subsidiaries belong to 13 banking groups, four of which are headquartered domestically. On average, a banking group owns six subsidiaries and operates in three countries. While banking groups in the EA tend to exhibit a home bias, a significant portion of their assets and corporate loans is held by foreign subsidiaries, accounting for 25% of total assets and 26% of corporate loans, respectively.

Reflecting differences in country size, the distribution of banks is significantly skewed towards the EA Big-4 countries (Germany, Italy, Spain, and France), which together account for around 72% of all banks (see Figure 7 Panel A). In contrast to the median EA country, the vast majority of banks in Big-4 countries are part of a banking group, with 150 subsidiaries compared to 70 stand-alone banks. In addition, Big-4 countries have more than twice as many domestic subsidiaries as foreign ones, with 100 domestic subsidiaries versus 50 foreign ones. These subsidiaries are part of 52 banking groups, 18 of which are headquartered in the domestic market.

While stand-alone banks are significant in numbers, they are typically small and account for a smaller proportion of total assets, corporate lending, and securities holdings than subsidiaries of banking groups. Specifically, subsidiaries of banking groups hold, on average, 70% of a country's banking sector assets, with the remaining 30% held by stand-alone banks.

Among subsidiaries, foreign subsidiaries play a crucial role, holding more than a quarter of total assets, while domestic subsidiaries account for 44%. These proportions are similar for corporate lending and securities holdings, with subsidiaries of banking groups representing 67% and 69%, respectively. Foreign subsidiaries are almost as important as stand-alone banks, accounting for 26% of corporate loans and 24% of securities held.

As Figure 7, Panel B highlights, the distribution of domestic and foreign subsidiaries is not homogeneous across the EA. Foreign subsidiaries play a disproportionately more impor-

tant role in countries with smaller domestic banking systems, such as Portugal, Belgium, Luxembourg, Slovakia, Lithuania, and Estonia, where the share of corporate loans extended by foreign subsidiaries is approximately 50%.

These patterns underscore the importance of examining the impact of the collateral channel on banks with and without internal liquidity access within the banking group, as well as any potential differences in the treatment of domestic and foreign subsidiaries.

4 Securities Losses and the Interbank Market

4.1 Effects of borrowing banks' losses

Euro area banks rely heavily on the interbank market to finance their balance sheets, with an average of 14% of bank assets funded through interbank borrowing (see Table 1, Panel B). More importantly, the interbank market plays a crucial role in redistributing liquidity when banks face negative shocks. Banks with reduced access to the interbank market may decrease their credit supply as a precautionary measure. Because loans are illiquid assets, banks may prefer to avoid additional illiquidity arising from additional lending when their ability to insure against liquidity shocks through interbank borrowing is reduced by collateral constraints. Based on these arguments, securities losses reduce the value of a bank's collateral, impair its ability to access the interbank market, and negatively affect the bank's ability to insure liquidity shocks. If this is the case, banks may reduce the credit supply to the corporate sector to limit their exposure to liquidity risk.

To evaluate this mechanism, we begin by examining how securities losses impact a bank's borrowing ability in the interbank market. Specifically, we estimate the following model by ordinary least squares (OLS), where the dependent variable, Loan Amount$_{b,c,l,h,t}$ is the logarithm of the outstanding interbank credit amount issued by lending bank l located in country h to borrowing bank b based in country c during month t:

$$\text{Loan Amount}_{b,c,l,h,t} = \alpha + \beta \text{ Securities Losses}_{b,t-1} + \delta_{b,l} + \mu_{c,t} + \theta_{h,t} + \epsilon_{b,c,l,h,t}. \quad (2)$$

The variable of interest is Securities Losses$_{b,t-1}$, which denotes the lagged ratio of securities

losses to total assets of the borrowing bank as described by equation (1). This variable captures how, starting in August 2022, securities losses affected a bank's participation in the interbank market. In addition, $\delta_{b,l}$, denotes interactions of borrowing bank and lending bank fixed effects to control for the strength of the bilateral interbank relationship; $\mu_{c,t}$ and $\theta_{h,t}$ are interactions of the borrowing bank's country and time and the lending bank's country and time fixed effects, respectively, which capture any shocks affecting the borrowing bank's and the lending bank's countries.

Table 3 presents the results on whether securities losses affect interbank market participation. A negative estimate of the coefficient of interest β would suggest that banks with larger securities losses obtain less funding in the interbank market. Such an effect would suggest that banks with high collateral utilization rates face binding collateral constraints or that they reduce their demand for interbank loans to preserve future borrowing capacity when the value of their collateral decreases.

Column 1 of Table 3 shows that banks that experience larger securities losses receive less credit in the interbank market. The effect is both statistically and economically significant. A one-standard-deviation increase in borrowing banks' losses is associated with a 3.76% decline in credit received in the interbank market. We interpret this effect as deriving from a more binding collateral constraint. In principle, the demand for interbank loans by banks with larger securities losses could also decrease because of a decline in their lending opportunities. We consider this possibility unlikely based on our empirical evidence. Not only do we control for shocks affecting the bank's country, which should capture asymmetric changes in the banks' investment opportunities, but we will also demonstrate, by exploring bank lending to the corporate sector, that these banks' propensity to lend decreases, holding constant their borrowers' demand for credit. Therefore, we use the narrative from the outset that securities losses negatively affect a bank's ability to borrow in the interbank market due to current or feared constraints.

This interpretation is reinforced by the dynamic evidence in Figure 8, where we relate the securities losses of a borrowing bank accumulated until the end of the sample to its interbank borrowing over the previous months. Specifically, we estimate the following dynamic

difference-in-difference specification:

$$\text{Loan amount}_{b,c,l,h,t} = \alpha + \sum_{k \neq 2022m7} \beta_k (\text{Collateral Security Losses}_{b,2023Q4} \times \mathbf{1}_{t=k}) + \\ + \delta_{b,l} + \mu_{c,t} + \theta_{h,t} + \epsilon_{b,c,l,h,t}, \quad (3)$$

Figure 8 plots estimates of coefficients β_k over time. If the securities losses were capturing changes in banks' lending opportunities, we would expect a gradual decrease in banks' access to the interbank market. Put differently, we would expect the parallel trend assumption not to be satisfied before the loss realization. We observe instead that the negative effect of securities losses on banks' interbank borrowing becomes statistically significant only in July 2022, when the ECB's monetary tightening began and the largest securities losses materialized.

Securities losses may matter because the value of the collateral that a bank can post has decreased; however, they may also negatively impact a bank's net worth. A decrease in creditworthiness can, in turn, decrease a bank's ability to access the interbank market. To evaluate the extent to which the collateral channel is at work, we distinguish between securities accepted by the ECB as collateral and other securities. Only the former are accepted as collateral in the interbank market. In column 2 of Table 3 , we observe that a decrease in the value of pledgeable securities is associated with a decrease in the amount of funds that a bank can borrow in the interbank market. In column 3, we do not observe an analogous effect for nonpledgeable securities.

To further scrutinize the collateral channel, in column 4, we define a bank's collateral utilization rate as the ratio of its outstanding debt to other banks to the value of its securities in March 2022. Consistent with the collateral channel, we observe that the ability to borrow through the interbank market decreases to a greater extent for banks that have posted the majority of their securities as collateral.

Not only do these findings support the collateral channel, but in columns 7 and 8, we observe that securities losses affect only the amount that a bank can borrow through the repo market. Securities losses appear to have no effect on banks' access to the unsecured

market, suggesting that a decrease in creditworthiness is not the primary driver of banks' reduced ability to borrow in the interbank market. Put differently, the net worth channel does not appear to drive our findings for the interbank borrowing.

This conclusion is further supported by the interest rates paid on repo and unsecured loans. In column 9, we observe that the interest rate on collateralized loans increases, whereas the interest rate paid by banks with larger securities losses on unsecured loans remains unchanged. Changes in creditworthiness should primarily affect the latter, while an increase in the repo interest rate may reflect banks with securities losses pledging collateral of lower quality, which in turn may result in a higher interest rate (Barbiero et al., 2024).

The negative effects of securities losses on interbank borrowing could also operate through the bank regulatory capital channel. Specifically, securities losses may affect a bank's capital position, compelling the bank to reduce its balance sheet. If the bank regulatory capital channel is at play, the impact of securities losses should be stronger for banks with lower ex-ante capital ratios. To test this mechanism, we extend equation (2) by introducing an interaction between securities losses and the borrowing bank's capital ratio. However, as shown in column (5), this interaction is not statistically significant, suggesting that a bank's regulatory capital plays a less critical role in its ability to obtain liquidity in the secured interbank market. This finding is consistent with the fact that securities losses did not affect the financial stability of euro area banks (Enria, 2023) and suggests that the collateral channel is the primary mechanism driving our results.

We also consider whether securities losses matter most when they affect the bank's capital requirements. This is the case if the securities, being categorized as AFS, are marked to market. Losses on HTM securities have no effect on banks' regulatory capital. In column 6, we distinguish between securities losses in HTM and AFS portfolios. Both AFS and HTM securities losses appear to negatively affect a bank's access to credit in the interbank market. An F-test cannot reject the null hypothesis that the magnitude of their effects is statistically the same. These findings provide further support for the notion that the effects of securities losses we highlight do not depend on bank regulatory capital and are consistent with a collateral channel.

Table 4 focuses on losses affecting a bank's pledgeable securities and distinguishes between

loans that a bank receives from subsidiaries outside and within the banking group (columns 1 and 2). While a bank's ability to borrow from outside the banking group substantially decreases as the value of its pledgeable securities decreases, it appears to receive large loans from other subsidiaries within the group. This further supports our interpretation that the value of pledgeable securities is important for a bank's ability to borrow, as intra-group lending is typically unsecured.

The effect is not only statistically significant but also economically significant. A one-standard-deviation increase in borrowing banks' losses is associated with a 13.6% increase in credit received from other banks in the same banking group. Thus, the decrease in interbank market borrowing for banks experiencing securities losses is entirely driven by lending from banks that do not belong to the same banking group. Intra-group lending has a counteracting effect. Importantly, within-group loans are not subject to asymmetric information and enforcement problems and are consequently uncollateralized. Thus, these findings support our interpretation that banks experiencing large securities losses are unable to access the market due to their collateral constraints. Banks may also be reluctant to borrow for precautionary reasons, as they may want to preserve collateral to face negative liquidity shocks. The result that the internal capital market substitutes for the external capital market for subsidiaries of banking groups provides micro-foundations for the findings in the existing literature that lending to corporations of banks that are part of business groups is less sensitive to monetary policy (Campello, 2002).

4.2 Effects of Lending Banks' Losses

To the extent that a bank that has experienced securities losses is less able to attract liquidity through the interbank market, it can also become less inclined to extend credit to other banks. Given our interest in identifying the collateral channel, we continue to focus on losses affecting pledgeable securities and investigate whether collateral securities losses also affect banks' lending behavior. To this end, we estimate equation (1) and focus on the lending bank's ratio of securities losses to total assets. Equation (2) describes our empirical model:

$$\text{Loan Amount}_{b,c,l,h,t} = \beta \text{ Securities Losses}_{l,t-1} + \delta_{b,l} + \mu_{c,t} + \theta_{h,t} + \epsilon_{b,c,l,h,t}, \tag{4}$$

where the key variable of interest is the lending bank's ratio of securities losses to total assets (Securities $\text{Losses}_{l,t-1}$).

Column 3 of Table 4 presents the results. We find that securities losses not only affect banks' ability to receive credit but also their lending behavior. Banks that experience larger securities losses extend less credit in the interbank market. The effect is once again statistically and economically significant, with a one-standard-deviation increase in lending banks' losses associated with an 8.9% decrease in their credit supply in the interbank market. Columns 4 and 5 reveal that the effect is entirely driven by loans to banks outside the banking group. The internal capital market is unaffected by the lending bank's securities losses.

All results on the redistribution of liquidity between and within banking groups are confirmed in columns 6 – 8 where we jointly consider borrowing and lending banks' securities losses. Overall, it appears that collateral valuations facilitate the functioning of the interbank market and the redistribution of liquidity, which are crucial for banks' ability to insulate against liquidity shocks.

5 Credit Flows Within and Between Banking Groups

5.1 Within-Group Lending to Domestic and Foreign Subsidiaries

Banking groups transfer liquidity to subsidiaries experiencing pledgeable securities losses, partially substituting for the decline in their access to interbank market. This finding provides relevant cross-sectional variation for studying the importance of the collateral channel for the supply of credit to the corporate sector. To obtain even more granular predictions for our empirical investigation, we ask how the insurance provided by the banking group differs between domestic and foreign subsidiaries. Such an investigation can also help determine whether cross-border consolidation through business groups promotes an even transmission of monetary policy across countries in the EA, even if deposit insurance remains national and banking groups are required to maintain local liquidity pools.

We distinguish between domestic and foreign subsidiaries of the banking group. For the within-group lending analysis, we employ two distinct definitions of domestic versus foreign

subsidiaries. First, we define a subsidiary as domestic based on the geo-location of the lending and borrowing banks. The borrowing subsidiary is considered domestic if it is based in the same country as the lending subsidiary; otherwise, it is considered foreign. Second, and more importantly, we define a subsidiary as domestic with respect to the headquarters. In this case, a subsidiary is considered domestic if it is based in the same country as its banking group headquarters, and foreign otherwise. As in the earlier tests, we perform subsample analysis to facilitate interpretation.

We first examine whether domestic and foreign subsidiaries of a banking group receive different liquidity support after experiencing securities losses. Table 5, columns 1–4 present the results for the borrowing subsidiary's losses. Only domestic subsidiaries receive additional loans from other parts of the banking group when they experience considerable securities losses, whereas we do not observe a similar effect for foreign subsidiaries. This is the case whether we consider foreign subsidiaries located in a different country from the lending subsidiary (column 1) or from the group headquarters (column 2).

Interestingly, columns 3 and 4 highlight the importance of border effects for the functioning of internal capital markets. In column 3, we consider the subsample of foreign subsidiaries. We find that foreign subsidiaries support other subsidiaries located outside the headquarters' country when those subsidiaries experience losses on their pledgeable securities. Meanwhile, column 4 shows that domestic subsidiaries lend to other subsidiaries located in the same country as their headquarters. Taken together, the internal capital markets appear to remain segmented, arguably due to local liquidity pools and firewalls resulting from the absence of a common deposit insurance system.

Columns 5 and 6 examine how subsidiaries of the banking group extend liquidity when they themselves experience securities losses. On average, subsidiaries of a banking group do not reduce the credit when they experience securities losses (column 5). However, column 6 shows that subsidiaries located in a different country from the headquarters extend less credit, suggesting that local liquidity pools and firewalls limit their ability to provide insurance within the banking group.

5.2 Between-Group Lending to Domestic and Foreign Subsidiaries

Importantly, the evidence of segmentation along national borders appears to be specific to banking groups. Table 6 examines intergroup lending and its dependence on the securities losses incurred by borrowing and lending banks. In column 1, banks that experience larger securities losses obtain less credit from other banks outside the business group, irrespective of whether they are located in the same country or not. If anything, the effect of securities losses is somewhat smaller for foreign banks (defined as banks located in a different country from the lending subsidiary). This may reflect that banks able to borrow from foreign lenders tend to be the largest and most central in the interbank market.

We draw similar conclusions when examining lending subsidiaries. Column 2 shows that subsidiaries that experience securities losses lend less to other banks. Although the effect appears to be statistically different from zero only for domestic subsidiaries, the lack of statistical significance for loans by foreign banks (defined as loans extended by banks located in a different country than the borrowing subsidiary) is largely due to a lack of power. Overall, there is no evidence that banks outside the group provide liquidity support to other banks experiencing securities losses, whether these are domestic or foreign. Thus, border effects appear to only emerge within banking groups.

5.3 Robustness: Other Subsidiary Characteristics

So far, we have considered banking groups' lower propensity to transfer liquidity to foreign subsidiaries with securities losses as arising from segmentation along national borders. However, foreign subsidiaries could be used primarily for funding, making liquidity transfers unnecessary (Cetorelli and Goldberg, 2012b). To evaluate whether this is the case, we control for the ratio of a subsidiary's deposits to its loans outstanding. A higher ratio would indicate that the subsidiary is more likely to serve as a funding source. In column 1 of Appendix Table A1, we replace the foreign subsidiary dummy (used in Table 6) with the proxy capturing a funding subsidiary. We do not observe any different propensity to obtain within-group lending for subsidiaries with a high ratio of deposits to outstanding loans, suggesting that the foreign subsidiary dummy is unlikely to capture subsidiaries with different functions.

Finally, banking groups may shield their domestic subsidiaries from losses to a greater extent because these subsidiaries are larger and more central to the group's business. If this is the case, the border could play a minor role in explaining the segmentation in liquidity provision that we observe within the group. We should, however, observe that large foreign subsidiaries of a banking group receive relatively more liquidity support from the rest of the group when they experience securities losses.

Column 2 of Appendix Table A1 shows that large subsidiaries indeed receive more credit from other subsidiaries of the group when they experience more extensive securities losses. However, column 3 shows that only large domestic subsidiaries of banking groups obtain liquidity support. The double interaction term Securities $\text{Losses}_{b,t} \times \text{Large Subsidiary}_b$ is negative and significant, indicating that not only do large foreign subsidiaries not benefit from the intra-group liquidity support, but they also obtain less liquidity than other foreign subsidiaries.

Thus, large domestic subsidiaries, and domestic subsidiaries in general, benefit from intra-group liquidity provision. This finding aligns with (Cetorelli and Goldberg, 2012a), which suggests that US banks obtain liquidity from their foreign subsidiaries when funding conditions at home deteriorate. However, we also show that foreign subsidiaries subject to shocks do not experience the same benefits, even when their purpose is not to primarily raise funds for the whole group. We also observe that foreign subsidiaries that incur losses tend to extend less credit to other domestic subsidiaries of the group. Overall, these results suggest that local liquidity pools and the national deposit insurance segment the redistribution of liquidity within banking groups following negative shocks.

6 Securities Losses and Corporate Lending

6.1 Main Results

This section examines whether banks' collateral value, which influences their capacity to insure against liquidity risk, affects the supply of credit. We test whether banks that are more exposed to monetary tightening through their securities portfolios reduce lending to firms, and whether subsidiaries of banking groups that benefit from internal liquidity support

shield their borrowers from such shocks. These tests are crucial for evaluating the collateral-based bank lending channel of monetary policy and also shed light on how stand-alone banks and domestic and foreign subsidiaries of banking groups transmit monetary tightening to the corporate sector.

Because we control for borrowers' credit demand, our analysis also informs whether the observed reduction in liquidity redistribution, across both the interbank market and to foreign subsidiaries within banking groups, reflects heterogeneity in banks' lending opportunities. If some banks reduced their liquidity demand due to limited lending prospects, then their securities losses should not be associated with reductions in credit to a given borrower.

We estimate the following equation for the logarithm of the outstanding credit of bank (subsidiary) b belonging to group g to firm f during month t:

$$\text{Loan Amount}_{b,g,f,t} = \alpha + \beta \text{ Securities Losses}_{b,t-1} + \gamma X_{b,t-1} + \delta_{f,t} + \mu_{g,t} + \theta_{b,f} + \epsilon_{b,g,f,t}. \quad (5)$$

Following (Khwaja and Mian, 2008), we include interactions of firm and time fixed effects ($\delta_{f,t}$) in most of the analysis to control for demand shocks. In some specifications, we control for demand shocks by including sector-country-time fixed effects, instead of firm-time fixed effects, to ensure that our results generalize to firms with single-bank relationships. We also control for the strength of the relationship between a bank and a firm, including interactions of bank and firm fixed effects ($\theta_{b,f}$). Finally, in our preferred specification, we include lagged subsidiary-level controls ($X_{b,t-1}$), namely the share of deposits to total assets, the equity ratio, and the logarithm of total assets, to capture group and subsidiary-level financial conditions. Specifically, the share of deposits-to-total-assets ratio allows us to control for the fact that banks may expect to experience deposit outflows when policy interest rates increase, and for this reason, they contract their credit supply (Drechsler et al., 2017).[11] Finally, in some specifications, we also include interactions of banking group and time fixed effects ($\mu_{g,t}$), which allow us to compare domestic and foreign subsidiaries of the same banking group.

Table 7 shows that banks that experience larger securities losses lend less to a given firm

[11] We provide additional robustness with respect to the deposit channel in Table 12. In particular, we show that our results remain unchanged when controlling for both the interaction between a bank's deposit share and changes in the policy rate, as well as the actual change in deposits over the quarter.

relative to other banks. In column 1, we estimate the effects on the full sample of firms, including firms borrowing from only one bank (for which firm–time fixed effects cannot be estimated). In this specification, we control for credit demand using sector–country–time fixed effects. The coefficient is similar in magnitude to column 2 – our preferred specification with firm–time fixed effects – showing that the estimated effects are not driven by credit-demand fluctuations but reflect shifts in credit supply. The estimates are also stable regardless of whether we control for bank time-varying characteristics(columns 2 and 3). Importantly, the estimated parameter on the variable of interest is negative and significant in both columns 3 and 4, and becomes even larger when we include interactions of banking group and time fixed effects. This suggests that subsidiaries of a banking group experiencing larger losses tend to contract lending, despite receiving liquidity from other subsidiaries within the group. However, as we show in Table 10, the average effect masks important differences between domestic and foreign subsidiaries within the same banking group.

The effect of securities losses is both statistically and economically significant. A one-standard-deviation increase in banks' losses is associated with a 2.54% decline in lending to firms (column 3). This effect appears to be primarily driven by losses on securities accounted for at historical cost (column 5). In contrast, the coefficient for losses on marked-to-market securities is negative but statistically insignificant (column 6). This is likely because AFS securities losses are small on average. Additionally, we measure securities holdings at the beginning of the sample, and securities may have been sold prior to the price depreciation.[12] Furthermore, the effect of AFS and HTM securities losses on credit supply is statistically indistinguishable, as the F-test cannot reject the null that the coefficients of the AFS and HTM losses in column 7 are equal. More importantly, in column 8 of Table 7, we include an interaction term between AFS securities losses and the bank's regulatory capital. Not only is the coefficient on the interaction term positive and significant, but the coefficient on AFS securities losses becomes negative and statistically significant, and its absolute value is larger. This indicates that the negative effect of AFS securities losses on credit supply is larger for banks with lower regulatory capital, confirming the mechanism described by

[12]We note, however, that the coefficient on AFS is negative and significant in Table A2 in the Internet Appendix, when we include interactions of group and time fixed effects.

Greenwald et al. (2024). The negative and significant coefficient on HTM securities losses continues to support the relevance of the bank-based collateral channel.

6.2 Mechanism

Table 8 further explores the mechanism through which securities losses are expected to negatively impact the supply of credit.[13] The collateral channel would imply that the negative effect of security losses is driven by banks with high collateral utilization rates, which may face a binding collateral constraint if they experience negative liquidity shocks. Supporting the collateral channel, column 1 shows that the effect of securities losses is indeed larger for banks with high collateral utilization rates. Thus, collateral scarcity leads to a sharper contraction in bank lending following a monetary tightening.

Furthermore, securities losses should negatively affect the supply of credit for banks with less excess liquidity, which are less able to withstand deposit redemptions and other negative liquidity shocks without accessing the repo market. These banks may reduce their credit supply to increase the liquidity of their assets. In column 2, we examine whether the effect of securities losses varies across banks with different levels of ex ante liquidity. We proxy for a bank's liquidity position using excess liquidity, defined as the amount deposited with the central bank above the minimum reserve requirements relative to the bank's total assets. While the coefficient on securities losses is negative and significant, the double interaction between securities losses and excess liquidity is positive and statistically significant. This indicates that, for a given level of securities losses, the impact is stronger for banks with weaker ex-ante liquidity positions. These findings support our hypothesis that securities losses impair banks' liquidity access, thereby reducing their propensity to extend illiquid loans. Such an interpretation is confirmed in column 3, where we interact the pledgeable securities losses with the bank's amount of borrowing from the ECB relative to the bank's total assets. The monetary tightening coincided with the phasing out of the Targeted Long-Term Refinancing Operations (TLTRO), which enabled banks to access liquidity at favorable ECB rates. Banks that had borrowed more through this facility are naturally more exposed

[13] All findings are robust in Table A3 in the Internet Appendix, when we include interactions of banking group and time fixed effects.

to the quantitative tightening and anticipate higher liquidity needs. Securities losses should thus have a particularly negative impact on their ability to supply credit. This is precisely what the negative and significant coefficient on the interaction term suggests in column 3.

In column 4, we proxy for a bank's exposure to negative liquidity shocks by considering the stability of its liabilities. We capture this through the net stable funding ratio (NSFR), which banks must report to regulators. Banks with a higher NSFR are less exposed to negative liquidity shocks. It is thus consistent with the collateral channel that the negative effects of securities losses on these banks' credit supply are attenuated.

In column 5, we consider the Liquidity Coverage Ratio (LCR). This regulation, enacted in response to the Global Financial Crisis, aims to ensure that banks maintain sufficient liquid assets to meet their obligations. Larger amounts of securities on a bank's balance sheet increase the LCR. Securities losses could matter not for the precautionary motives we posit but because they make it harder for banks to satisfy the LCR constraint. In column 5, the coefficient on the interaction between a bank's securities losses and its LCR is negative and statistically significant. This suggests that banks with higher securities holdings and, consequently, a higher LCR reduce credit supply more. Thus, the effects of securities losses on credit supply are not mechanically driven by the LCR regulation, underscoring the importance of a bank's ability to insulate itself against future liquidity shocks.

Overall, these results are consistent with the findings of Altavilla et al. (2025), which suggest that the liquidity of bank assets matters for the credit supply. While they focus on excess reserve holdings, we highlight the complementary role of securities' valuations. As a consequence, monetary tightening, by decreasing the value of a bank's pledgeable securities, can have particularly large negative effects on the credit supply when it is accompanied by quantitative tightening and a decrease in the outstanding amount of liquidity.

6.3 New Loans to Firms

In addition to considering the effect of securities losses on a bank's outstanding credit to a given borrower, we also consider their effects on newly issued loans. Table 9 presents the results. Column 1 considers the amount of newly issued loans of a bank to a given firm. Consistent with previous findings, the negative and statistically significant coefficient

on our variable of interest suggests that banks experiencing larger securities losses extend less credit compared to banks with smaller losses. Columns 2 and 3 explore the terms of newly issued loans, specifically interest rates and loan maturities. In column 2, the positive and statistically significant coefficient indicates that banks with greater securities losses charge higher interest rates on new loans, further corroborating the evidence of a reduced credit supply. Column 3 indicates that these banks also offer new loans with shorter maturities, which may reflect increased caution in their lending practices and a desire to mitigate liquidity risks associated with long-maturity loans. Overall, the results in Table 9 suggest that securities losses not only reduce the quantity of new lending but also affect the pricing and structure of credit, amplifying the transmission of banks' securities losses to the real economy.

6.4 Corporate Lending and Banking Group Structure

We also consider differences between stand-alone banks and banking groups. Table 10, column 1 distinguishes between stand-alone banks and subsidiaries of banking groups. It appears that one euro of securities losses results in a larger contraction in lending for stand-alone banks compared to subsidiaries of banking groups, which can rely on intra-group liquidity redistribution. In column 2, we focus on stand-alone banks and domestic subsidiaries to compare banks within the same country (i.e., domestic banks). The coefficient estimates in column 2 are consistent with those in column 1, confirming that domestic subsidiaries are partially shielded from securities losses through intra-group loans.

Column 3 restricts the sample to subsidiaries of banking groups and examines differences between domestic and foreign subsidiaries, where the latter are defined as subsidiaries located in a country other than the group's headquarters. Consistent with our earlier finding that foreign subsidiaries of banking groups do not benefit from intra-group liquidity redistribution, they contract credit significantly more than domestic subsidiaries for a given euro amount of losses.

6.5 Firm-Level Credit

In principle, securities losses could have limited effects on the supply of credit if firms were able to substitute from banks with large securities losses toward less affected lenders. To be able to evaluate the effects of securities losses on aggregate lending to firms, we estimate the following firm-time level regression:

$$\text{Loan Amount}_{f,t} = \alpha + \beta \overline{\text{Securities Losses}_{f,t-1}} + \gamma \overline{X_{f,t-1}} + \delta_f + \mu_{s,c,t} + \epsilon_{b,g,f,t}, \qquad (6)$$

where Loan Amountf,t denotes the logarithm of the total borrowing of firm f from all banks at time t. The firm-level exposure to banks' securities losses, $\overline{\text{Securities Losses}_{f,t-1}}$, is constructed as the credit-weighted average of the securities losses of the banks that lend to firm f, with weights given by the outstanding credit of firm f with bank b at time $t-1$. Firm exposure to other bank-level controls, $\overline{X_{f,t-1}}$, is constructed analogously. The regression includes sector–country–time fixed effects, $\mu_{s,c,t}$, to absorb any observable or unobservable time-varying shifts in credit demand at the sector and country level, as well as firm fixed effects, δ_f.

Table 11 presents the results. We find that the negative effects of securities losses estimated at the relationship level translate into sizable and statistically significant effects at the firm level. Firms borrowing from banks with larger securities losses experience an overall decline in credit, suggesting limited ability to substitute credit away from more exposed lenders. The magnitude of the firm-level effect is comparable to that estimated at the relationship level: a one-standard-deviation increase in securities losses is associated with a 2.4% reduction in firm-level borrowing.

Overall, these results suggest that reduced liquidity access through the interbank market leads banks to contract their credit supply, and that liquidity redistribution within the banking group partially shields domestic subsidiaries from the effects of securities losses.

6.6 Robustness

We have so far provided consistent evidence that securities losses negatively affect a bank's access to the interbank market and result in a contraction in corporate lending. The mech-

anism tests provide suggestive evidence that banks with reduced access to the interbank market, and thus a reduced ability to weather liquidity shocks, decrease the credit supply in order to increase their asset liquidity.

Table 12 further shows that our conclusions remain robust when considering the fact that monetary restrictions can impact banks through various other channels. We consider both banks' borrowing in the interbank market (columns 1 to 5) and banks' lending to corporations (columns 6 to 9). For instance, recent work emphasizes the deposit channel (Drechsler et al., 2017) and highlights that banks lose deposits when interest rates increase, inevitably leading to a contraction in lending. The deposit contraction could be particularly pronounced for banks with larger securities losses, driving our findings. To address this concern, we interact our control for the proportion of a bank's liabilities that are deposits with the change in the policy rate (columns 1 and 6). We also include as a control the actual change in deposits over the quarter (columns 2 and 7). Our results are qualitatively invariant, further supporting our interpretation that access to the interbank market affects the supply of credit by impacting banks' ability to face future liquidity shocks.

Importantly, the specifications in Table 12 also interact the other banks' time-varying controls, namely equity to total assets and the logarithm of total assets, with the change in the policy interest rates. The estimates thus show that our results are not driven by asymmetries in monetary transmission between banks of different sizes or with different levels of capitalization.

We also take into account that, up to this point, we have abstracted from hedging. Hedging profits that compensate securities losses should not affect the collateral channel because banks pledge securities, and not hedging instruments. Yet, hedging could explain why we find limited evidence for the net worth channel. We thus define a bank's hedging as the ratio of the total notional amount of interest rate derivatives used for hedging purposes, normalized by total assets. Including this control in columns 3 and 8 does not affect our results. Columns 4 and 9 further control for the banks' nonperforming loans, as the monetary tightening could also have caused borrowers' financial distress. The estimates are once again invariant. Finally, column 5 includes additional loan-level controls, such as maturity and interest rate, in the interbank market and again shows that our results are robust to these

specifications.

7 Conclusions

We document that collateral constraints play a central role in shaping bank lending. When monetary policy tightens, the market value of securities that banks can pledge in the interbank market declines, limiting their ability to insure against future liquidity shocks. In response, banks optimally increase the liquidity of their assets and reduce illiquid lending.

Internal capital markets within banking groups mitigate these effects. Domestic subsidiaries within groups can extend more credit than similarly affected stand-alone banks because they rely on internal liquidity support. By contrast, foreign subsidiaries do not benefit to the same extent: when they experience securities losses, they cut credit as much as stand-alone banks.

These findings have important implications for monetary policy transmission and bank regulation. First, they highlight the importance of the collateral channel: by lowering the collateral value of banks' securities, monetary policy tightening restricts access to interbank liquidity and amplifies the contraction in lending. More generally, securities losses translate into a tighter monetary policy stance even in the absence of interest rate hikes. Policymakers should therefore account for how fluctuations in collateral values affect the strength of the transmission mechanism.

Second, the evidence that cross-border internal liquidity transfers are limited suggests that national deposit insurance and local liquidity pools constrain banking integration. As a result, bank consolidation and cross-border acquisitions within the monetary union do not necessarily ensure an even transmission of monetary policy. Incomplete banking integration may thus create vulnerabilities in countries that rely heavily on foreign-owned banks, in the absence of a common deposit insurance system that enables cross-border liquidity reallocation.

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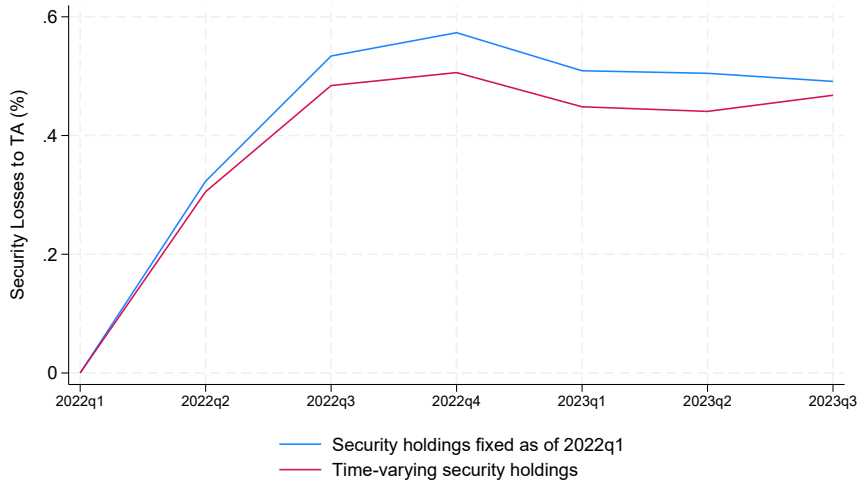
Figure 1: Securities Losses Over Time

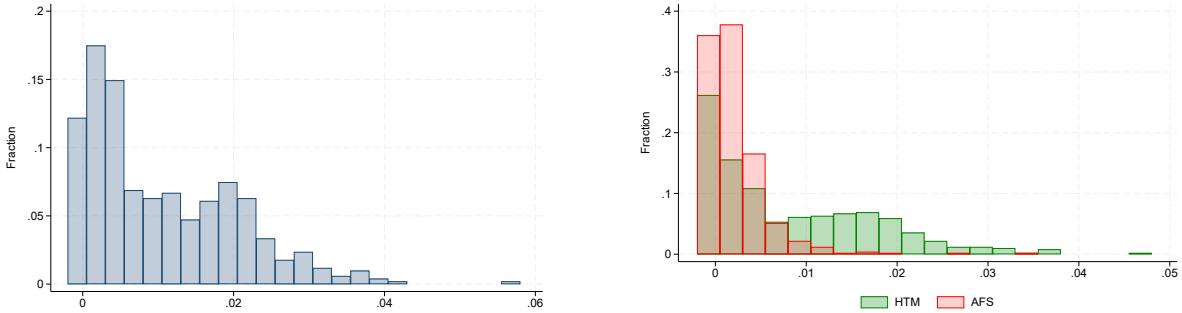


The figure plots the time-series evolution of aggregate securities losses as a share of total assets, as defined in equation (1). Aggregate securities losses are computed as the weighted average of individual bank losses. The blue line shows losses calculated using security holdings fixed as of 2022q1 (the baseline specification), while the red line shows losses computed using time-varying security holdings that account for banks' portfolio adjustments over time.

Figure 2: Distribution of Securities Losses Across Banks

(a) Total Securities Losses

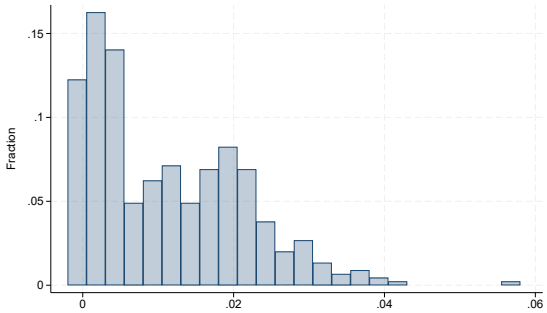
(b) HTM vs. AFS Securities Losses



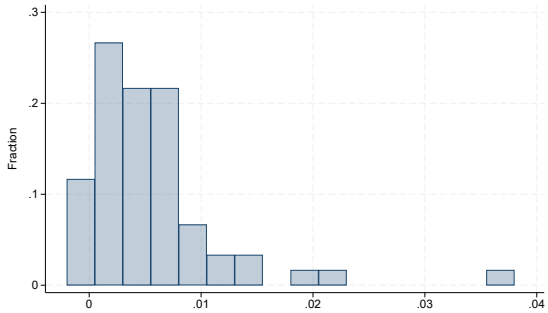
The figure shows the distribution of the securities losses accrued between 2022q1 and 2023q3, expressed as a share of total assets in 2022q1, as described by equation (1). Panel A presents the distribution of total securities losses. Panel B plots the distribution of HTM vs. AFS securities losses, respectively.

Figure 3: Distribution of Securities Losses: Subsidiaries vs. Stand-alone Banks

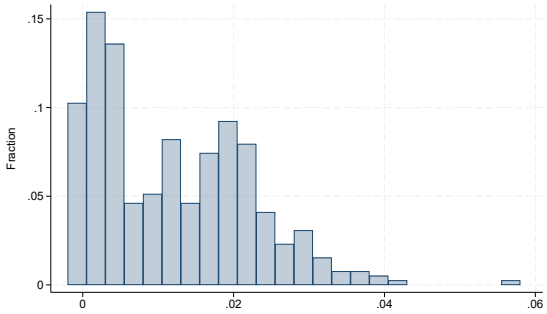
(a) Subsidiaries of Banking Groups



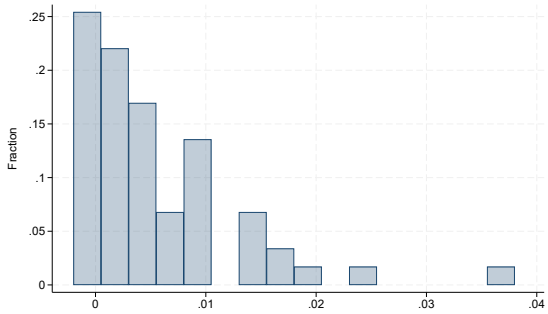
(b) Stand-Alone Banks



(c) Domestic Subsidiaries of Banking Groups



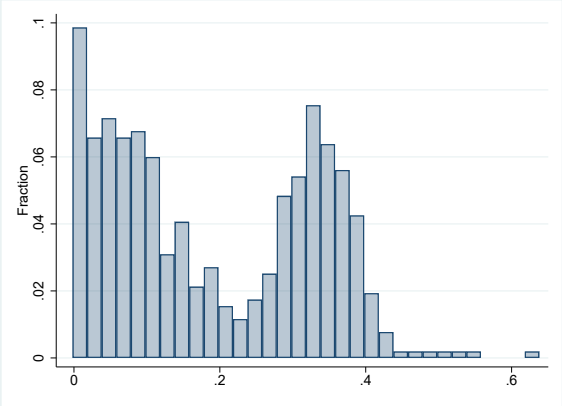
(d) Foreign Subsidiaries of Banking Groups



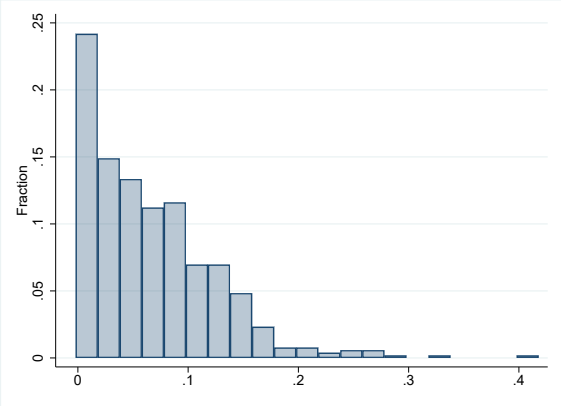
The figure shows the distribution of the securities losses accrued between 2022q1 and 2023q3, expressed as a share of total assets in 2022q1, as described by equation (1). Panel A presents the distribution of securities losses for subsidiaries of banking groups. Panel B presents the distribution of securities losses for stand-alone banks. Panel C and D present the distribution of securities losses for domestic and foreign subsidiaries of banking groups, respectively.

Figure 4: Securities Holdings by Banks

(a) All Securities



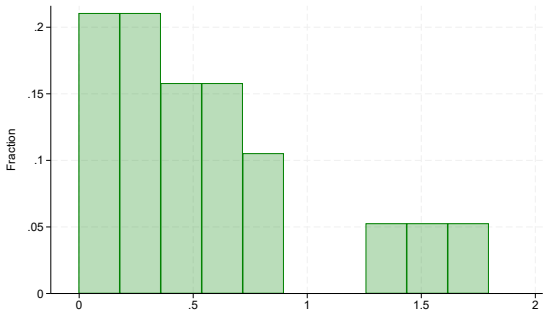
(b) Long-Term Securities



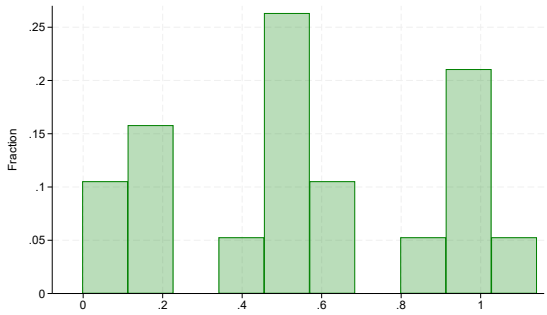
The figure plots the distribution of securities holdings across banks in Euro Area countries as of 2022q1. Panels A presents the histogram of total securities holdings, while Panel B focuses on long-term securities with a residual maturity greater than three years. All values are reported as a percentage of total assets.

Figure 5: Securities Losses by Country

(a) Median Bank



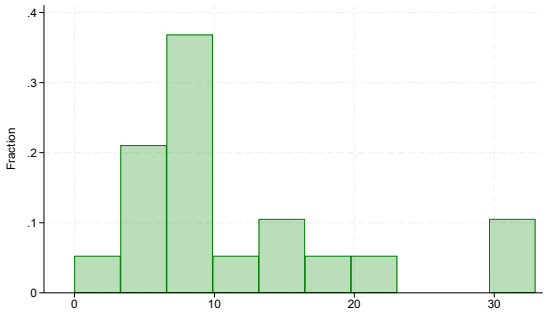
(b) Weighted Average



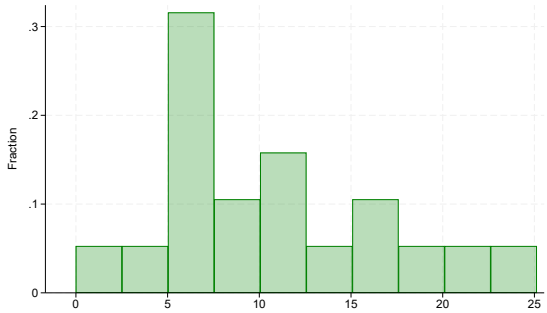
The figure plots securities losses across Euro Area countries as of 2023q3. Panel A presents the country-level securities losses of all reported securities for a median bank. Panel B plots the securities losses as a weighted average of banks within the country. All values are reported as a percentage of total assets.

Figure 6: Securities Holdings by Country

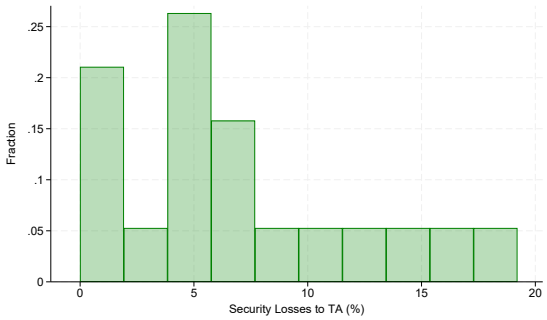
(a) All Securities (Median Bank)



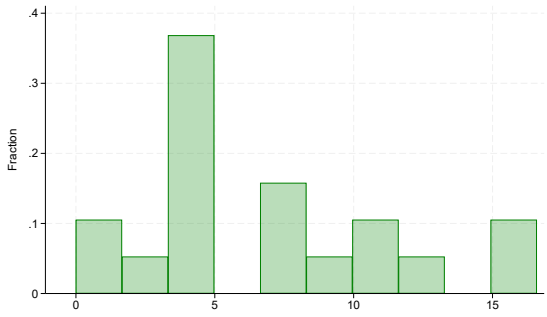
(b) All Securities (Weighted Average)



(c) Long-Term Securities (Median Bank)



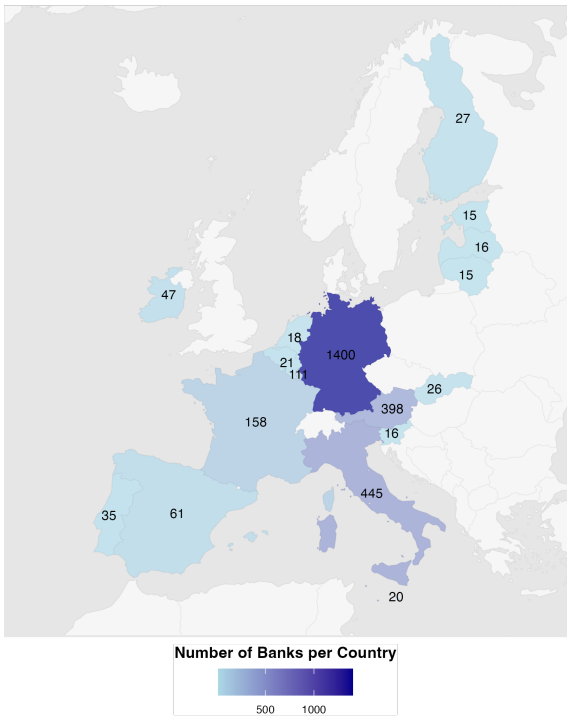
(d) Long-Term Securities (Weighted Average)



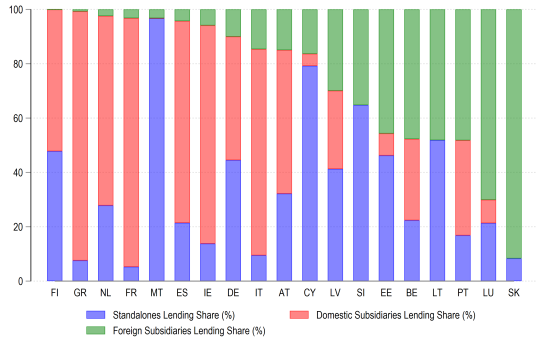
The figure plots securities holdings across Euro Area countries as of 2022q1. Panels A and B present the country-level securities holdings of all reported securities for a median bank, as well as the weighted average, respectively. Panels C and D focus on long-term securities with a residual maturity of more than three years, showing the country-level distribution for a median bank and as a weighted average, respectively. All values are reported as a percentage of total assets.

Figure 7: Distribution of Banks within the Euro Area

(a) Geographical Distribution of Banks

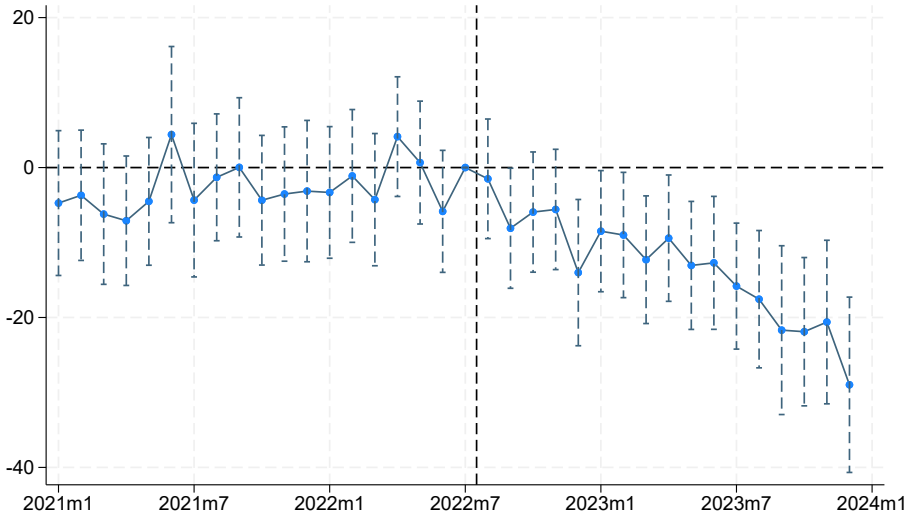


(b) Lending Share of Stand-Alone Banks and Banking Groups



The figure plots the country-level distribution of banks and their lending shares across the euro area. Panel A shows the number of banks per country. Panel B decomposes the lending shares of stand-alone banks, domestic and foreign subsidiaries of banking groups in each euro area country. A stand-alone bank refers to a bank that is not part of a banking group. A bank (subsidiary) is classified as domestic if it is located in the same country as its banking group's headquarters, and as foreign otherwise.

Figure 8: Securities Losses and the Interbank Market: Dynamic Effects



This figure presents estimates of β_k from

$$\text{Loan amount}_{b,c,l,h,t} = \alpha + \sum_{k \neq 2022m7} \beta_k (\text{Collateral Security Losses}_{b,2023Q4} \times \mathbf{1}_{t=k}) + \delta_{b,l} + \mu_{c,t} + \theta_{h,t} + \epsilon_{b,c,l,h,t},$$

where the dependent variable is the natural logarithm of the outstanding interbank credit amount issued by a lending bank l located in country h to a borrowing bank b located in country c during month t. Error bars represent 95 percent confidence intervals computed from standard errors two-way clustered at the borrowing bank-time and lending bank-time level.

Table 1: Summary Statistics

Panel A: Country-Level Summary Statistics of Stand-Alone Banks and Banking Groups in the Euro Area						
Variable	N	Mean	SD	P10	P50	P90
Number of Banks and Banking Groups per Country						
Total Number of Banks	19	151	328	15	26	445
Number of Stand-Alone Banks	19	96	285	5	10	293
Number of Domestic Subsidiaries	19	34	64	1	6	124
Number of Foreign Subsidiaries	19	20	24	3	9	78
Number of Banking Groups Present in the Country	19	105	294	9	13	314
Composition of Banks per Country (in %)						
Stand-Alone Banks / All Banks	19	43.29	22.97	12.77	44.26	80.00
Domestic Subsidiaries Banks / All Banks	19	25.75	22.02	5.00	21.05	66.67
Foreign Subsidiaries Banks / All Banks	19	30.96	19.54	5.03	27.78	63.83
Composition of Key Balance Sheet Variables per Country (in %)						
Share of NFC Lending by stand-alone Banks	19	33.25	25.52	7.58	24.38	79.21
Share of NFC Lending by Domestic Subsidiaries	19	40.83	34.72	0.00	34.99	91.52
Share of NFC Lending by Foreign Subsidiaries	19	25.92	26.43	0.74	14.97	70.07
Share of Total Assets of Stand-Alone Banks	19	30.55	25.08	10.81	18.35	76.23
Share of Total Assets of Domestic Subsidiaries	19	44.24	34.56	0.27	46.06	87.04
Share of Total Assets of Foreign Subsidiaries	19	25.20	25.48	1.15	14.58	70.55
Share of Securities Holdings by Stand-Alone Banks	19	30.93	30.14	4.14	18.76	95.88
Share of Securities Holdings by Domestic Subsidiaries	19	45.55	35.69	0.00	44.70	93.21
Share of Securities Holdings by Foreign Subsidiaries	19	23.52	28.26	0.00	8.30	79.87
Number of Subsidiaries and Key Characteristics per Banking Group						
Number of Subsidiaries	108	6.08	10.96	2	2.5	10
Number of Domestic Subsidiaries	108	3.94	10.08	1	1	5
Number of Foreign Subsidiaries	108	2.14	3.42	0	1	6
Number of Countries in Which a Banking Group Operates	108	2.68	1.98	1	2	6
Share of Group NFC Lending Held Domestically	108	83.29	24.94	49.98	95.35	100.00
Share of Group Total Assets Held Domestically	108	86.25	20.87	64.15	94.67	100.00

Panel B: Bank-Level Securities Holdings, Securities Losses and Other Balance Sheet Variables						
Variable	N	Mean	SD	P10	P50	P90
Securities Holdings (as of 2022q1)						
Total Securities Holdings (mil EUR)	498	3,164	8,657	38	386	9,592
Securities Holdings to Total Assets (in %)	498	18.37	14.45	1.64	14.26	36.96
Long-Term Securities Holdings to Total Assets (in %)	498	6.59	5.86	0.21	5.23	14.12
HTM Securities / Total Securities Holdings (in %)	498	64.19	33.26	0.00	71.76	99.98
AFS Securities / Total Securities Holdings (in %)	498	35.81	33.26	0.02	28.24	100.00
(ECB + Interbank Borrowing) / Total Securities Holdings (in %)	498	90.92	90.08	27.77	55.55	202.89
Other Balance Sheet Variables (as of 2022q1)						
Total Assets (log)	498	8.48	2.21	5.81	8.02	11.47
Interbank Borrowing (% of Total Assets)	498	13.82	16.05	0.32	13.55	23.73

Variable	N	Mean	SD	P10	P50	P90
Securities Losses						
Securities Losses (% of Total Assets)	3486	0.87	1.02	0.00	0.51	2.19
Collateral Securities Losses (% of Total Assets)	3486	0.86	1.00	0.00	0.49	2.17
Non-Collateral Securities Losses (% of Total Assets)	3486	0.01	0.20	0.00	0.00	0.05
HTM Securities Losses (% of Total Assets)	3486	0.68	0.91	0.00	0.29	1.91
AFS Securities Losses (% of Total Assets)	3486	0.18	0.29	0.00	0.08	0.48
Securities Losses (% of Total Equity)	3486	10.26	14.42	0.00	6.37	24.79
Collateral Securities Losses (% of Total Equity)	3486	10.09	13.97	0.00	6.09	24.47
Non-Collateral Securities Losses (% of Total Equity)	3486	0.17	3.36	0.00	0.00	0.61
HTM Securities Losses (% of Total Equity)	3486	8.02	13.46	0.00	3.31	21.18
AFS Securities Losses (% of Total Equity)	3486	2.07	3.29	0.00	0.90	5.48

Panel C: Loan-Level Summary Statistics

Variable	N	Mean	SD	P10	P50	P90
Interbank Lending						
Loan Amount (log)	67,845	16.27	3.48	11.75	16.62	20.39
Securities Losses of Borrowing Banks (% of Total Assets)	67,609	0.66	0.62	0.08	0.45	1.59
Securities Losses of Lending Banks (% of Total Assets)	67,341	0.65	0.60	0.08	0.45	1.59
Repo Amount (log)	14,820	18.04	2.32	14.92	18.42	21.00
Repo Rates (in %)	14,820	1.03	1.53	-0.35	0.01	3.60
Corporate Lending						
Loan Amount (log)	19,005,930	12.23	1.76	10.31	12.07	14.48
Number of Bank Relationships	19,005,930	3.40	4.25	2	3	6
Securities Losses (% of Total Assets)	19,005,930	0.79	0.57	0.08	0.81	1.34

Table 2: Securities Losses, Securities Holdings and Bank Characteristics

	Securities Losses							Securities Holdings					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Securities Holdings$_b$/TA$_b$	0.0554***	0.0535***	0.0535***	0.0543***	0.0537***	0.0523***	0.0507***						
	(0.00264)	(0.00300)	(0.00301)	(0.00341)	(0.00352)	(0.00364)	(0.00324)						
log(TA$_b$)		-0.000267	-0.000347	-0.000392	-0.000503	-0.000525	-0.000197	-0.0321***	-0.0323***	-0.0206***	-0.0296***	-0.0286***	-0.0251***
		(0.000201)	(0.000229)	(0.000278)	(0.000321)	(0.000321)	(0.000292)	(0.00261)	(0.00307)	(0.00376)	(0.00412)	(0.00401)	(0.00418)
Deposits$_b$/TA$_b$			-0.00137	-0.00221	-0.00231	-0.000205	0.00119		-0.00273	-0.0472	-0.0606	0.0414	0.0724
			(0.00199)	(0.00226)	(0.00227)	(0.00272)	(0.00255)		(0.0283)	(0.0310)	(0.0454)	(0.0353)	(0.0480)
Excess Liquidity$_b$/TA$_b$				-0.00126	-0.00213	-0.000398	-0.00391			-0.365***	-0.406***	-0.285***	-0.309***
				(0.00581)	(0.00595)	(0.00607)	(0.00530)			(0.0779)	(0.0765)	(0.0778)	(0.0772)
ECB Borrowing$_b$/TA$_b$					0.00663	0.0111	-0.00693				0.587***	0.742***	0.686***
					(0.00956)	(0.0101)	(0.00889)				(0.123)	(0.123)	(0.125)
Interbank Borrowing$_b$/TA$_b$						0.00680	-0.0000627					0.328***	0.339***
						(0.00488)	(0.00435)					(0.0621)	(0.0633)
Total Capital Ratio$_b$							0.00294						0.0284
							(0.00222)						(0.0327)
N	498	498	498	498	498	498	498	498	498	498	498	498	498
R^2	0.464	0.466	0.466	0.467	0.467	0.468	0.468	0.229	0.230	0.230	0.230	0.231	0.231

The table reports the results examining the relationship between bank securities losses, securities holdings, and various bank characteristics. In Columns (1)–(7), the dependent variable is the securities losses accrued between 2022q1 and 2023q3, expressed as a share of total assets in 2022q1, as defined in equation (1). In Columns (8)–(13), the dependent variable is the securities holdings as a share of total assets in 2022q1. All bank characteristics are measured as of 2022q1. TA denotes bank total assets. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 3: Types of Securities Losses and the Interbank Market

	Loan Amount								Loan Spread	
	All Instruments						Repo	Non-Repo	Repo	Non-Repo
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
All Securities Losses$_{b,t-1}$	-3.691***									
	(1.403)									
Collateral Securities Losses$_{b,t-1}$		-9.006***		-6.226*	-9.953***		-21.89***	2.889	0.114**	-0.083
		(3.211)		(3.325)	(3.632)		(5.666)	(4.561)	(0.055)	(0.054)
Non-Collateral Securities Losses$_{b,t-1}$			-1.236							
			(1.014)							
Collateral Securities Losses$_{b,t-1}$				-4.939***						
×Collateral Utilization Rate$_{b,2022q1}$				(1.251)						
Collateral Securities Losses$_{b,t-1}$					2.088					
×Total Capital Ratio$_{b,2022q1}$					(3.458)					
Collateral AFS Securities Losses$_{b,t-1}$						-13.24**				
						(5.441)				
Collateral HTM Securities Losses$_{b,t-1}$						-6.930**				
						(3.325)				
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity Basket FE	No	No	No	No	No	No	Yes	Yes	Yes	Yes
N	120,799	120,005	120,005	99,344	120,005	120,005	13,258	85,280	13,258	85,280
R^2	0.899	0.898	0.898	0.896	0.898	0.898	0.809	0.888	0.761	0.761

The table reports the results of the relationship between banks' behavior in the interbank market and securities losses. In Columns (1)–(8), the dependent variable is the natural logarithm of the outstanding interbank credit amount issued by bank l to bank b during month t. Column (7) considers only repo loans, while column (8) considers only unsecured borrowing. In Columns (9)–(10), the dependent variable is the loan spread on repo and non-repo borrowing, respectively. Securities losses are calculated based on equation (1). The collateral utilization rate is defined as the ratio of ECB and interbank borrowing to total securities holdings in 2022q1. The Total Capital Ratio is the ratio of Tier 1 and Tier 2 capital to risk-weighted assets in 2022q1. Standard errors are two-way clustered at the borrowing-bank–time and lending-bank–time levels. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 4: Securities Losses and the Interbank Market

	Loan Amount							
	Borrowing Banks' Losses		Lending Banks' Losses			Borrowing and Lending Banks' Losses		
	Between Groups	Within Group	All	Between Groups	Within Group	All	Between Groups	Within Group
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Collateral Securities Losses$_{b,t-1}$	-16.73***	13.61***				-6.563***	-15.56***	9.269**
	(3.778)	(3.971)				(2.342)	(5.839)	(3.839)
Collateral Securities Losses$_{l,t-1}$			-8.896**	-10.26**	0.273	-9.598***	-9.900**	-1.017
			(3.467)	(4.840)	(4.280)	(3.592)	(4.936)	(4.203)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	99,134	20,855	51,879	35,330	16,518	51,150	35,151	15,968
R^2	0.881	0.907	0.882	0.841	0.916	0.880	0.841	0.910

The table reports the results of the relationship between banks' behavior in the interbank market and securities losses for the subsamples of between-group and within-group loans, as described by equations (2) and (4). The dependent variable is the natural logarithm of the outstanding interbank credit amount issued by a lending bank l to a borrowing bank b during month t. Securities losses are calculated based on equation (1). Standard errors are two-way clustered at the borrowing bank-time and lending bank-time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 5: Within-Group Lending to Domestic and Foreign Subsidiaries

	Loan Amount					
	Borrowing Subsidiary's Losses				Lending Subsidiary's Losses	
Definition of domestic/foreign:	Domestic†	Domestic‡	Domestic‡	Domestic‡	Domestic†	Domestic‡
Lending by:	All	All	Foreign subs.	Domestic subs.	All	All
	(1)	(2)	(3)	(4)	(5)	(6)
Collateral Securities Losses$_{b,t-1}$ × Foreign$_b$	-8.960	3.573	71.22*	-4.625		
	(13.30)	(12.72)	(39.40)	(13.57)		
Collateral Securities Losses$_{b,t-1}$ × Domestic$_b$	10.82***	9.948***	8.796	5.346*		
	(3.690)	(3.834)	(7.820)	(2.956)		
Collateral Securities Losses$_{l,t-1}$ × Foreign$_b$					-6.681	-62.79***
					(12.82)	(13.24)
Collateral Securities Losses$_{l,t-1}$ × Domestic$_b$					1.003	5.021
					(4.487)	(4.689)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes	Yes	Yes	Yes
N	16,132	16,132	1,420	15,214	16,423	16,423
R^2	0.910	0.910	0.867	0.922	0.916	0.916

The table presents the results of the effects of banks' securities losses on within-group lending to domestic and foreign subsidiaries, as described by equations (2) and (4). The dependent variable is the natural logarithm of the outstanding intra-bank credit amount issued by a lending bank l to a borrowing bank b during month t. Securities losses are calculated based on equation (1). Two different definitions of domestic versus foreign borrowing (lending) subsidiaries are used. Domestic† is based on the location of the lending and borrowing bank: the borrowing subsidiary is classified as domestic if it is located in the same country as the lending subsidiary, and as foreign otherwise. Domestic‡ is based on the subsidiary's location relative to its headquarters: the subsidiary is classified as domestic if it is located in the same country as its banking group's headquarters, and foreign otherwise. Standard errors are two-way clustered at the borrowing bank-time and lending bank-time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 6: Between-Group Lending to Domestic and Foreign Subsidiaries

	Loan Amount	
	Borrowing Subsidiary's Losses	Lending Subsidiary's Losses
	(1)	(2)
Collateral Securities Losses$_{b,t-1}$	-4.119*	
× Foreign$_b$	(-1.71)	
Collateral Securities Losses$_{b,t-1}$	-22.92***	
× Domestic$_b$	(5.939)	
Collateral Securities Losses$_{l,t-1}$		-6.699
× Foreign$_l$		(6.421)
Collateral Securities Losses$_{l,t-1}$		-13.57**
× Domestic$_l$		(5.590)
Bank Lender – Bank Borrower FE	Yes	Yes
Country Lender – Time FE	Yes	Yes
Country Borrower – Time FE	Yes	Yes
N	35271	35243
R^2	0.842	0.841

The table presents the results of the effects of banks' securities losses on between-group lending to domestic and foreign subsidiaries, as described by equations (2) and (4). The dependent variable is the natural logarithm of the outstanding interbank credit amount issued by a lending bank l to a borrowing bank b during month t. Securities losses are calculated based on equation (1). Domestic dummy is based on the location of the lending and borrowing bank: the borrowing subsidiary is classified as domestic if it is located in the same country as the lending subsidiary, and as foreign otherwise. Standard errors are two-way clustered at the borrowing bank-time and lending bank-time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 7: Securities Losses and Bank Lending to Firms

	Loan Amount							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Collateral Securities Losses$_{b,t-1}$	-2.769***	-2.910***	-2.542***	-5.476***				
	(0.429)	(0.572)	(0.541)	(0.576)				
Collateral HTM Securities Losses$_{b,t-1}$					–2.903***		-3.025***	-3.370***
					(0.572)		(0.566)	(0.599)
Collateral AFS Securities Losses$_{b,t-1}$						-1.460	-2.228	-10.971***
						(2.558)	(2.406)	(3.999)
Collateral AFS Securities Losses$_{b,t-1}$								45.846**
× Total Capital Ratio$_{b,2022q1}$								(19.189)
Bank Controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Bank – Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry – Country – Time FE	Yes	-	-	-	-	-	-	-
Firm – Time FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Banking Group – Time FE	No	No	No	Yes	No	No	No	No
N	57,135,073	16,290,844	16,290,840	16,290,839	16,290,840	16,290,840	16,290,840	15,803,384
R^2	0.956	0.972	0.972	0.972	0.972	0.972	0.972	0.972

The table presents the results of the effects of banks' securities losses on bank lending to firms, as described by equation (5) The dependent variable is the natural logarithm of the outstanding credit issued by a bank (subsidiary) b to a firm f during month t. Securities losses are calculated based on equation (1). Total Capital Ratio is defined as the ratio of the sum of Tier 1 and Tier 2 capital to risk-weighted assets in 2022q1. Standard errors are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 8: Securities Losses and Bank Lending to Firms: Mechanism

	Loan Amount				
	(1)	(2)	(3)	(4)	(5)
Collateral Securities Losses$_{b,t-1}$	-1.982***	-3.922***	-3.658***	-9.542**	-0.106
	(0.671)	(1.020)	(0.972)	(3.982)	(1.475)
Collateral Securities Losses$_{b,t-1}$ × Collateral Utilization Rate$_{b,2022q1}$	-1.406***				
	(0.541)				
Collateral Securities Losses$_{b,t-1}$ × Excess Liquidity$_{b,2022q1}$		6.798***			
		(2.503)			
Collateral Securities Losses$_{b,t-1}$ × ECB Borrowing$_{b,2022q1}$			-28.628***		
			(4.517)		
Collateral Securities Losses$_{b,t-1}$ × NSFR$_{b,2022q1}$				5.924**	
				(2.816)	
Collateral Securities Losses$_{b,t-1}$ × LCR$_{b,2022q1}$					-0.547**
					(0.273)
Bank Controls	Yes	Yes	Yes	Yes	Yes
Bank – Firm FE	Yes	Yes	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes	Yes	Yes
N	12,536,518	12,610,601	12,610,594	6,072,838	5,685,899
R^2	0.968	0.968	0.968	0.974	0.974

The table presents the results of the effects of banks' securities losses on bank lending to firms, as described by equation (5) The dependent variable is the natural logarithm of the outstanding credit issued by a bank (subsidiary) b to a firm f during month t. Securities losses are calculated based on equation (1). The collateral utilization rate is defined as the ratio of ECB and interbank borrowing to total securities holdings as of 2022q1. Excess liquidity is defined as liquidity deposited with the central bank in excess of the minimum reserve requirements as of 2022q1. ECB Borrowing represents the ratio of bank funding from the central bank (ECB) to total assets as of 2022q1. NSFR represents Net Stable Funding Ratio as if 2022q1. LCR represents Liquidity Coverage Ratio as of 2022q1. Standard errors are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 9: Securities Losses and New Loans to Firms

	New Loan Amount	Rates	Maturity
	(1)	(2)	(3)
Collateral Securities Losses$_{b,t-1}$	-3.138**	0.688***	-13.93**
	(1.284)	(0.164)	(6.816)
Controls	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry – Country – Time FE	Yes	Yes	Yes
Banking Group – Time FE	Yes	Yes	Yes
N	383,092	383,092	383,092
R^2	0.787	0.869	0.824

The table presents the results of the effects of banks' securities losses on the new bank of lending to firms, as described by equation (5). In column 1, the dependent variable is the natural logarithm of the new credit issued by a bank (subsidiary) b to a firm f in month t. In column 2, the dependent variable is the credit-weighted average annualized interest rate on the newly issued loans by a bank (subsidiary) b to a firm f in month t. In column 3, the dependent variable is the logarithm of the credit-weighted average original maturity of the newly issued loans by a bank (subsidiary) b to a firm f in month t. Securities losses are calculated based on equation (1). Standard errors are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 10: Securities Losses, Banking Group Structure and Lending

	Loan Amount		
	All Banks	Domestic Banks	Banking Groups
	(1)	(2)	(3)
Collateral Securities Losses$_{b,t-1}$	-6.761***	-7.368***	
× Stand-Alone Bank$_b$	(2.052)	(2.064)	
Collateral Securities Losses$_{b,t-1}$	-1.951***	-1.985***	
× Subsidiary$_b$	(0.8181)	(0.855)	
Collateral Securities Losses$_{b,t-1}$			-4.125***
× Foreign Subsidiary$_b$			(1.093)
Collateral Securities Losses$_{b,t-1}$			-1.446***
× Domestic Subsidiary$_b$			(0.556)
Bank Controls	No	No	No
Bank – Firm FE	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes
Banking Group – Time FE	No	No	Yes
N	16,290,844	13,748,918	10,611,217
R^2	0.972	0.972	0.974

The table presents the results of the effects of banks' securities losses on bank lending to firms, by differentiating different types of banks. The dependent variable is the natural logarithm of the outstanding credit issued by a bank (subsidiary) b to a firm f during month t. Securities losses are calculated based on equation (1). Column 1 contrasts the lending behavior of stand-alone banks with subsidiaries of the banking groups. Column 2 repeats the analysis from Column 1 but restricts the sample to stand-alone banks and domestic subsidiaries within the same country. Column 3 restricts the sample to banking group subsidiaries and examines differences between domestic and foreign subsidiaries. A subsidiary is classified as domestic if it is located in the same country as its banking group's headquarters, and as foreign otherwise. Standard errors are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 11: Securities Losses and Firm-level Credit

	Loan Amount		
	(1)	(2)	(3)
Collateral Securities Losses$_{f,t-1}$	-1.801***	-2.521***	-2.396***
	(0.327)	(0.154)	(0.155)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Time FE	Yes	-	-
Industry – Country – Time FE	No	Yes	Yes
Average Bank Controls	No	No	Yes
N	47,444,694	47,410,518	47,410,518
R^2	0.960	0.961	0.961

The table reports the effects of banks' securities losses on total lending to firms, as described by equation (6). The dependent variable is the natural logarithm of the total amount borrowed by firm f in month t. For each firm–month observation, we construct the firm-level exposure to bank-level securities losses and all other bank-level control variables as the credit-weighted average of the corresponding bank variables, where the weights are given by the outstanding credit of firm f with each bank at time $t-1$. Standard errors are two-way clustered at the firm and industry - sector - time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table 12: Security Losses, Interbank Market and Bank Lending to Firms: Robustness

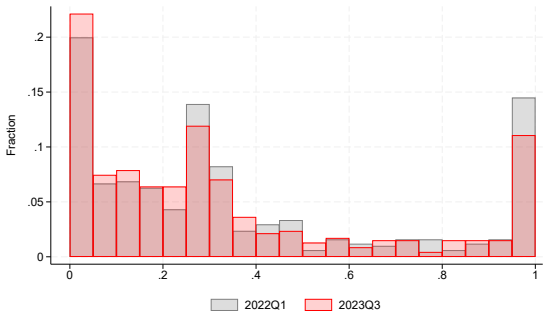
	Loan Amount								
	Interbank Market					Lending to Firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Collateral Security Losses$_{b,t-1}$	-10.711***	-10.993***	-9.050***	-9.092***	-6.964**	-4.912***	-5.081***	-4.853***	-4.519***
	(3.265)	(3.891)	(3.209)	(3.222)	(3.161)	(0.580)	(0.652)	(0.564)	(0.574)
Bank Controls × Δ ECB Rate	Yes	Yes	No	No	No	Yes	Yes	No	No
Bank Control for Deposit Growth	No	Yes	No	No	No	No	Yes	No	No
Bank Control for Hedging	No	No	Yes	No	No	No	No	Yes	No
Bank Control for NPL	No	No	No	Yes	No	No	No	No	Yes
Baseline Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Controls	No	No	No	No	Yes	No	No	No	No
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes	Yes	-	-	-	-
Country Lender – Time FE	Yes	Yes	Yes	Yes	Yes	-	-	-	-
Country Borrower – Time FE	Yes	Yes	Yes	Yes	Yes	-	-	-	-
Bank – Firm FE	-	-	-	-	-	Yes	Yes	Yes	Yes
Firm – Time FE	-	-	-	-	-	Yes	Yes	Yes	Yes
Banking Group – Time FE	-	-	-	-	-	Yes	Yes	Yes	Yes
N	120,005	120,005	120,005	120,005	119,592	16,290,839	16,290,839	16,290,839	16,290,839
R^2	0.898	0.898	0.898	0.898	0.901	0.972	0.972	0.972	0.972

The table reports robustness checks on the effects of banks' security losses on interbank borrowing and lending to firms. In Columns (1)–(5), the dependent variable is the natural logarithm of the outstanding interbank credit amount issued by bank l to bank b during month t. In Columns (6)–(9), the dependent variable is the natural logarithm of the outstanding credit issued by bank b to firm f during month t. Security losses are calculated based on equation (1). Baseline bank controls include the ratio of deposits to total assets, the ratio of equity to total assets, and the logarithm of total assets. Deposit growth is defined as the monthly change in total deposits, normalized by lagged total assets. The ECB rate corresponds to the Deposit Facility Rate. Bank-level hedging is defined as the ratio of the total notional amount of interest rate derivatives used for hedging purposes, normalized by total assets. NPL is defined as the ratio of non-performing loans to total loans issued to households and firms. Loan controls include maturity buckets and the interest rate on interbank loans. Standard errors in Columns (1)–(5) are two-way clustered at the borrowing-bank–time and lending-bank–time level. Standard errors in Columns (6)–(9) are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Internet Appendix

Figure A1: Importance of AFS Portfolio over Time

(a) Share of Securities in AFS Portfolio



(b) Reclassification

The figure examines changes in the importance of the AFS (Available for Sale) portfolio. Panel A plots the distribution of the share of all securities held in the AFS portfolio as a percentage of total securities holdings in 2022q1 versus 2023q3. Panel B uses observations at the bank-ISIN level and focuses on the subset of securities that a specific bank b has reported in both AFS and HTM portfolios in different periods. It plots the share of securities from this restricted sample that are reported as part of the AFS portfolio in 2022q1 versus 2023q3.

Table A1: Funding Subsidiaries, Large Subsidiaries and Intra-Group Domestic and Foreign Lending

	Loan Amount		
	(1)	(2)	(3)
Collateral Securities Losses$_{b,t-1}$	13.762**	8.025**	26.48*
	(6.570)	(3.857)	(14.56)
Collateral Securities Losses$_{b,t-1}$× Deposits$_b$/Loans$_b$	-0.423		
	(3.503)		
Collateral Securities Losses$_{b,t-1}$× Large Subsidiary$_b$		11.22**	-58.02***
		(5.245)	(20.95)
Collateral Securities Losses$_{b,t-1}$× Domestic$_b$			-22.56
			(14.89)
Collateral Securities Losses$_{b,t-1}$× Large Subsidiary$_b$			67.87***
× Domestic$_b$			(21.48)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes
N	20,738	19,267	16,091
R^2	0.906	0.906	0.909

The table presents the results of the effects of banks' securities losses on intra-group lending to subsidiaries of banking groups, differentiated by their funding structure and size. The dependent variable is the natural logarithm of the outstanding interbank credit amount issued by a lending bank l to a borrowing bank b during month t. Securities losses are calculated based on equation (1). Deposits$_b$/Loans$_b$ is a ratio of subsidiary's deposits to loans in 2022q1. Large Subsidiary is a dummy variable equal to one if the subsidiary's total assets are above the median within its banking group. Domestic equals one if the subsidiary is located in the same country as its banking group's headquarters. Standard errors are two-way clustered at the borrowing bank–time and lending bank–time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table A2: Securities Losses and Bank Lending to Firms (Robustness Including Banking Group–Time FE)

	Loan Amount				
	(1)	(2)	(3)	(4)	(5)
Collateral Securities Losses$_{b,t-1}$	-5.476***				
	(0.576)				
Collateral HTM Securities Losses$_{b,t-1}$		-7.120***		-6.489***	-7.742***
		(0.838)		(0.872)	(0.669)
Collateral AFS Securities Losses$_{b,t-1}$			-5.727***	-3.868***	-10.543***
			(1.069)	(1.048)	(2.427)
Collateral AFS Securities Losses$_{b,t-1}$					42.139***
× Total Capital Ratio$_{b,2022q1}$					(12.161)
Bank Controls	Yes	Yes	Yes	Yes	Yes
Bank – Firm FE	Yes	Yes	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes	Yes	Yes
Banking Group – Time FE	Yes	Yes	Yes	Yes	Yes
N	16,290,839	16,290,839	16,290,839	16,290,839	15,803,384
R^2	0.972	0.972	0.972	0.972	0.972

The table reports the effects of banks' securities losses on firms' total borrowing, as described by equation (6). The dependent variable is the natural logarithm of the total amount borrowed by firm f in month t. For each firm–month observation, we construct firm-level exposure to banks' securities losses—and all other bank-level control variables—as the credit-weighted average of the corresponding bank-level variables, where the weights are given by the outstanding credit of firm f with each bank. Standard errors are two-way clustered at the firm level and at the industry–sector–time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table A3: Securities Losses and Bank Lending to Firms: Mechanism (Robustness Including Banking Group–Time FE)

	Loan Amount				
	(1)	(2)	(3)	(4)	(5)
Collateral Securities Losses$_{b,t-1}$	-5.204***	-4.725***	-4.498***	-23.633***	-7.267***
	(0.945)	(0.873)	(0.906)	(7.693)	(1.117)
Collateral Securities Losses$_{b,t-1}$ × Collateral Utilization Rate$_{b,2022q1}$	-2.588***				
	(0.354)				
Collateral Securities Losses$_{b,t-1}$ × Excess Liquidity$_{b,2022q1}$		16.989**			
		(7.499)			
Collateral Securities Losses$_{b,t-1}$ × ECB Borrowing$_{b,2022q1}$			-30.073***		
			(5.155)		
Collateral Securities Losses$_{b,t-1}$ × NSFR$_{b,2022q1}$				12.458**	
				(5.886)	
Collateral Securities Losses$_{b,t-1}$ × LCR$_{b,2022q1}$					-0.577
					(0.394)
Bank Controls	Yes	Yes	Yes	Yes	Yes
Bank – Firm FE	Yes	Yes	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes	Yes	Yes
Banking Group – Time FE	Yes	Yes	Yes	Yes	Yes
N	12,536,511	12,610,601	12,610,594	6,072,830	5,685,891
R^2	0.968	0.967	0.968	0.974	0.974

The table presents the results of the effects of banks' securities losses on bank lending to firms, as described by equation (5) The dependent variable is the natural logarithm of the outstanding credit issued by a bank (subsidiary) b to a firm f during month t. Securities losses are calculated based on equation (1). The collateral utilization rate is defined as the ratio of ECB and interbank borrowing to total securities holdings as of 2022q1. Excess liquidity is defined as liquidity deposited with the central bank in excess of the minimum reserve requirements as of 2022q1. ECB Borrowing represents the ratio of bank funding from the central bank (ECB) to total assets as of 2022q1. NSFR represents Net Stable Funding Ratio as if 2022q1. LCR represents Liquidity Coverage Ratio as of 2022q1. Standard errors are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.

Table A4: Robustness: Securities losses computed using time-varying security holdings

	Loan Amount	
	Interbank Borrowing	Corporate Lending
	(1)	(2)
Collateral Securities Losses$_{b,t-1}$	-7.882**	-1.666***
	(-2.37)	(-4.07)
Bank Lender – Bank Borrower FE	Yes	-
Country Lender – Time FE	Yes	-
Country Borrower – Time FE	Yes	-
Bank – Firm FE	-	Yes
Firm – Time FE	-	Yes
N	120,005	16,334,685
R^2	0.898	0.942

The table reports the effects of banks' securities losses on interbank borrowing (column 1) and corporate lending (column 2). In column 1, the dependent variable is the natural logarithm of the outstanding interbank credit amount issued by a lending bank l to a borrowing bank b in month t. In column 2, the dependent variable is the natural logarithm of the outstanding credit issued by bank (subsidiary) b to firm f in month t. Securities losses are computed following equation (1), but using *time-varying security holdings* rather than the fixed 2022q1 portfolios employed in the baseline specification. This approach captures changes in banks' portfolios over time, including potential adjustments through security sales and purchases. In column 1, standard errors are two-way clustered at the borrowing bank-time and lending bank-time level. In column 2, standard errors are two-way clustered at the bank and time level. ***, **, and * denote significance at the 1%, 5%, and 10% (two-sided) levels, respectively.