A Geopolitical Shock to Bank Assets and Monetary Policy Transmission

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Abstract

Geopolitical shocks are primarily perceived as transitory shocks to aggregate supply. This suggests a "look-through" approach by policymakers to the connected inflation surges who, at the same time, should stand ready to contain potential second round effects. We study whether and how a geopolitical shock simultaneously affects demand and its impact on monetary policy transmission. For identification, we use banks' exposure to sanctioned borrowers. After Russia's invasion of the Ukraine in 2022, Russian and Belarusian borrowers faced sanctions forcing banks to write off most of these loans. We find that more exposed banks have higher deposit funding costs after the shock and consequently decrease their lending. Moreover, these banks also react more strongly to interest rate changes in the subsequent monetary policy tightening period, both with their deposit and their loan rates. Central banks should therefore be cautious in their response to a rise in inflation after a geopolitical shock, as the shock itself lowers inflation pressure via the demand-side as well as it strengthens the transmission of monetary policy.

Keywords: geoeconomics, geopolitical shock, policy uncertainty, deposits, loans, monetary policy, transmission.
JEL codes: E52, F34, F51, G21.

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1 Introduction

Geopolitical economic shocks such as Russia's war against the Ukraine since 2022 are primarily perceived as shocks to aggregate supply due to, for example, supply chain disruptions or stark increases of energy prices. While this typically argues for monetary policy to follow a "look-through" approach to these transitory supply driven inflation surges, it should stand ready to contain second round effects such as the de-anchoring of inflation expectations or wage-price spirals. As a consequence, it is important to understand how a geopolitical shock also affects aggregate demand, thereby mitigating inflation, as well as how it affects the transmission of monetary policy. This is especially relevant in times when we observe high levels of economic integration where various market participants might dampen or amplify the direct effects of a geopolitical shock.

In this paper, we investigate the demand-side effects of the 2022 invasion at the micro-level. We explore how a geopolitical shock affects the interest rates of financial intermediaries both directly and through the intensity of how monetary policy is transmitted thereafter. In all analyses, we focus on deposits and loans of the same banks ensuring a direct link of interest rates within banks. This allows us to understand the direct relation of a geopolitical shock to banks' funding and the associated consequences for borrowers and accordingly the real economy. For identification, we use the exposure of banks' to borrowers in Russia and Belarus at the start of the war in 2022. Russian and Belarussian firms face sanctions since the war started forcing banks to write down loans issued to these firms. The cross-sectional heterogeneity of banks' exposure to this shock allows us to identify direct demand-side effects through banks' funding and lending. Thereafter, we investigate how it relates to differences in monetary policy transmission in the subsequent tightening period, which showed the steepest increase in policy rates in the history of the ECB.

Central to our analysis are unique data at the bank-firm-transaction level in the period March 2021 until February 2023, which are essential for the identification of the questions we analyze. We rely on a combination of proprietary data sets on deposit and loan transactions of banks in Europe. We use Anacredit for loan transactions and the Money Market Statistical Reporting (MMSR) dataset for (unsecured) deposit transactions of nonfinancial corporations. Importantly, we directly link these data with each other. This allows us to not only compare the effect of a geopolitical shock on both markets individually but also to test whether changes in bank funding are directly related to changes in bank

lending. The transaction data also allow us to isolate both bank deposit demand and bank credit supply effects using a difference-in-differences setup in the spirit of Khwaja and Mian (2008). This dataset is thus crucial to our identification strategy and provides novel insights into the role of aggregate demand in the face of a geopolitical shock. We also use the loans from Anacredit to measure banks' exposure to the geopolitical shock and add Security Holdings Statistic Group (SHS-G) data which include information on banks' bond holdings. A bank's shock exposure is then calculated as its credit exposure to Russian and Belarussian borrowers over the bank's total equity in the period prior to the start of the war. To measure the effects of monetary policy on bank interest rates and volumes, we use changes in the deposit facility rate (DFR) and the monetary policy surprises of Jarociński and Karadi (2020) and apply those in panel local projections as suggested by Dube, Girardi, Jordà and Taylor (2023).

While the transaction level data allow for a more rigorous identification they only include parts of banks' deposit funding and loan issuance. We are also interested in a more holistic picture on banks' deposits and loans. We therefore amend our data with more aggregate but complete information on banks' deposits and loans using the individual balance sheet items (iBSI) and individual MFI (monetary financial institutions) interest rates (iMIR) statistics datasets. These do not only include bank characteristics such as bank size, bank equity, or the amount of bank reserves but also monthly aggregates of banks' total volumes and average interest rates of all their (new) deposits and loans.

In the first part of our analysis, we investigate the effect of the geopolitical shock on bank deposits. We find that more exposed banks relatively increase their deposit rates after the shock. This effect is very robust and amounts to almost 1bps which compares to a roughly 15% higher deposit rate compared to the average market rate. Our results on deposit volumes are indicating a rather negative effect suggesting that the larger exposure to the geopolitical shock resulted in generally negative effects for banks and their funding. In simple words, depositors require higher interest rates from banks with a larger share of their assets at risk consistent with corporate depositors disciplining more risky banks (e.g., Imbierowicz et al., 2024). The results on deposit volume show a negative regression coefficient in general which, however, is insignificant unless in weighted least squares regressions. This indicates differences in the variance of the error term with larger deposits also being associated with larger variances. Our results on bank deposit funding are robust to the inclusion of various

sets of fixed effects including fixed effects at the bank-firm and the firm-year:day level in the most rigorous specification. They are also confirmed when we aggregate our data to the bank-year:day level, eliminating any firm-specific factors.

We perform various additional tests to further ensure the robustness of our results on bank deposit funding after the geopolitical shock. First, we examine our result of a higher deposit interest rate for more exposed banks and account for differences in bank characteristics and deposit volume. Our results show that different bank control variables do not affect our findings. Additionally, a bank's deposit volume has no differential impact irrespective whether we use the volume of the same transaction, the overnight deposit volume of a bank in the previous week, or the total deposit volume of the bank in this week. Second, we illustrate that our result that more exposed banks have to pay higher deposit rates also extends to different depositor and deposit types. Third, we provide a battery of tests which confirm that our results hold irrespective of our definition of a bank's exposure to the geopolitical shock. Importantly, we show that our measure provides additional bank-specific information over and above classical measures of geopolitical risk. And fourth, we investigate whether a bank's exposure to the shock is solely related to bank credit risk. Our results confirm that it is important to account for the direct exposure of geopolitical risk of a bank and that it is not sufficient to account only for bank risk via, for example, various measures derived from bank credit default swap spreads. Taken together, our results indicate that our exposure measure encompasses more than what is captured by standard credit or geopolitical risk metrics.

In a second step, we examine how the geopolitical shock affects bank lending. We hypothesize that the negative effect of the geopolitical shock on bank funding causes negative effects on lending. We again use banks' credit exposure to Russian and Belarussian borrowers over total equity and regress loan volume and loan interest rates on this exposure measure. We aggregate the transaction level data from Anacredit to the bank-firm-month level. Our results show that a higher exposure to the geopolitical shock causes banks to reduce their loan issuance. The effect on loan interest rates is positive but insignificant. Accordingly, the negative effect in the deposit market negatively affects bank lending. To ensure that this result is causal, we link both markets within a given bank and regress bank loan volume on different measures of bank deposit interest rate changes after the geopolitical shock. Our results confirm that banks with a larger deposit interest rate increase in response

to the geopolitical shock, reduce their lending to nonfinancial firms more. This confirms that the asset shock of banks with high exposure to Russian and Belarussian borrowers translates into worse funding conditions for these banks which are negatively transmitted to their lending.

As mentioned earlier, we are also interested in a more holistic view of the geopolitical shock on bank deposits and loans and revisit our tests using more aggregate but complete data at the bank-year:month level together with several bank control variables in local projection estimations. We include the total volume and the average interest rate of both deposits and loans of all banks in Europe included in the individual balance sheet items (iBSI) and individual MFI (monetary financial institutions) interest rates (iMIR) statistics datasets. Our results show again that bank deposit rates significantly increase after the geopolitical shock, with the differential effect between low and high exposure banks reaching a peak one quarter after the start of the war. Deposit volumes decrease also in these analyses, however, again with too large confidence intervals to argue for a strongly significant effect. Turning to bank lending, the local projections reveal significant and negative effects for both loan volume and interest rates when incorporating aggregate bank level data. This confirms also for this larger coverage of deposits and loans of banks in Europe that the negative effect of the geopolitical shock on bank funding transfers to banks' lending to corporate borrowers and accordingly to the demand side of the real economy.

Thereafter, we investigate whether the geopolitical shock has a differential effect on the transmission of monetary policy through banks. Our results so far show that the geopolitical shock has a direct effect on banks' funding and lending. More exposed banks allow for a stronger transmission of the shock suggesting deflationary effects on the demand side through banks' portfolios. After the start of the war, inflation substantially increased and the European Central Bank (ECB) started to raise policy rates at the end of July 2022. We ensure that our estimates of the direct effect of the geopolitical shock on bank funding and lending are not confounded by the effects on monetary policy transmission via banks by splitting the period of analysis. To investigate direct effects, we end our period of analysis in July 2022. For the analysis of monetary policy transmission, however, we include the sample period from March 2021 until February 2023 and accordingly additionally include the start of the strongest interest rate increase in the history of the ECB. Note that this sample period implies

a symmetric window of 12 months before and after the start of the war. We estimate local projections to measure monetary policy transmission following Jorda and Taylor (2025).

Accordingly, third, we examine whether banks which are more exposed to the geopolitical shock more strongly transmit policy rate changes to deposit interest rates in line with the credit channel of monetary policy. The geopolitical shock to bank assets differentially increases banks' external finance premium which should result in a heterogeneous monetary policy transmission. We find this hypothesis confirmed. More exposed banks increase deposit interest rates stronger when the policy rate increases. This effect is observable immediately and persists over the subsequent months. It is also confirmed irrespective of whether we use changes in the deposit facility interest rate or the monetary policy rate surprises of Jarociński und Karadi (2020) as measures for the change in monetary policy.

And fourth, we analyze whether the transmission of monetary policy is also stronger for the lending of banks more exposed to the geopolitical shock. This analysis eventually measures the transmission of the increase in the external finance premium via funding markets to higher loan interest rates. Our results are suggestive of this mechanism. Changes in the policy rate cause a stronger increase of bank loan rates of more exposed banks. As for deposits, this effect is contemporaneous and persistent and independent of the use of the deposit facility rate or monetary policy surprises to measure monetary policy rate changes.

The effects we uncover are economically substantial. We follow the partial equilibrium aggregation as in Chodorow-Reich (2014) and Federico et al. (2025) to quantify the effect of the geopolitical shock on bank deposit funding costs. This implies that in the following calculations we account for the full distribution of exposures and deposit market activity together with the estimated sensitivities of both deposit pricing and volumes. We observe that after the start of the invasion exposed banks in our sample on aggregate have €79 mn. higher funding costs (€112 mn. when additionally considering the effect on deposit volumes). This is equivalent to a 18.8% higher deposit rate (net of the policy rate) compared to non-exposed banks. When we compute the aggregate effects due to differences in monetary policy transmission to deposit rates, we find that deposit funding rates of exposed banks are 18.9% higher after the series of (five) rate hikes included in our sample period. This is equivalent to a cost increase of €500 mn. in total. When we compare both effects in terms of additional funding costs for exposed banks, our results suggest that the direct impact of

the geopolitical shock prior to the policy rate increases is equivalent to an increase in the policy rate of 48 basis points (policy rate increases of overall 300bps during our sample period times €79mn./€500mn.).

Our study contributes to the literature by highlighting the demand side effects of a geopolitical shock to bank assets. Geopolitical economic shocks are often perceived as shocks to aggregate supply. Our results emphasize that the high levels of economic and financial integration imply deflationary effects on the demand side through financial intermediaries. We show that banks more exposed to the shock have higher funding costs which cause a decrease in their loan issuance. Additionally, these more exposed banks allow for a stronger monetary policy transmission to both deposit and loan markets. Our results suggest that policymakers have to act carefully in their response to a rise in inflation after a geopolitical shock, as the shock does not only impact aggregate supply but also lowers inflationary pressure on the demand-side as well as it increases the transmission of monetary policy.

Related literature

Our paper contributes to several strands of the literature on the economic effects of geopolitical events, bank deposits and lending, and the role of banks for the transmission of monetary policy.

Geopolitical shocks are increasingly recognized as significant macro-financial disturbances. Recent research constructs news-based indices of geopolitical risk (GPR) to quantify such shocks and finds that rises in geopolitical tensions, reflected by an increase in the GPR index, tend to dampen real economic activity (Caldara and Iacoviello, 2022). These adverse macroeconomic effects can propagate into financial markets. Using U.S. syndicated loan data, Nguyen and Ho (2023) show that elevated geopolitical risk is associated with higher bank loan interest spreads and stricter non-price terms, reflecting lenders' efforts to price in greater uncertainty. Examining the Brexit referendum as a direct fragmentation shock, Imbierowicz et al. (2025) show that banks subsequently decrease their credit supply to firms located in the United Kingdom due to increased uncertainty about future losses. This evidence aligns with broader uncertainty-shock frameworks (e.g. the economic policy uncertainty channel) but also highlights a distinct geopolitical dimension wherein banks tighten lending conditions in response to geopolitical turmoil. Accordingly, heightened geopolitical risk does not only indicate slower growth but also tighter credit conditions and

increased funding pressures in the financial system. These findings directly relate to a severe geopolitical event such as a major military conflict and the associated sanctions and how this might be reflected in banks' balance sheets and lending behavior.

Imposing financial sanctions because of a geopolitical conflict can imply a severe balance-sheet shock to banks and alter their funding costs and asset quality. In the case of Russia's military incursions and the ensuing Western sanctions, banks with direct exposures to the affected region or entities experienced sudden losses and heightened counterparty risk. Recent work on the 2014 Russia-Ukraine crisis illustrates this mechanism. Federico, Marinelli, and Palazzo (2023) exploit the dual shock of Russia's 2014 sanctions and oil price collapse to show that Italian banks more exposed to Russian markets significantly cut back their overall credit supply especially to ex ante riskier borrowers. This finding suggests that sanctions-induced losses strained banks' balance sheets and forced them to decrease credit supply. This is comparable to earlier episodes of international contagion. Peek and Rosengren (2000) show that bank asset losses during the Japanese banking crisis led to an exogenous decrease in credit supply by Japanese bank branches in the United States which in turn depressed U.S. real estate activity. Schnabl (2012) documents that following the 1998 Russian default, international banks with liquidity shortfalls sharply reduced credit to their domestic borrowers. This again shows how a foreign geopolitical shock can induce a loan supply contraction in unrelated markets. Consistent with these patterns, Niepmann and Shen (2025) show in three case studies on U.S. banks' exposure to Russian borrowers (conflict with Georgia in 2008:Q3, annexation of Crimea in 2013:Q4, and invasion of Ukraine in 2022:Q1) that more exposed banks experience an increase in aggregate portfolio default probability and reduce their cross-border lending to countries with higher geopolitical risk. Taken together, we add to this literature which positions geopolitical conflict and sanctions as a new class of bank balance-sheet shock, very similar to sudden asset write-downs or counterparty default, which can impair banks' capital and funding and thereby affect credit allocation.

These dynamics are deeply intertwined with the bank lending channel of monetary transmission, wherein banks' financial health determines their loan supply. A large literature following Bernanke and Blinder (1988) and Kashyap and Stein (2000) argues that monetary-policy shocks affect the real economy in part by influencing banks' funding and lending decisions. A key insight is that banks with stronger balance sheets are better able to sustain

lending when conditions tighten, whereas weaker banks contract credit more aggressively (Gambacorta and Marques-Ibanez, 2011; Spiegel, 2025). Kashyap and Stein (2000) find that following a policy-induced rate increase, loan volumes of small, low-capital banks decline more than those of large, well-capitalized banks. This indicates a decrease in lending by financially weaker banks and emphasizes that the efficacy of monetary policy hinges on banks' health. Our results confirm this effect. Monetary policy is transmitted stronger by banks more exposed to the shock. The potential for geopolitical shocks to induce such conditions represents an important new channel for the traditional monetary transmission mechanism.

By integrating these strands of literature, our study contributes new evidence on the interplay between geopolitical risk, bank balance-sheet health, and monetary transmission. First, we add to the nascent literature on geopolitical risk and finance by documenting how a major geopolitical shock can impair banks' funding conditions and loan supply. Prior studies of geopolitical risk have largely focused on aggregate asset prices or corporate investment, or on international bank asset allocations. We extend this literature by providing micro-level evidence of a geopolitical shock affecting the bank lending channel in developed countries. In doing so, we connect the geopolitical risk literature with the large literature on the bank lending channel and balance-sheet heterogeneity. Our findings underscore that even absent any change in central bank policy rates, an external shock that undermines bank balance sheets can produce outcomes akin to a monetary tightening. Bank funding costs increase and credit is curtailed which is consistent with the mechanisms in the bank lending channel. This emphasizes the importance of banks' balance-sheet strength for maintaining credit supply in the face of shocks. Second, our work relates to the literature on funding stress, liquidity hoarding, and credit supply under stress. We provide direct evidence that a sudden, geopolitically-driven, spike in funding costs leads banks to maintain and potentially hoard liquidity by raising deposit rates and scaling back lending. This corroborates to the literature which links liability-side shocks to reductions in bank lending. It complements existing research on crisis-induced credit contractions by highlighting geopolitical events as the channel which can trigger a similar sequence of bank responses as traditional financial crises (e.g., Ivashina and Scharfstein, 2010; Cornett et al., 2011). Third, we contribute to understanding monetary-policy transmission under bank stress. Our results imply that when banks are scrambling for liquidity due to war-related sanctions or analogous shocks, the pass-through of tightening policy might be amplified. In the period immediately after the start of

the war policy interest rates did not rise but credit contracted for the most affected banks. This suggests a form of "silent tightening" operating through the banking system. Thereafter, when monetary policy was actively tightened more affected banks allowed for a stronger transmission of monetary policy. These findings enrich the monetary policy transmission literature by illustrating how exogenous shocks to banks' funding can distort credit supply both in a static as well as in a dynamic policy environment, arguing for a different reaction required by policymakers compared to what standard literature suggests. Geopolitical shocks also affect the demand-side of the economy through financial intermediaries. This is a key insight of our study with high relevance for central banks monitoring financial stability alongside price stability.

In sum, our study bridges multiple literatures, from geopolitical risk to bank balance-sheet channels to monetary economics. We use these to better understand the real, demand-side, effects of rare but powerful shocks. Our study provides the first direct evidence that a geopolitical conflict and its financial sanctions can operate through banks' funding costs to dampen loan supply. This advances the literature on credit supply shocks and provides timely implications for both macroprudential policy and central banking in a world of heightened geopolitical tensions. In summary, our paper provides novel insights into how a geopolitical shock, such as Russia's invasion of the Ukraine, affects bank funding and lending and how subsequent increases in the policy rate transmit to depositors and borrowers of financial intermediaries. By leveraging unique and detailed data from the Deutsche Bundesbank, we isolate effects on the demand side and examine the interplay between international financial integration and geopolitical events. This contributes to a deeper understanding of the transmission of economic shocks in a globalized world.

The rest of the paper is structured as follows. Section 2 describes the data and presents descriptive statistics. Section 3 outlines our empirical approach. Sections 4 and 5 present the empirical implementation and results. Section 6 concludes.

2 Data and descriptive statistics

Our data uniquely link information on banks' exposure to firms with comprehensive data on both deposit and loan transaction level data. We use several proprietary datasets from the Deutsche Bundesbank. The core of our analysis are bank deposits of (Section 2.1) and bank loans to (Section 2.2) nonfinancial corporate borrowers. We complement this with

banks' credit exposure as a measure of the geopolitical shock (Section 2.3). Finally, we merge several additional data sources (Section 2.4) to investigate questions in more detail such as different definitions of our exposure measure or the impact of bank risk. Our dataset covers the period March 2021 to February 2023, providing a symmetric window of analysis around the start of Russia's invasion of the Ukraine in February 2022. All data are denominated in euros. Section 2.5 presents descriptive statistics.

2.1 Bank deposits

We use data on the unsecured euro area money market segment from the Money Market Statistical Reporting (MMSR) dataset for deposit transactions of nonfinancial corporations. We include a comprehensive set of reporting banks in our analyses by combining the euro area MMSR, which covers the largest monetary financial institutions (MFIs) in the Eurozone, with the German subset of the MMSR, which is maintained by the national central bank and covers additional reporting agents from Germany. The data document the exact time when a transaction is executed and inter alia include the volume, interest rate, maturity and deposit type of the individual deposit transaction between a firm and a bank. We focus on overnight fixed-rate transactions of nonfinancial firms or their respective financing vehicles. This short maturity allows us to measure effects on interest rates without including additional aspects such as inflation expectations and the slope of the yield curve. In terms of deposit types, we focus on unsecured deposits (DPST) and call accounts (CACM) as the two most common instruments in the unsecured MMSR. To avoid that our dataset is inflated by ongoing reporting of existing accounts or rollovers of existing deposits, we include a transaction between a bank and firm only when there is a change in rate and/or volume compared to the previous business day. We further drop amendments or corrections of past transactions. We aggregate multiple transactions of a given bank-firm pair during a given day using the volume-weighted average deposit rate and the total deposit volume of this bank-firm pair. The MMSR database includes firms with multiple bank deposit relationships. This allows us to investigate banks' deposit demand after a geopolitical shock using the methodology of Khwaja and Mian (2008).

2.2 Bank loans

We collect data on bank loans from the Anacredit (Analytical Credit) database. It provides loan level information on European banks' credit to individual borrowers. All credit institutions domiciled in the euro area, including their foreign branches, are required to report

their loan issuance to Anacredit. It includes all individual loans of a bank's borrower when the aggregate loan amount of this borrower with the bank exceeds €25,000. In our analyses, we focus on bank lending to non-financial corporations through term loans and non-revolving credit lines. We drop loans with missing information on the interest rate or the interest rate type, loans with an interest rate or loan amount equal to zero, loans with multiple debtors, and loans with multiple inception dates. AnaCredit covers a large number of loan attributes including loan amount, interest rate and maturity together with information on the borrower, such as size or probability of default. Analogous to the MMSR, the Anacredit dataset includes firms with multiple bank relationships. This allows us to identify credit supply effects following the methodology of Khwaja and Mian (2008).

2.3 Bank exposure to the geopolitical shock

We use the Anacredit and the securities holdings statistics at the group level (SHS-G) databases for our main measure of banks' exposure to the geopolitical shock. The SHS-G data include information on the holdings of more than 100 significant euro area banking institutions at both the entity- and the group-level. Our main measure is calculated as the average total loan and bond volume of a bank to Russian and Belarussian borrowers in 2021, the year prior to the start of the war, divided by the bank's total book equity value at the end of 2021.

$$Exp_b^{Russia} = \frac{\frac{1}{12} \cdot \sum_{t=1}^{T=12} \left(Loans_{t,2021}^{Russia} + Bonds_{t,2021}^{Russia} \right)}{Book\ Equity\ at\ Year\ End\ 2021}$$

It reflects the percentage of equity at risk in case all these credit exposures cannot be collected by the bank anymore. In many cases banks had to increase loan loss provisions or even directly write off loans and bond investments to account for the sanctions introduced by their home countries after the start of the war.

2.4 Further data

We augment our data using several other data sources. First, we include bank characteristics from the individual balance sheet items (iBSI) statistics to derive control variables related to key balance sheet components. These controls are book equity, total deposits of nonfinancial firms, total loans to nonfinancial firms, bond holdings, central bank reserves (all normalized with total assets), and the logarithm of total assets.

Second, we use data from the individual MFI interest rates (iMIR) statistics which provides entity-level information on interest rates and volumes of new deposits and loans vis-à-vis non-financial corporations and households. Compared to the MMSR data with 28 banks in the final sample, iMIR has less granular information but encompasses a larger set of MFIs. It includes 144 banks and is representative for monetary policy transmission and lending to the non-financial private sector (Bojaruniec and Morandi, 2015). Using both datasets ensures the validity of our findings. While the more granular MMSR database allows for a more precise identification and ensures internal validity, the iMIR statistics ensure external validity by extending the data to a larger and representative sample of banks.

Third, we investigate the transmission of monetary policy using two alternatives. As a direct measure of changes of the policy rate we use the interest rate of the marginal deposit facility of the ECB. As further measure to identify the effect of monetary policy changes, we incorporate monetary policy surprises provided by Jarociński and Karadi (2020). These surprises are derived from high frequency data around a monetary policy announcement on a given day.

Fourth, in additional tests, we measure bank risk using the credit default swap (CDS) spread of banks from Refinitiv. Moreover, we collect data on geopolitical risk from Caldara and Iacoviello (2022).[1] We use the data to construct a bank-level measure of geopolitical risk by weighting country-specific GPR indices with a bank's loan and bond exposure (taken from AnaCredit and the SHS-G databases) to this country.

2.5 Descriptive statistics

Regarding bank-firm relationships, our deposit dataset includes a total of 23,291 observations from 885 firms. Out of these, 832 (94%) have a relationship with a single bank, while the remaining 53 firms have a relationship with two or more banks. Despite their smaller number, multi-bank firms are by far the largest depositors and account for more than 75% of new overnight deposit volume.

Table 1 shows the descriptive statistics of all major variables as used in the regression analyses of deposits. The table is based on the set of multi-bank depositors. These firms deposit with 28 banks in Europe during our sample period, what amounts to 6,211 daily bank-firm observations.

[1] We retrieve the data from Matteo Iacoviello's homepage: https://www.matteoiacoviello.com/gpr.htm

[Table 1]

The average deposit rate is -56bps and the average deposit volume of a firm with a given bank is €260mn. on a given day. We accordingly only incorporate large corporate depositors in our MMSR sample. The table further shows that sample banks have on average almost 7% of their bank equity at risk due to the geopolitical shock. However, the median value of our exposure measure is only around 1.5%. Both values indicate that the shock does not imply severe risk of failure for most banks in the sample. This supports our identification strategy because it argues against potential contagion effects between banks which might bias our results through, for example, interbank market transactions. The average bank in our sample has total assets of roughly €260 billion, an equity ratio of 6%, a ratio of nonfinancial (NFC) firm deposits (loans) to total assets of 9.45% (13.5%), and a ratio of reserve holdings to total assets of 15.8%.

The last two rows in Panel A show the descriptive statistics for our loan sample. The monthly bank-firm panel from AnaCredit includes overall 13 million loans to over 900,000 firms in the period March 2021 to February 2023. Out of all firms, 68,000 (7%) have a loan relationship with two or more banks, resulting in a total of 1,840,198 bank-firm observations. On average, these firms have €3.53 million outstanding credit with an interest rate of 2.35%.

Panel B compares banks with different exposure to Russian and Belarussian borrowers prior to the start of the war. We employ a 2% equity-at-risk threshold to divide our sample into high- and low-exposure banks. By construction, the exposure of high-exposure banks substantially exceeds the almost zero exposure of low-exposure banks. Apart from this, we observe further heterogeneity between both groups. Banks with a higher exposure to Russian borrowers have a larger asset base and a slightly different balance sheet composition. However, with the exception of the loan ratio, all financial ratios are fairly close to each other and none of the differences is statistically significant.

Panel C shows the correlation of our main exposure variable with other proxies for geopolitical and credit risk of banks. We observe that our exposure measure is positively correlated with other broader bank-level measures of geopolitical risk and changes in bank CDS spreads before and after the invasion. This suggests that our exposure measure captures aspects related to both types of risks without a perfect overlap of either type. We will return to and discuss this in more detail later. The two relations where our main measure of the exposure of banks to Russian borrowers has a value above 50% are to (i) borrowers from neighboring countries, both naturally strongly related through spatial clustering of business

operations, and (ii) the change in bank CDS spreads post-invasion, suggesting that geopolitical exposure and bank risk are to some extent related.

3 Empirical strategy

To explore the implications of the geopolitical shock on bank deposits, we examine dynamics at the bank-firm-year:day level. We estimate versions of the following equation in the spirit of Khwaja and Mian (2008) using the MMSR dataset:

$$Y_{b,f,t} = \beta \cdot Post \cdot Exp_b^{Russia} + \gamma \cdot \mathrm{X}_{\mathrm{b,t\text{-}1}} + I_{b,f} + I_{f,t} + \epsilon_{b,f,t} \qquad (1)$$

The dependent variable $Y_{b,f,t}$ is either the deposit interest rate, an indicator variable which is one for bank *b* receiving a new deposit by firm *f* on a given day *t*, or the natural logarithm of the new deposit volume of a firm with this bank on a given day. The variable $Post$ is an indicator set to one from February 24, 2022 onwards. For the deposit regressions, the sample period ranges from March 1, 2021 to July 26, 2022. On July 27, 2022, the ECB started its monetary policy tightening cycle and increased the policy rate by 50 basis points. We stop prior to this in order to cleanly separate the direct effect of the geopolitical shock on bank deposits from its impact on bank deposits through monetary policy, which will be the focus of our analysis only thereafter. Exp_b^{Russia} is the share of a bank's total (loan and bond) lending to Russian and Belarussian borrowers over equity prior to the shock, capturing a bank's exposure to the geopolitical shock. Exp_b^{Russia}controls for the effect of the shock on a bank's overall deposits while interacting it with the $Post$ dummy accounts for the conditional and differential effect for assuming deposits after the start of the war. β is our main coefficient of interest as it measures how the geopolitical shock affects a bank's deposit funding conditional on its ex-ante shock exposure. $X_{b,t-1}$ represents the vector of bank controls lagged by one month and described in Table 1. $I_{b,f}$ are fixed effects between bank *b* and firm *f* to account for potential time invariant matching and relationship effects between firms and banks as transactions in the unsecured money market are typically relationship-based.[2] To control for firm deposit supply, we include firm-year:day fixed effects $I_{f,t}$ following Khwaja and Mian (2008). Including these restricts the sample to only firms with depositing relationships with at least two banks on a given day. We therefore also provide

[2] As described in more detail in a speech by Isabel Schnabel, Member of the ECB's Executive Board, on November 7th, 2024, The ECB's balance sheet reduction: an interim assessment.

results with a less rigorous saturation. Furthermore, we investigate our results on deposits by aggregating our data to the bank-firm-year:day level. Additional robustness tests of our results on deposit interest rates include different measures of deposit volumes as additional control variables, sample splits by bank, firm and deposit types, different definitions of our exposure variable, and varying measures for bank risk using CDS spreads of banks.

In the second part of our analysis, we investigate the effects of the geopolitical shock on banks' lending. We use AnaCredit's loan level data and estimate again equation (1) following Khwaja and Mian (2008) as well as Degryse et al. (2019) by including industry-country-year:day fixed effects instead of the firm-year:day level. The dependent variables in these analyses are the natural logarithm of a bank's loan volume and the loan interest rate charged to a given firm.

In further analyses, we link both types of analyses using the following equation:

$$\log(L_{b,f,t}) = \beta \cdot \Delta r_b^{invasion} + \gamma \mathrm{X}_{b,t-1} + I_{b,f} + I_{f,t} + \epsilon_{b,f,t} \qquad (2)$$

The dependent variable $\log(L_{b,t})$ is the natural logarithm of bank b lending amount *L* to firm *f* in month *t*. The variable Δr_b^t measures immediate changes in deposit rates after the start of the war where we use two different proxies. It is either the difference in the median deposit interest rate in the five days after the invasion relative to the median deposit interest rate in the preceding month, or the difference of the median predicted and residual deposit rate between these two periods. For the predicted and residual values we use two regression models. The first ('restricted') model follows equation (1) but does not include our measure of a bank's exposure to geopolitical risk after the start of the war, $Post \cdot Exp_b^{Russia}$. The second ('unrestricted') model uses regression equation (1). Note that the sum of the predicted and the residual deposit rate is equal to the actual rate. Accordingly, including the difference of both over time is equivalent to including the difference of the actual deposit rate $Y_{b,f,t}$ in equation (1). In computing Δr_b^t, we employ a tight event window around the start of the war to ensure identification. Our strategy is inspired by the literature on isolating exogenous monetary policy surprises using high-frequency movements in financial markets around monetary policy announcements (Kuttner, 2001; Gürkaynak et al., 2005; Altavilla et al., 2019). In the immediate aftermath of the invasion, observed movements in deposit rates should predominantly capture the direct impact of the geopolitical shock rather than other confounding market dynamics that could potentially contaminate our estimates.

We additionally explore banks' overall deposit and loan business with nonfinancial firms following the geopolitical shock. To do this, we use the more comprehensive iMIR data at the bank-month level in local projection estimations of the following form:

$$Y_{b,t+h} - Y_{b,t} = \beta \cdot Invasion_{t-k} \cdot D\left(Exp_b^{Russia} \geq 2\%\right)_+ X_{b,t-k} + \Delta Y_{b,t-k} + I_b + \epsilon_{b,t} \quad (3)$$

The dependent variable measures the difference in the deposit rate (volume) and the average loan rate (volume) of a bank between period *t+h* and *t*, where we investigate results over a horizon of *h=4* months, ending in June 2022 to abstract from monetary policy rate changes. We use a lag length of *k=3*. We only consider a bank's new business in these analyses as iMIR only provides very limited information on outstanding business. $Invasion$ is an indicator variable which is one in the month of February 2022 and $D\left(Exp_b^{Russia} \geq 2\%\right)$ is an indicator of whether a bank has an exposure of more than 2% of its equity to Russian or Belarussian borrowers prior to the start of the war.

In the third and final part of our study, we examine the transmission of monetary policy to bank interest rates in more detail. For this analysis, we use the full sample period until February 2023, encompassing five ECB policy rate hikes. The strong and rapid tightening of monetary policy a few months after the invasion allows us to test whether a geopolitical shock alters the pass-through of policy rates to deposit and loan rates. We use the following panel local projections to trace out transmission dynamics across banks with different exposure to Russian borrowers:

$$Y_{b,f,t+h} - Y_{b,f,t} = \beta_{Russia} \cdot Invasion_{t-k} \cdot Exp_b^{Russia} + \\ + \beta_{MP} \cdot \Delta MP_{t-k} \cdot Exp_b^{Russia} + \gamma \mathrm{X}_{\mathrm{b,t\text{-}k}} + I_{b,f} + \epsilon_{b,f,t} \quad (4)$$

The dependent variable measures again the difference in the deposit rate (volume) and the loan rate (volume) of a bank between period *t+h* and *t*, where we investigate results over a horizon of *h=5* months. We set *k=3*. Deposit and loan rates and volumes are calculated as monthly averages at the bank-firm level using transaction level data from the MMSR and Anacredit databases. Our main coefficient of interest is β_{MP} which measures the effect of a change in the monetary policy rate on bank's pricing of new loans and deposits with nonfinancial corporations conditional on the exposure to the geopolitical shock. We measure the change in monetary policy ΔMP with the change in the deposit facility interest rate. We also incorporate the monetary policy surprises provided by Jarociński and Karadi as an alternative.

4 The effect of the geopolitical shock on bank deposits and loans

This section presents the results of the analysis of the geopolitical shock on bank deposits (Section 4.1) and loans (Section 4.2). The analyses include both transaction level data as well as results for all new deposits and loans of nonfinancial firms with given banks at the bank-year:month level. We first focus on bank funding. Understanding the impact of the geopolitical shock on bank liabilities is important to thereafter better comprehend the effects on banks' assets. This helps establish why a geopolitical shock might eventually affect aggregate demand. In the last part of this section, we link both markets and show that the geopolitical shock to bank assets directly transmits from a bank's deposits to the same bank's loans.

4.1 Deposits

Our analysis of the effects of the geopolitical shock on the demand side starts with an investigation of the direct impact of the shock on bank funding. Thereafter we perform several robustness tests by including additional control variables and separately investigating different subsets of our sample. Finally, we run several tests to confirm that our exposure variable measures the uncertainty about banks' performance due to geopolitical risk.

4.1.1 Main Effect

We use our exposure measure to identify the effect of the geopolitical shock of Russia invading the Ukraine in February 2022 on demand through financial intermediaries. We first examine banks' funding with transaction level data aggregated to the bank-firm-year:day level. These data derive from the MMSR database where we use unsecured deposit transactions of nonfinancial firms with European banks in the period March 2021 until July 2022. We estimate different versions of regression equation (1) and cluster standard errors at the bank and at the time level. All regressions include bank control variables but a different set of fixed effects to isolate the effect of the invasion on unsecured corporate deposits. Table 2 shows the results.

[Table 2]

Panel A of Table 2 presents the results for bank deposit interest rates. It shows that banks with greater exposure to Russian risks significantly increase the interest rates offered on new unsecured corporate deposits after the invasion. The size of the coefficient increases when we include more rigorous fixed effects and is statistically significant across all

specifications. Following Khwaja and Mian (2008), we include firm-year:day fixed effects in column (6) to control for firm demand and observe a coefficient of 0.735 with a t-value of 4.57. This relates to an average (median) exposure of 6.98% (1.47%) and accordingly a 5bps (1bps) higher deposit interest rate. With an average (median) deposit spread of -6bps it shows that the average (median) bank paid a 80% (20%) higher spread for its deposits. In column (7), we additionally weigh observations by the deposit volume of the bank with a given firm and observe the economically and statistically strongest effect. This suggests differences in the variance of the error term with larger deposits also being associated with larger variances.

In Panel B of Table 2 the dependent variable of analysis is an indicator which is one on days when the bank receives a new deposit from a given firm and zero otherwise. The estimated coefficient accordingly indicates the probability of a bank receiving an additional deposit from a given firm. Despite all coefficients being insignificant in columns (1) to (6), their sign is consistent with a lower probability of receiving a new deposit on a given day for more exposed banks after the shock. The coefficient becomes statistically significant in a weighted least squares regression as shown in column (7). This suggests that more exposed banks seem to generally encounter negative effects in funding markets. Panel C of Table 2 shows the same patterns as Panel B. It uses the logarithm of the deposit volume of new deposits as dependent variable. The negative coefficients accordingly suggests that more exposed banks receive smaller deposit amounts after the geopolitical shock. Overall, the results in Table 2 are consistent with the interpretation that more exposed banks experience negative effects for their deposit funding. Depositors require higher interest rates from banks with a larger share of their assets at geopolitical risk.

To ensure that our results are not driven by individual transactions on some days with specific firms, we aggregate our data to the bank-year:day level and re-estimate our specifications. The results are shown in Table 3. It confirms our previous finding. More exposed banks pay higher deposit interest rates. This can be observed both in an OLS regression in column (3) and a weighted least squares regression in column (4) using deposit volume as weight. Column (1) also confirms that the volume of new corporate deposits decreases for banks with a higher exposure to the geopolitical shock in the period after the shock. The coefficient is negative but statistically insignificant in column (2) which uses the logarithm of the volume of total bank-firm deposits on a given day as dependent variable.

Overall, Table 3 again confirms that more exposed banks experience negative effects for their funding.

[Table 3]

In the last part of our main analysis on bank deposit funding, we use data from the individual balance sheet items (iBSI) and individual MFI (monetary financial institutions) interest rates (iMIR) statistics datasets. These data are at a more aggregate level than the transaction level data from the MMSR but allow us to provide a more holistic picture on bank deposits. For our analyses, we use the new deposit business with nonfinancial firms of all banks in the euro area included in iMIR. A confirmation of our findings would allow us to rule out that our results on deposit transactions from the MMSR are driven by a potential selection of banks, firms, or deposit types.[3] We investigate the effect of the geopolitical shock on bank deposit interest rates and volumes with nonfinancial firms using local projections as shown in equation (3). Figure 1 presents the results.

[Figure 1]

Figure 1 confirms our transaction level results also using these data. Banks with meaningful asset exposure to the geopolitical shock have to pay higher deposit interest rates to their nonfinancial depositors. These depositors generally appear to deposit less, however, the effect is again insignificant as the confidence interval of coefficients is too wide in our local projection estimations. Nevertheless, these results confirm that the geopolitical shock implies negative effects for bank funding. In the following section, we investigate whether and how this transmits to bank lending. Before doing so, however, we further ensure the robustness of our results on bank funding.

4.1.2 Robustness – Deposit Size

The analysis of the effect of the geopolitical shock on bank funding so far separately included tests of interest rates and volumes. Interest rates and volumes are however jointly determined. In this part, we are therefore interested whether our result of higher deposit interest rates for more exposed banks also holds when we simultaneously account for the amount of deposit funding. Given their joint determination, we implement regressions

[3] The iMIR database does not include all banks in Europe but is representative for monetary policy transmission and lending to the non-financial private sector (Bojaruniec and Morandi, 2015 [p8, here]).

including different measures of banks' deposit volume, some less endogenous than others. Table 4 shows the results.

[Table 4]

The first column of Table 4 shows the regression of the deposit rate of a bank with a firm on a given day on only bank-firm and firm-time fixed effects, excluding bank level control variables. The coefficient estimate of 0.6997 is very comparable to our model with bank control variables, shown in column (6) of Table 2, which was 0.7352. In column (2), we include bank control variables and additionally the logarithm of the deposit volume of a firm with its bank on this day. We observe only a small change in the coefficient estimate. The joint determination of deposit interest rates and deposit volume argues for endogeneity of this specification. We therefore replace the contemporaneous deposit volume with the overnight (column (3)) and the total (column (4)) deposit volume of new deposits of a firm with this bank in the previous week. The coefficient estimates remain almost the same. This suggests that a potential endogeneity between interest rate and volume of a transaction does not systematically bias our coefficient estimates. Finally, we interact all bank control variables with our variable post, which is one from February 2022 on and zero otherwise. This accounts for potential changes in the relation of certain bank control variables to a bank's deposit interest rate before and after the geopolitical shock. The coefficient estimate of our main variable is again very comparable to our main regression. We therefore conclude that neither bank deposit volume nor other bank control variables substantially affect our result that more exposed banks have to pay higher deposit interest rates after the geopolitical shock.

4.1.3 Robustness – Deposit Type

Another concern for the robustness of our findings might be that results differ by deposit type. In this part, we therefore split the sample by various deposit types and show the results in Table 5.

[Table 5]

In our main regression, we include firm-year:day fixed effects following Khwaja and Mian (2008). While this allows to control for firm demand, it restricts the sample to firms which deposit with at least two banks on a given day. We relax this assumption and include only year:day instead of the firm-year:day fixed effects. The result is shown in column (1) of Table 5. The number of observations increases from 6,211 in column (6) of Table 2 to 23,291

which is an almost fourfold increase. The number of included banks increases from 28 to 34. Despite the much larger sample, the coefficient estimate of our main variable of interest does not change substantially. The statistical significance, on the other hand, even increases from 4.57 to 5.08. In the remainder of this subsection, we keep this specification and data sample.

We incorporate all overnight deposits of nonfinancial firms with European banks in our main sample. This includes call accounts which are technically not actively renewed each day and therefore might not timely reflect interest rate changes. We therefore exclude call accounts and re-run our regression. Column (2) of Table 5 shows that call accounts do not differentially affect our findings. Both the level and the statistical significance of the coefficient is very comparable to our main regression in column (6) of Table 2.

For our analyses, we include two versions of the MMSR. These are the MMSR for the European market to which we amend the MMSR for Germany. The German MMSR is to some extent a subset of the European MMSR, but the European database includes only the largest 14 German MFIs. The German MMSR includes transactions of a broader and more heterogeneous set of German banks to allow for deeper insights for the German regulator (see Felka and Hirsch (2024) for additional details). This may affect our results in two different ways. First, it may introduce a selection bias in our sample as the German market is overweighed and might be different compared with the general remaining European market. And second, amending the German MMSR to the European one also implies that we do not add only more but on average also several smaller deposit transactions. For these reasons, we split the sample into banks which report to the European MMSR (column (3)) and those which report only to the German MMSR (column (4)). Additionally, we subdivide the sample into deposits with a volume below the median volume of deposits in the MMSR (column (5)) and above this threshold (column (6)). Columns (3) to (6) suggest that deposit size is a relevant factor for our results. While columns (3) and (6) show a very comparable coefficient estimate to our main regression, in columns (4) and (5) it is only a half of it. These columns include banks which report to the German MMSR (column (4)) and smaller deposits (column (5)). This argues for our effects being driven more strongly by large corporate depositors. This is consistent with and adds to the findings in Imbierowicz et al. (2024) who show that riskier banks are disciplined by large corporate depositors. We will argue and show later that our geopolitical risk measure is different to classical bank risk and rather reflects

the uncertainty about banks' future performance due to geopolitical risk. Nevertheless, it is reasonable to assume that investors require compensation also for this risk.

In our main analyses, we focus on overnight transactions of nonfinancial firms. This excludes factors relevant for the longer term such as inflation expectations. In column (7) of Table 5, we include term deposits instead. The coefficient estimate is also positive and even larger, but weaker in statistical significance. Its higher value might be driven by the higher interest rates of longer term deposits and accordingly to some extent be mechanical.[4] Nevertheless, we find our result confirmed that more exposed banks pay higher deposits interest rates also when investigating term deposits.

Finally, we examine differences in investor type. In our main regressions, we include nonfinancial firms. We do not include insurance companies and pension funds (ICPFs) which account for a smaller but nevertheless sizable amount of deposits with roughly one-third of the total NFC deposit volume. The reason why we initially exclude ICPFs is to ensure consistency across data sources since other datasets like AnaCredit or iMIR only cover activities vis-à-vis non-financial corporations. Column (8) only includes overnight deposits of insurance companies and pension funds. It shows that the effect of more exposed banks paying higher deposit interest rates after the geopolitical shock is smaller but also observable in this subsample.

Overall, the tests in this subsection confirm that banks with a larger exposure of their assets to the sanctions after the geopolitical shock of Russia's invasion of the Ukraine have to pay higher interest rates for their deposits. This effect is robust to different deposit and depositor types and the database of included transactions. The results suggest that larger depositors require even higher compensation for geopolitical risks while insurance companies and pension funds require less.

4.1.4 Robustness – Exposure Measure

In this part, we investigate banks' exposure to the geopolitical shock in more detail. We measure a bank's exposure to the geopolitical shock in our main analyses by the loan exposure and bond holdings to Russian and Belarussian borrowers relative to the bank's total book equity value. This measures the bank's equity at risk due to the sanctions towards

[4] As shown in Table 1, the deposit interest rate is -56 bps, what implies a spread over the deposit facility interest rate at this time of -6bps. A higher interest rate accordingly implies a smaller spread in absolute terms what ceteris paribus implies a larger coefficient estimate if the economic effect is the same.

Russian and Belarussian firms and includes the related increases in loan loss provisions and write offs of these credit exposures. In simple words, it is the amount of depleted equity if all credit exposures to Russian and Belarussian firms were lost. In this part, we analyze different definitions of exposure and the relation of our measure to other measures of geopolitical risk. The results are shown in Table 6.

[Table 6]

First, we vary the numerator and the denominator of our exposure measure. In column (1) we normalize the credit exposure to Russian and Belarussian firms with the bank's total assets. This addresses the potential concern that differences in bank equity might relate to differences in exposure to these firms thereby systematically affecting our measure. The column shows that the effect is the same irrespective of whether we normalize with equity or with total assets of the bank. Regarding the numerator, we use only loans issued to Russian and Belarussian borrowers over equity in column (2) and only bonds of these in a bank's portfolio over equity in column (3). Our results show that only loan exposures matter. Given that in our data loan exposures are substantially larger than bond exposures it indicates that our results are indeed driven by the more economically meaningful part of banks' assets at risk. Alternatively, the stronger effect for loan exposures might be related to a higher (relative) degree of asymmetric information about borrowers between bank lenders and their depositors compared with public bond markets. In column (5) we extend our definition of exposure to borrowers which are not based in Russia or Belarus but have a parent company which is headquartered there. This may imply difficulties for these subsidiary firms as internal capital markets of multinational firms often act as a device to mitigate shocks to parts of the multinational corporation (e.g., Imbierowicz et al., 2025). Column (5) confirms our previous result also when we use this wider definition. As another robustness tests, we define exposure using loans and bonds from first-degree neighboring countries as defined in Federle et al. (2024). This definition serves two purposes. First, it allows to investigate whether banks might experience spillover effects due to their exposure of firms located in neighboring countries. And second, it might also be considered as a placebo test as none of these firms are subject to sanctions. Column (5) shows that the coefficient is insignificant when calculating exposure using borrowers from neighboring countries.

Second, we ensure that effects are robust to how we include our measure of exposure. In column (6), instead of the continuous variable of a bank's credit exposure to Russian and

Belarussian borrowers over equity, we use an indicator variable which is one when this ratio is larger than two percent. In column (7), we sort banks by their exposure to these borrowers and rank them accordingly. This reflects the ordinal ranking of banks and accounts for depositors potentially demanding only higher rates from the most exposed banks. Our previous result is confirmed in both columns. Note that column (6) allows for a direct economic inference. It shows that banks with a credit exposure to Russian and Belarussian borrowers over equity of larger than two percent on average have to pay a 1.7bps higher deposit interest rate after the start of the war.

4.1.5 Robustness – Exposure Measure vs. Other Risk Measures

To further analyze the nature of our exposure measure, we decompose its informational content into the three components of idiosyncratic, systematic, and mixed (hybrid) risk. Conceptually, the exposure variable blends direct credit risks with broader macro-financial vulnerabilities. To disentangle these channels, we augment our baseline model with proxy variables targeting each specific risk dimension. This approach allows us to isolate the contribution of each risk type to the overall exposure measure. We proxy idiosyncratic risk using the component of a bank's credit default swap (CDS) spread that is orthogonal to standard bank's balance sheet characteristics as described in Table 1. This orthogonalized CDS spread captures bank-specific credit events such as significant loan write-offs or asset impairments that directly impair a bank's asset quality. Such idiosyncratic shocks should be reflected in the bank's CDS pricing, independent of broader market movements. The mixed risk component, combining idiosyncratic and systematic elements, is proxied by a bank-specific geopolitical risk (GPR) index. We construct this index by weighting country-level GPR indices from Caldara and Iacoviello (2022) with each bank's loan and bond exposure to the respective country. We exclude domestic business activities to ensure that the index does not merely reflect the local risk of a bank's home country. Hence, this proxy reflects how a bank's particular foreign exposure channels geopolitical tensions into its perceived risk, capturing both firm-level effects and macro-level developments. In essence, it measures the degree to which a bank's idiosyncratic exposure profile translates global political shocks into risk for that bank. Finally, we capture systematic risk by measuring each bank's sensitivity to broad financial market conditions. Specifically, we regress changes in each bank's CDS spread on changes in the iTraxx Bank CDS index as a measure for the market-wide benchmark of European bank credit risk and use the resulting beta coefficient. This

estimated beta reflects how strongly the bank's credit risk moves in tandem with the overall market sentiment. A higher beta indicates that the bank's creditworthiness is more tightly linked to general financial conditions, whereas a lower beta suggests more resilience to market-wide fluctuations. Table 7 shows the results.

[Table 7]

It reports the results of re-estimating our main specification as in Table 2, Column (6) when additionally introducing these risk proxies. Column (1) provides the baseline results for comparison, including only observations where all risk measures are available. In Columns (2) through (4), we add each proxy variable individually together with our main interaction term. In all cases, the coefficient of our exposure measure remains positive and statistically significant. Its magnitude declines to some extent with each proxy included suggesting that parts of our main measure indeed overlap with the specific risk channel introduced by that proxy. In Column (5), we include all three proxies simultaneously in the regression. In this fully augmented model, the coefficient of our exposure measure drops to roughly half of its baseline value but remains statistically significant. This decrease in magnitude indicates that the three proxies collectively explain a substantial part of the effect originally attributed to our exposure measure. Nonetheless, the persistence of a significant coefficient even after controlling for idiosyncratic, mixed, and systematic risk proxies implies that our exposure measure contains additional information not captured by these.

Taken together, these results indicate that our exposure measure encompasses more than what is captured by standard credit or geopolitical risk metrics. Although the inclusion of observable risk proxies (idiosyncratic CDS component, GPR index, and market beta) absorbs some of the effect, our measure of a bank's exposure to the geopolitical risk of Russia's start of the war continues to have an independent and economically meaningful influence on deposit rates. In other words, banks' direct exposures to Russian and Belarusian counterparties during the geopolitical shock imply multiple dimensions of risk that are not fully captured by conventional individual risk indicators of idiosyncratic, systematic, or hybrid risk. The analysis in Table 7 thus confirms that our exposure measure embeds unique risk information beyond traditional financial proxies, consistent with a multifaceted impact on bank funding costs.

The results in Table 7 confirm that both geopolitical risk and bank risk matter for bank deposit interest rates. However, the table also shows that our measure of a bank's exposure

to the geopolitical shock is another highly relevant factor. Following the arguments of Liu (2023), this indicates that beside the fundamental value of a bank and its liquidation value, depositors additionally also account for the aggregate liquidation value in the system. The latter is highly uncertain in times of a geopolitical shock as included in our study making it reasonable that our measure of banks' exposure to the geopolitical shock proxies for this. It reflects the within bank coordination together with the cross bank price externality in Liu (2023) and is suggestive of a rather small asset shock being able to translate into a systemic crisis. Liu (2023) predicts that an idiosyncratic shock lowering a bank's asset fundamentals can trigger a creditor run when two conditions interact: (i) a common asset-market externality that depresses liquidation prices system-wide, and (ii) within-bank coordination problems among creditors. The Russian invasion constitutes precisely such a shock for banks with large exposures, lowering the expected liquidation value of their assets and moving them to the run threshold in Liu's model. Our results are consistent with this mechanism. The initial asset shock increases the incentive to run for creditors but leaves less-exposed banks largely unaffected. Thus, the empirical heterogeneity by exposure offers direct evidence for the model's core prediction that country-specific shocks translate into systemic fragility through asset market spill overs and creditor coordination failures.

4.2 Loans

The previous part has shown that the geopolitical shock of Russia invading the Ukraine has negative effects on bank funding. More exposed banks pay higher deposit interest rates. We are now interested in how this transmits to their lending. Specifically, we estimate the effect of our interaction variable on loan volumes and interest rates at the bank-firm-year:month level, using alternative sets of fixed effects to control for borrower, sectoral, and time variation. Table 8 shows the results.

[Table 8]

In Table 8, the dependent variable in columns (1) to (3) is the natural logarithm of loan volume and in columns (4) to (6) it is the interest rate on the loan. We gradually saturate the model with fixed effects starting with time fixed effects, then industry-country-year:month fixed effects in the spirit of Degryse et al. (2019), and finally borrower-year:month fixed effects following Khwaja and Mian (2008) in column (3) for volume and column (6) for interest rates. Across all specifications in columns (1) to (3), the coefficient of our interaction term is negative, and statistically significant in columns (2) and (3). The latter specifications

control for firms' demand for bank loans and therefore allow for more precise isolation of bank supply. This shows that banks which are more exposed to geopolitical risk reduce their lending following the invasion, even after controlling for borrower characteristics and sector-specific shocks. It suggests that negative effects on banks' funding translates into a contraction of credit supply. The result is consistent with the classic bank lending channel, where liability-side constraints impact asset-side behavior.

In contrast, in columns (4) to (6) the estimated effects on loan rates are positive but insignificant across all specifications. While banks reduce credit supply, they do not systematically reprice their loans. This suggests that a geopolitical shock can weaken the bank lending channel through balance sheet stress even without changes in monetary policy. Loan volumes do not decrease because of higher loan interest rates but because banks restrict loan supply under funding pressure. This indicates that geopolitical risk can impair credit intermediation via supply-side channels. The asymmetry of less bank loans but no change in rates is notable when compared with deposit rates which increase after the shock. This indicates that the negative effects on banks' funding directly transmit to banks' lending.

We investigate this in more detail and directly link a bank's change in loan volume to its change in deposit interest rate. We test whether tighter funding conditions of more exposed banks lead to lower loan volumes after the start of the war. The results are shown in Table 9.

[Table 9]

Columns (1) to (3) of Table 9 use changes in banks' funding rates over a period of five days after the start of the war as independent variables. Column (1) shows that higher funding costs in the post period are associated with significantly lower lending confirming a direct link from liability-side stress to reduced loan supply. Columns (2) and (3) decompose these funding cost changes into predicted and residual components. To derive these, column (2) uses equation (1) including our exposure variable to the shock, and column (3) uses the same specification but excludes our geopolitical exposure measure. The columns show that both anticipated and unanticipated increases in funding costs translate into lower credit provision but only when including our main measure of a bank's exposure to the geopolitical shock. Columns (4) to (6) repeat this analysis for the period of 20 days after the start of the war. It confirms our previous results that bank funding stress transmits to bank lending. Table 9 highlights that tightening funding conditions for some banks due to a geopolitical shock lead

to asymmetric credit supply effects. Moreover, banks may not pass on higher funding costs to borrowers via loan rates but instead adjust loan quantities. This implies hidden stress on banks' intermediation margins.

We investigate our results on bank lending also in local projections to illustrate the dynamic effects of banks' geopolitical exposure on loan market outcomes following the Russian invasion. We use the iMIR data which include the amount and interest rates of all new loans of a bank to corporate borrowers and show the differential effect of high exposure banks in the post period on loan rates in Panel A and on loan volume in Panel B of Figure 2.

[Figure 2]

Figure 2 in general confirms the negative effects of the geopolitical shock on bank lending. In the larger iMIR sample, we observe in Panel A that loan rates tend to increase. Panel B of Figure 2 is in line with our earlier finding that more exposed banks decrease their lending. The trough appears around 2 months after the invasion. The effect remains negative indicating that it persists for at least the first quarter after the start of the invasion. Thus, Figure 2 illustrates that in the wake of the geopolitical shock banks with greater exposure decrease their lending volumes. The combination of Panels A and B indicate an adjustment in volume what is consistent with funding shortages or risk aversion forcing banks to cut back lending.

These loan-market results are closely linked to the paper's earlier findings on bank deposit funding. Our results suggest that depositors respond to the geopolitical risk profile of banks after the start of the war, possibly anticipating losses or instability due to the banks' Russia-related assets. The results for bank loans are consistent with this and provide a supply-side counterpart to the deposit findings. More exposed banks which face higher funding costs reduce their lending in the months after the invasion. This is consistent with the classic bank lending channel: a shock that negatively affects a bank's funding leads the bank to reduce the quantity of newly issued loans. Furthermore, our results suggest that more exposed banks did not (or could not) compensate for the negative effects on their funding by charging (sufficiently) more but rather decreased their lending.

The results in this part highlight that geopolitical risk relates to the bank lending channel via deposit market disruptions. The Russian invasion caused stress for banks' balance sheets. Banks with greater exposure to the shock have to pay higher deposit interest rates what

impairs their ability to fund loans. Consequently, these banks curtail lending to firms, demonstrating how a geopolitical shock can propagate to the real economy by constricting credit supply. This mechanism is analogous to the transmission of a monetary tightening as it shows that weaker funding capacity at banks translates into reduced lending to borrowers. In sum, a geopolitical shock has effects on aggregate demand through financial intermediaries and constitutes a "silent tightening" through exposed banks.

5 Monetary Policy Transmission

Section 4 provides empirical evidence that the exposure of banks to the geopolitical shock of Russia invading the Ukraine has direct demand side effects through bank assets and liabilities. In this section, we investigate whether banks with a larger exposure also differentially transmit changes in monetary policy. The ECB only started to adjust policy rates at the end of July 2022. We are therefore able to investigate the direct and immediate effect on aggregate demand in Section 4 by ending our sample period in these analyses at this point in time. We now focus on the transmission of monetary policy after these immediate effects already occurred and include the full sample period which ranges from March 2021 until February 2023. We implement local projections of unsecured deposit rates (Figure 3) and corporate loans rates (Figure 4) in response to changes in the deposit facility rate (Panel A) and monetary policy surprises (Panel B).

[Figure 3 and 4]

Figures 3 and 4 present evidence that banks with greater exposure to Russian and Belarusian borrowers experience a significantly stronger transmission of monetary policy to both deposit and lending rates in the post-invasion period. The results confirm that the geopolitical shock's impact on banks continues to influence their behavior well beyond the start of the invasion. Figure 3 focuses on deposit rate pass-through using money-market data from the MMSR database. It shows that highly exposed banks raise their overnight corporate deposit rates relatively more after a monetary policy tightening. For example, in Panel A, a 100 basis point rise in the ECB's Deposit Facility Rate (DFR) leads to roughly a 40 basis points larger increase in deposit interest rates of high-exposure banks within about five months. This differential response emerges almost immediately after a rate hike and widens over the subsequent months, being statistically significant in all periods. Moreover, the effect is sizable given an average rate of 2.2% for MMSR deposits at the end of our sample period.

In Panel B, we use the high-frequency surprises from Jarociński and Karadi as exogenous monetary policy shock measure. It confirms the same pattern. More exposed banks adjust deposit interest rates stronger in response to an unanticipated policy tightening. These results are consistent with our earlier findings that more exposed banks face funding pressure after the invasion with deposit outflows and higher deposit rates. The result that their deposit rates now respond more strongly to policy rate changes suggests that these banks also have to pass through rate hikes more to retain and attract unsecured deposit funding.

Figure 4 uses granular bank-firm loan data from Anacredit and shows that the pass-through of monetary policy rates of more exposed banks is also stronger for loans. Consistent with our results on deposits, banks hit more severely by the geopolitical shock transmit policy rate increases more to their borrowers. Panel A of Figure 4 shows that the increase in loan rates is about 35bps stronger for more exposed banks within about four months, with the effect being statistically significant over most periods. It is also economically meaningful given an average loan rate of 2.9% at the end of our sample period. Panel B uses the high-frequency surprises from Jarociński and Karadi again and confirms this result. Loan rates of highly exposed banks respond more to an unanticipated policy rate increase. These findings align with our earlier results on bank loans to corporate borrowers which showed a reduction in credit supply.

Overall, the pass-through dynamics in Figures 3 and 4 illustrate how a geopolitical shock amplifies the aggregate effects of monetary tightening through the banking system. More exposed banks amplify the pass-through of the subsequent monetary tightening relative to less-exposed banks by increasing their deposit and loan rates more. This intensified pass-through carries important demand-side implications. Borrowers reliant on the more-exposed banks face higher borrowing costs and possibly reduced credit availability during monetary tightening cycles. This could imply more negative real effects for these firms compared with less-affected parts of the economy. Thus, the geopolitical shock of Russia invading the Ukraine did not only impact banks' funding what negatively affected bank lending but also magnified the contractionary impact of subsequent rate hikes on the real economy. This stronger monetary policy transmission via exposed banks is an important channel through which geopolitical risks can translate into broader macroeconomic consequences. It accelerates the pass-through of policy actions and thereby further restrains aggregate demand.

6 Conclusion

This study shows that banks with a larger exposure to sanctioned Russian and Belarusian borrowers face a stronger funding shock after the start of Russia's war in Ukraine in 2022. Overnight deposit rates relatively increase and volumes tend to decreases while the same banks curtail lending without materially raising loan rates. In the subsequent tightening cycle, changes in the policy rate are passed through more to both deposits and loans at these institutions, revealing a markedly stronger monetary-policy transmission channel.

These patterns imply that the invasion restrained aggregate demand alongside the well-recognized supply shock. Higher funding costs and shrinking balance sheets contract credit even before monetary policy acts to increasing inflation. Central banks should therefore tighten monetary policy cautiously to avoid overshooting and unnecessarily suppressing already weakened private demand. This argues for a data-driven approach with incremental policy rate changes and clear forward guidance.

Furthermore, standard risk measures such as CDS spreads or generic geopolitical-risk indices explain only part of the observed funding stress. Our exposure metric retains independent explanatory power irrespective of including further established measures of idiosyncratic, mixed, or systematic risks. Banks' direct exposures to Russian and Belarusian counterparties during the geopolitical shock imply multiple dimensions of risk that are not fully captured by conventional individual risk indicators. Supervisors should therefore require granular disclosure of country-counterparty concentrations, embed geopolitical-stress scenarios in Pillar 2 reviews, and oblige banks to price these risks internally. Transparent, forward-looking capitalization of geopolitical concentration risk will curb hidden exposures and reduce the need for emergency intervention when shocks might aggravate.

Declaration of generative AI and AI-assisted technologies in the writing process.

Statement: During the preparation of this work the authors used ChatGPT in order to refine sentence phrasing and improve clarity. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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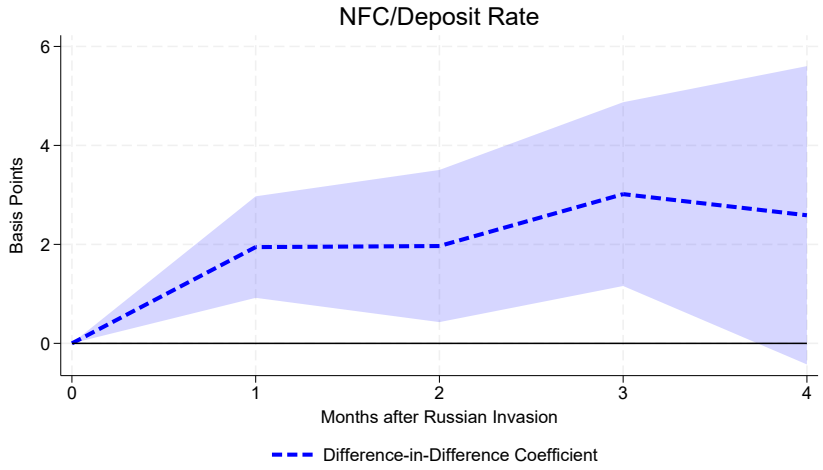
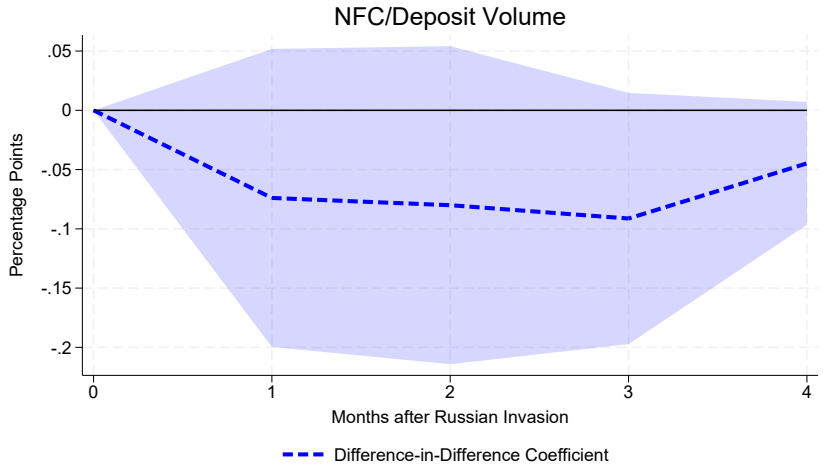
Figure 1: Local Projections - Deposit Market Outcomes (IMIR)
This figure shows the coefficient estimates $\beta_{Invasion}$ of the following local projection:

$$Y_{b,t+h} - Y_{b,t} = \beta_{Russia} \cdot Invasion_{t-k} \times D(Exp_b^{Russia} \geq 2\%) + X_{b,t-k} + \Delta Y_{b,t-k} + I_b + \epsilon_{b,t}$$

$Y_{b,t+h} - Y_{b,t}$ is the change in overnight deposit rates (volumes) for non-financial corporations in the upper (lower) figure. *Invasion* is a dummy variable equal to one for February 2022 and zero otherwise. $D(Exp_b^{Russia} \geq 2\%)$ is a dummy variable equal to one when a bank has an *Exposure* to Russian and Belarusian borrowers equal or greater than 2% of book equity. X is a vector of bank-level control variables are described in Panel A of Table 1. α_b are bank fixed effects. We set $k = 3$ and include but do not report lower-order terms of the interactions. Standard errors are clustered at the bank level. 90% confidence bands are visible as the shaded blue area.



(a) Overnight Deposit Rates for Non-Financial Corporations (New Business)

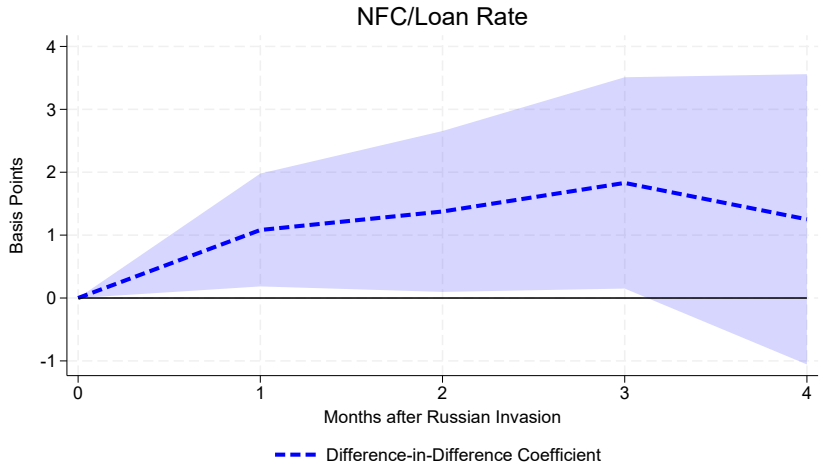


(b) Overnight Deposit Volumes for Non-Financial Corporations (New Business)

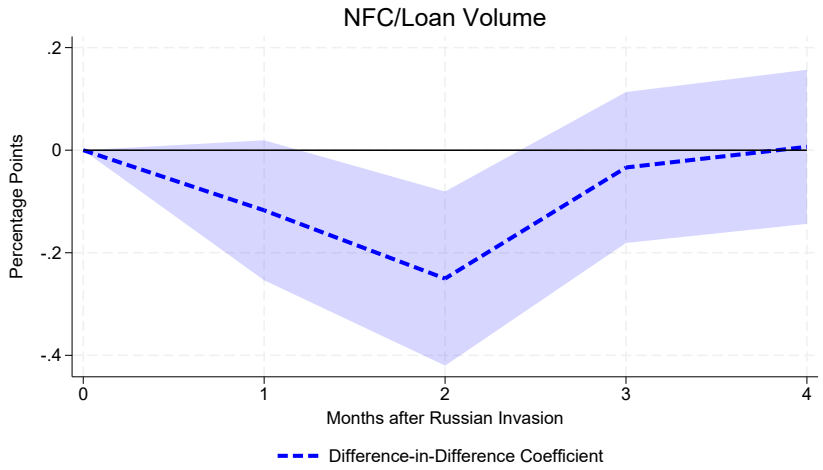
Figure 2: Local Projections - Loan Market Outcomes (IMIR)
This figure shows the coefficient estimates $\beta_{Invasion}$ of the following local projection:

$$Y_{b,t+h} - Y_{b,t} = \beta_{Russia} \cdot Invasion_{t-k} \times D(Exp_b^{Russia} \geq 2\%) + X_{b,t-k} + \Delta Y_{b,t-k} + I_b + \epsilon_{b,t}$$

$Y_{b,t+h} - Y_{b,t}$ is the change in loan rates (volumes) for non-financial corporations in the upper (lower) figure. *Invasion* is a dummy variable equal to one for February 2022 and zero otherwise. $D(Exp_b^{Russia} \geq 2\%)$ is a dummy variable equal to one when a bank has an *Exposure* to Russian and Belarusian borrowers equal or greater than 2% of book equity. X is a vector of bank-level control variables are described in Panel A of Table 1. α_b are bank fixed effects. We set $k = 3$ and include but do not report lower-order terms of the interactions. Standard errors are clustered at the bank level. 90% confidence bands are visible as the shaded blue area.



(a) Loan Rates for Non-Financial Corporations (New Business)

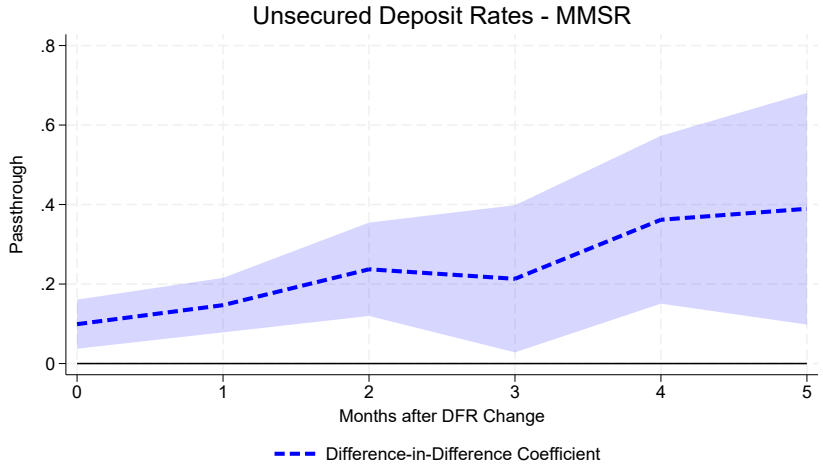


(b) Loan Volumes for Non-Financial Corporations (New Business)

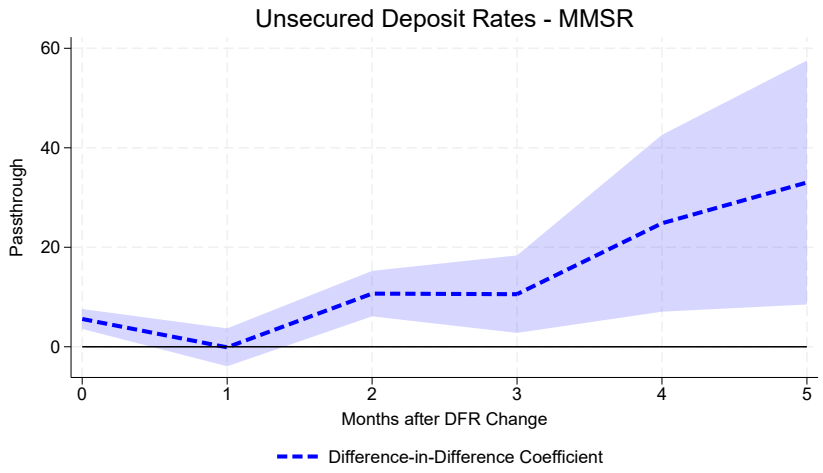
Figure 3: Local Projections - Deposit Rate Passthrough (MMSR)
This figure shows the coefficient estimates β_{MP} of the following local projection:

$$Y_{b,t+h} - Y_{b,t} = \beta_{Russia} \cdot Invasion_{t-k} \times Exposure_b + \beta_{MP} \cdot \Delta MP_{t-k} \times Exposure_b + X_{b,t-k} + \Delta Y_{b,t-k} + \alpha_{b,f} + \alpha_t + \epsilon_{b,t}$$

$Y_{b,t+h} - Y_{b,t}$ is the change in overnight deposit for non-financial corporations. *Invasion* is a dummy variable equal to one for February 2022 and zero otherwise. ΔMP is changes in the deposit facility rate in the upper figure and monetary policy shocks of Jarocinsky and Karadi in the lower figure. *Exposure* is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity. X is a vector of bank-level control variables are described in Panel A of Table 1. α_b, f and α_t are bank-firm and time fixed effects, respectively. We set $k = 3$ and include but do not report lower-order terms of the interactions. Standard errors are clustered at the bank level. 90% confidence bands are visible as the shaded blue area.



(a) Rate Passthrough of DFR Changes to Overnight Deposits of Non-Financial Corporations

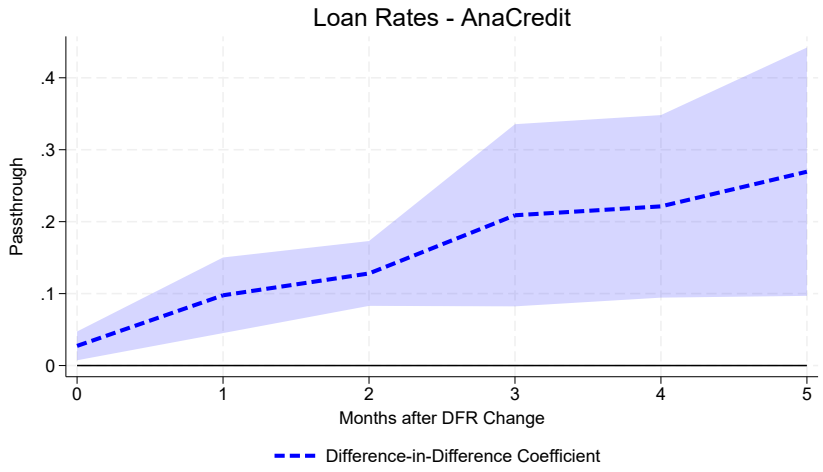


(b) Rate Passthrough of MPS to Overnight Deposits of Non-Financial Corporations

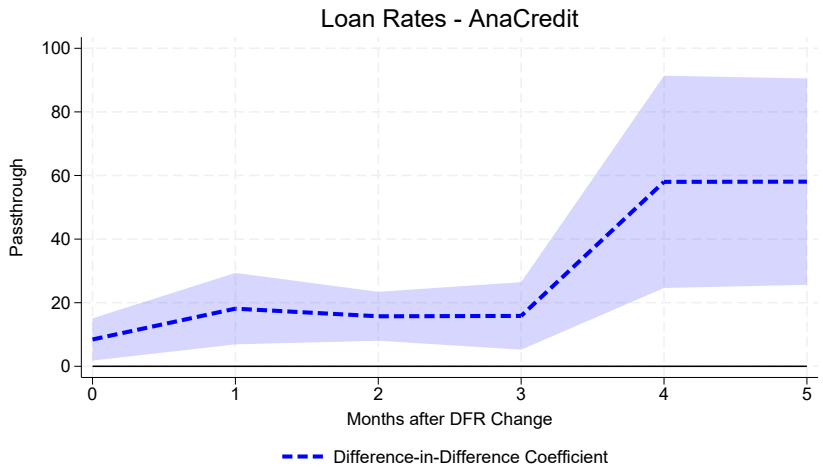
Figure 4: Local Projections - Loan Rate Passthrough (AnaCredit)
This figure shows the coefficient estimates β_{MP} of the following local projection:

$$Y_{b,t+h} - Y_{b,t} = \beta_{Russia} \cdot Invasion_{t-k} \times Exposure_b + \beta_{MP} \cdot \Delta MP_{t-k} \times Exposure_b + X_{b,t-k} + \Delta Y_{b,t-k} + \alpha_{b,f} + \alpha_t + \epsilon_{b,t}$$

$Y_{b,t+h} - Y_{b,t}$ is the change in loan rates for non-financial corporations. *Invasion* is a dummy variable equal to one for February 2022 and zero otherwise. ΔMP is changes in the deposit facility rate in the upper figure and monetary policy shocks of Jarocinsky and Karadi in the lower figure. *Exposure* is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity. X is a vector of bank-level control variables are described in Panel A of Table 1. α_b, f and α_t are bank-firm and time fixed effects, respectively. We set $k = 3$ and include but do not report lower-order terms of the interactions. Standard errors are clustered at the bank level. 90% confidence bands are visible as the shaded blue area.



(a) Rate Passthrough of DFR Changes to Loans to Non-Financial Corporations



(b) Rate Passthrough of MPS to Loans to Non-Financial Corporations

Table 1: Descriptive Statistics

Table 1 reports summary statistics for the variables used in the analyses. The sample is equivalent to the main regression sample used in e.g. Table 2. The sample period is March 2021 to July 2022, ending with the first policy rate change on July 27, 2022. Variable descriptions are listed in Table OA.1. In Panel A, statistics include the number of bank-firm-day observations (N), mean, standard deviation, and the 25th, 50th, and 75th percentiles. Panel B presents a comparison of pre-invasion averages of the most relevant bank-level control variables included in the analyses. Low (High) exposure banks are banks with an exposure to Russia equal or greater than 2% of book equity. In Panel C, we report spearman rank correlations of the main exposure variable with other variables used throughout the analyses.

Panel A: Descriptive Statistics - Main Sample

				Percentiles		
	N	Mean	SD	25th	50th	75th
Deposit Sample:						
Deposit Rate (in bps)	6,211	-56.01	4.52	-58.00	-56.00	-54.00
Deposit Volume (in mn EUR)	6,211	259.98	225.54	95.00	200.00	386.00
$\text{Exposure}^{\text{Russia}}$ (in %)	6,211	6.99	9.08	0.40	1.47	9.01
Total Assets (in logs)	6,211	12.81	0.74	12.11	12.72	13.51
Equity Ratio (in %)	6,211	6.06	1.91	4.42	5.84	7.24
NFC Deposit Ratio (in %)	6,211	9.45	3.96	7.13	8.65	12.34
NFC Loan Ratio (in %)	6,211	13.49	7.51	7.10	11.35	20.45
Bond Ratio (in %)	6,211	6.43	4.88	4.59	6.51	8.81
Reserve Ratio (in %)	6,211	15.82	5.95	11.44	15.09	20.17
CDS Spread (in bps)	5,675	52.33	16.91	36.99	54.18	64.03
Loan Sample:						
Loan Volume (in mn EUR)	1,840,198	3.53	29.90	0.08	0.25	0.89
Loan Rate (in bps)	1,840,198	235.47	134.65	150.00	206.60	304.20

Panel B: Bank Controls - Pre Invasion, Exposure Split

	N	Low Exposure	High Exposure	Difference	t-statistic
$\text{Exposure}^{\text{Russia}}$	28	0.33	11.11	10.78	(5.83)
Log Total Assets	28	12.35	12.90	0.55	(1.51)
Equity Ratio	28	7.25	5.87	-1.38	(-1.17)
NFC Deposit Ratio	28	10.42	9.58	-0.84	(-0.35)
Loan Ratio	28	17.72	12.17	-5.02	(-1.28)
Bond Ratio	28	9.22	7.36	-0.84	(0.84)
Reserve Ratio	28	17.00	15.07	-1.92	(-0.66)
CDS Spread	28	45.89	50.61	4.71	(0.29)

Panel C: Rank Correlation - Exposure, Geopolitical Risk, Credit Risk

	$\text{Exposure}^{\text{Russia}}$	Bank GPR	$\text{Exposure}^{\text{Neigbors}}$	$\Delta\text{CDS}^{Cum}_{Pre,4W}$	$\Delta\text{CDS}^{Cum}_{Post,4W}$
$\text{Exposure}^{\text{Russia}}$	1.0000				
Bank GPR	0.1771	1.0000			
$\text{Exposure}^{\text{Neigbors}}$	0.5267	0.1090	1.0000		
$\Delta\text{CDS}^{Cum}_{Pre,4W}$	0.1736	-0.1804	-0.1216	1.0000	
$\Delta\text{CDS}^{Cum}_{Post,4W}$	0.5252	0.0916	0.4132	0.5536	1.0000

Table 2: Deposit Market Outcomes - Adding FE

Table 2 shows the results for different fixed effect panel regressions described in equation (1). The dependent variables are unsecured deposit rates for new deposits (Panel A), a dummy variable equal to one when a bank receives a new deposit on day t (Panel B), and the natural logarithm of unsecured deposit volumes for new deposits. We gradually saturate the model with different fixed effects as indicated in the column header and at the bottom of the table. Bank-level control variables are described in Panel A of Table 1. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Exp_b^{Russia} is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity at the end of 2021. We report t-statistics based on standard errors, clustered at the bank and time level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) No FE	(2) Time FE	(3) Bank FE	(4) Firm FE	(5) Bank x Firm FE	(6) Firm x Time FE	(7) WLS
Panel A: Unsecured Deposit Rates							
$Post \times Exp_b^{Russia}$	0.5738***	0.5811***	0.8117***	0.8306***	0.8761***	0.7352***	0.9224***
	(3.41)	(3.57)	(3.23)	(3.42)	(3.93)	(4.57)	(5.15)
Adj. R2	26.67	29.25	65.25	67.39	75.42	73.32	62.48
Obs	6211	6211	6211	6211	6211	6211	6211
Banks	28	28	28	28	28	28	28
Panel B: Unsecured Deposit Volumes - Dummy: New Deposit (in percentage points)							
$Post \times Exp_b^{Russia}$	-0.20	-0.20	-0.21	-0.18	-0.42	-0.37	-1.58***
	(-0.29)	(-0.28)	(-0.36)	(-0.34)	(-0.89)	(-0.74)	(-2.80)
Adj. R2	8.219	8.829	10.06	13.95	18.2	20.61	22.02
Obs	44084	44084	44084	44084	44084	44084	44084
Banks	28	28	28	28	28	28	28
Panel C: Unsecured Deposit Volumes - New Deposit Volume							
$Post \times Exp_b^{Russia}$	-0.0827	-0.0833	-0.0657	-0.0215	-0.0879	-0.1226	-0.2911**
	(-0.44)	(-0.43)	(-0.42)	(-0.17)	(-0.67)	(-1.26)	(-2.56)
Adj. R2	31.23	31.49	33.17	37.03	42.47	38.95	38.93
Obs	44084	44084	44084	44084	44084	44084	44084
Banks	28	28	28	28	28	28	28
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	–	Yes	Yes	Yes	Yes	–	–
Bank FE	–	–	Yes	Yes	–	–	–
Firm FE	–	–	–	Yes	–	–	–
Bank x Firm FE	–	–	–	–	Yes	Yes	Yes
Firm x Time FE	–	–	–	–	–	Yes	Yes

Table 3: Deposit Market Outcomes - Bank-Level

Table 3 shows the results for fixed effect panel regressions described in equation (1). The dependent variables are unsecured deposit volumes for new deposits (Column 1) and total deposits (Column 2), and equally-weighted (Column 3) as well as volume-weighted (Column 4) deposit rates for new deposits. All regressions include bank and time fixed effects. Bank-level control variables are described in Panel A of Table 1. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Exp_b^{Russia} is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity at the end of 2021. We report t-statistics based on standard errors, clustered at the bank and time level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) Volume - New	(2) Volume - Total	(3) Rate - OLS	(4) Rate - WLS
$Post \times Exp_b^{Russia}$	-0.5323** (-2.10)	-0.2204 (-1.54)	0.5283** (2.12)	0.6803*** (4.99)
Adj. R2	53.63	68.99	82.68	80.8
Obs	8402	8402	4516	4516
Banks	28	28	28	28
Bank Controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes

Table 4: Deposit Rates - Robustness I

Table 4 shows the results for different fixed effect panel regressions described in equation (1). The dependent variables are unsecured deposit rates for new deposits. Fixed effects are included as indicated at the bottom of the table. Bank-level control variables are described in Panel A of Table 1 and included as indicated at the bottom of the table. In addition, we progressively include the log deposit volume for each new deposit, as well as the previous week's overnight and total deposit volume for each bank-firm pair. In column 4, we interact the control variables with the *Post* dummy. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Exp_b^{Russia} is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity at the end of 2021. We report t-statistics based on standard errors, clustered at the bank and time level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) No Controls	(2) New Volume	(3) Past O/N Volume	(4) Past Total Volume	(5) Post x Control
$Post \times Exp_b^{Russia}$	0.6997*** (3.96)	0.7156*** (4.40)	0.7176*** (4.41)	0.7145*** (4.40)	0.6951*** (3.04)
Adj. R2	73.03	73.41	73.41	73.42	73.47
Obs	6211	6211	6211	6211	6211
Banks	28	28	28	28	28
Bank Controls	No	Yes	Yes	Yes	Yes
Bank x Firm FE	Yes	Yes	Yes	Yes	Yes
Firm x Time FE	Yes	Yes	Yes	Yes	Yes

Table 5: Deposit Rates - Robustness II

Table 6 shows the results for different fixed effect panel regressions described in equation (1). The dependent variables are unsecured deposit rates for new deposits. Fixed effects are included as indicated at the bottom of the table. Bank-level control variables are described in Panel A of Table 1 and included as indicated at the bottom of the table. We vary the regression sample across columns: In Column 1, we include single-bank corporate depositors (by relaxing the firm-time FE to a time FE). In Column 2, we exclude call accounts (MMSR deposit type = CACM). In Column 3 and 4, we only include banks reporting into the Euro Area (German) MMSR sample, respectively. In Column 5 and 6, we split the sample into above- and below-median size deposits (according to deposit volume). In Column 7, we consider term deposits instead of overnight deposits. In Column 8, we consider insurance companies and pension funds (ICPFs) instead of non-financial corporate depositors. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Exp_b^{Russia} is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity at the end of 2021. We report t-statistics based on standard errors, clustered at the bank and time level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) Single Bank	(2) Only DPST	(3) Only EuSy	(4) Only DE	(5) Small Deposits	(6) Large Deposits	(7) Term	(8) ICPFs
$Post \times Exp_b^{Russia}$	0.6083***	0.6921***	0.6292***	0.2941**	0.2947*	0.7380***	1.0094*	0.1548**
	(5.08)	(4.60)	(4.64)	(2.30)	(1.84)	(5.30)	(1.87)	(2.27)
Adj. R2	98.67	95.83	99.4	98.1	98.09	85.62	87.98	47.74
Obs	23291	15130	19864	11649	11610	11625	25285	11533
Banks	34	29	28	15	30	27	43	26
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank x Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Deposit Rates - Exposure Shock

Table 6 shows the results for the most-saturated fixed effect panel regression described in equation (1). The dependent variable is unsecured deposit rates for new deposits. Fixed effects are included as indicated at the bottom of the table. Bank-level control variables are described in Panel A of Table 1 and included as indicated at the bottom of the table. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Across columns, we employ different variants of the Exp_b^{Russia} measure used in the main specifications. Column 1 uses total assets as denominator, Column 2 and 3 use only loans to (bond holdings of) Russian borrowers (issuers), respectively. Column 4 extends the exposure to firms with Russian parents. Column 5 looks at loans and bond holdings of firms located in first-degree neighboring countries as defined in Federle et al. (2022). Column 6 replaces the continuous exposure variable with a dummy variable equal to one for banks with above 2% exposure. Column 7 uses a rank version of exposure. We report t-statistics based on standard errors, clustered at the bank and time level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) Total Assets	(2) Only Loans	(3) Only Bonds	(4) Parents	(5) Neighbors	(6) $D(Exp_b^{Russia} \geq 2\%)$	(7) Rank - Exp_b^{Russia}
$Post \times Exp_b^{Russia}$	0.7012***	0.7331***	0.0217	0.6521***	0.3396	1.6954***	0.0252**
	(4.16)	(4.58)	(0.12)	(3.72)	(1.64)	(3.82)	(2.53)
Adj. R2	73.28	73.32	72.83	73.18	72.91	73.44	73.13
Obs	6211	6211	6211	6211	6211	6211	6211
Banks	28	28	28	28	28	28	28
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank x Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm x Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Deposit Rates - What is Exposure About?

Table 7 shows the results for different fixed effect panel regressions based on the main specification as described in equation (1). The dependent variables are unsecured deposit rates for new deposits. Fixed effects are included as indicated at the bottom of the table. Bank-level control variables are described in Panel A of Table 1 and included as indicated at the bottom of the table. In Column 1, we run our baseline regression as shown in Table 2, Panel A, Column 6 for reference. In Column 2, we include *GPR*, a bank-specific geopolitical risk index which is the average of country-specific geopolitical risk indices weighted by the country's loan and bond share in a bank's portfolio. In Column 3, we include *CDS*⊥, which is the average CDS spread of a bank orthogonalized with regard to the bank-level control variables. In Column 4, we include β_{CDS} from regression changes in bank CDS spreads on changes in the iTraxx Bank CDS index. In Column 5, we include all of these variables. The variables are all measured in the period prior to the invasion. In all columns, *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Exp_b^{Russia} is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity at the end of 2021. We report t-statistics based on standard errors, clustered at the bank and time level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) Baseline	(2) GPR	(3) CDS (Orth)	(4) CDS Beta	(5) Combined
$Post \times Exp_b^{Russia}$	0.7434***	0.5960***	0.6793***	0.6010***	0.3546**
	(3.92)	(3.22)	(3.72)	(4.50)	(2.51)
$Post \times$GPR		0.3745**			0.2586*
		(2.58)			(1.77)
$Post \times$CDS⊥			0.2561		0.5076*
			(0.85)		(1.74)
$Post \times \beta_{CDS}$				0.6899**	0.7750***
				(2.87)	(4.18)
Adj. R2	.5943	.5958	.5949	.5993	.6023
Obs	5583	5583	5583	5583	5583
Banks	18	18	18	18	18
Bank Controls	Yes	Yes	Yes	Yes	Yes
Bank x Firm FE	Yes	Yes	Yes	Yes	Yes
Firm x Time FE	Yes	Yes	Yes	Yes	Yes

Table 8: Loan Outcomes - Granular

Table 8 shows the results for different fixed effect panel regressions described in equation (2). The dependent variables are the natural logarithm of loan volume (Columns 1 to 3) and the loan rate (Columns 4 to 6) for a given bank-firm-month pair. We gradually saturate the model with different fixed effects as indicated at the bottom of the table. Bank-level control variables are described in Panel A of Table 1. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. Exp_b^{Russia} is equal to outstanding loans and bond holdings to Russian and Belarusian firms (averaged over 2021) divided by a bank's book equity at the end of 2021. We report t-statistics based on standard errors, clustered at the bank level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1) Loan Volume	(2) Loan Volume	(3) Loan Volume	(4) Loan Rate	(5) Loan Rate	(6) Loan Rate
$Post \times Exp_b^{Russia}$	-0.0017	-0.0035**	-0.0041**	1.0397	0.8659	1.0434
	(-0.50)	(-2.14)	(-2.36)	(1.23)	(1.41)	(1.20)
Adj. R2	98.46	98.49	98.46	97.28	97.38	98.61
Obs	1840198	1840198	1840198	1840198	1840198	1840198
Banks	28	28	28	28	28	28
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank x Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	–	–	Yes	–	–
Industry x Country x Time FE	–	Yes	–	–	Yes	–
Firm x Time FE	–	–	Yes	–	–	Yes

Table 9: Linking Deposit and Loan Markets

Table 9 shows the results for the fixed effect panel regressions described in equation (3). The dependent variables is the natural logarithm of loan volumes. Fixed effects are included as indicated at the bottom of the table. Bank-level control variables are described in Panel A of Table 1 and included as indicated at the bottom of the table. *Post* is a dummy variable equal to one after the Russian invasion to Ukraine on February 24, 2022. In Column 1 (Column 4), $\Delta r_b^{invasion}$ is the change in median funding rates between January 21 to February 20, 2022 and February 24 to March 2, 2022 (February 24 to March 23, 2022), respectively. $\Delta \hat{r}_b^{invasion}$ and $\Delta \tilde{r}_b^{invasion}$ are corresponding differences in predicted and residual funding rates. We model funding rates based on variants of the main regression model described in equation (1). In Columns 2 and 5, we include the interaction *Post* × *Exposure* in the model (= unrestricted). In Columns 3 and 6, we estimate the model without the interaction term (= restricted). We report t-statistics based on standard errors, clustered at the bank level, in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ funding rates 5 days after the invasion			Δ funding rates 20 days after the invasion		
Post x $\Delta r_b^{invasion}$	-0.0040**			-0.0047**		
	(-2.49)			(-2.26)		
Post x $\Delta \hat{r}_b^{invasion}$		-0.0040**	0.0021		-0.0045*	0.0017
		(-2.21)	(0.69)		(-1.99)	(0.66)
Post x $\Delta \tilde{r}_b^{invasion}$		-0.0037**	-0.0038*		-0.0027	-0.0019
		(-2.15)	(-1.88)		(-1.26)	(-0.89)
Adj. R2	98.46	98.46	98.46	98.46	98.46	98.46
Obs	1839076	1839076	1839076	1839076	1839076	1839076
Banks	25	25	25	25	25	25
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank x Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm x Time FE	Yes	Yes	Yes	Yes	Yes	Yes