CENTRE FOR RESPONSIBLE BANKING & FINANCE
CRBF

University of St Andrews | Business School

WORKING PAPERS IN RESPONSIBLE BANKING & FINANCE

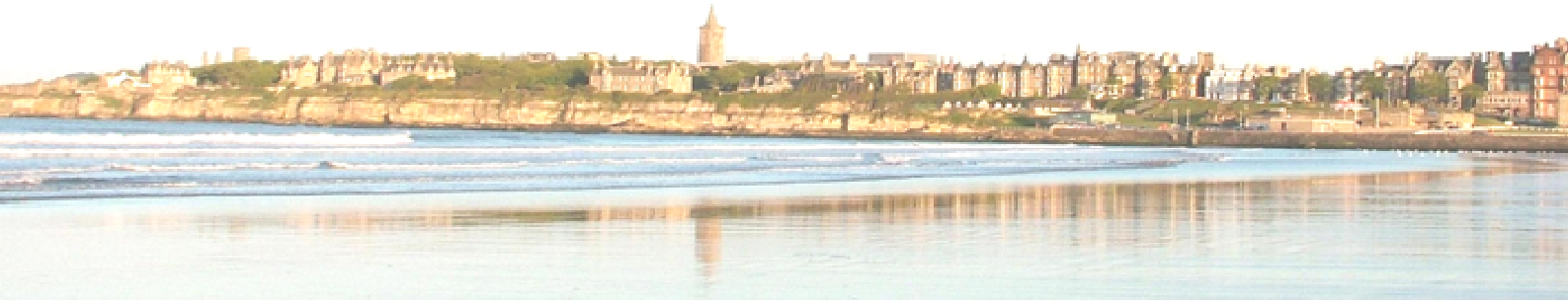
Banks' Foreign Homes

By *Kirsten Schmidt and Lena Tonzer*

Abstract: We study whether the low interest rate environment paired with booming housing markets affected banks' foreign activities in terms of commercial and residential real-estate backed lending. Using a unique dataset covering systemically relevant banks in the euro area over the period 2015-2022, we find that banks expand their foreign real estate backed lending in the presence of higher lending spreads. The result is especially present given a lack of or misalignment in macroprudential policies across home and destination country. Furthermore, we assess whether banks disclose potential losses conditional on higher lending spreads and borrowing country exposure. We find only better capitalized banks to show higher forbearance ratios. In line with search-for-yield motives, we find that during the COVID-19 crisis low capitalized banks experienced larger loan losses on real-estate backed loans in countries having offered higher rates.

WP N° 25-006

2nd Quarter 2025



University of St Andrews
Scotland's first university
600 YEARS
1413 – 2013

Banks' Foreign Homes*

Kirsten Schmidt† and Lena Tonzer‡

December 18, 2024

Abstract

We study whether the low interest rate environment paired with booming housing markets affected banks' foreign activities in terms of commercial and residential real estate backed lending. Using a unique dataset covering systemically relevant banks in the euro area over the period 2015-2022, we find that banks expand their foreign real estate backed lending in the presence of higher lending spreads. The result is especially present given a lack of or misalignment in macroprudential policies across home and destination country. Furthermore, we assess whether banks disclose potential losses conditional on higher lending spreads and borrowing country exposure. We find only better capitalized banks to show higher forbearance ratios. In line with search-for-yield motives, we find that during the COVID-19 crisis low capitalized banks experienced larger loan losses on real-estate backed loans in countries having offered higher rates.

Keywords: International banking; real estate backed loans; macroprudential regulation; financial stability

JEL Classification: F21; F34; G10; G21

*We thank Inaki Aldasoro, Manuel Buchholz, Max Croce, Cédric Huylebroek, Thomas Krause, Jochen Mankart, Francesco Mazzola, Jakob Miethe, Lorenzo Pandolfi, Alberto Pozzolo, and Moritz Stieglitz for valuable comments and suggestions. Furthermore, we are grateful for feedback received at the research seminar at Deutsche Bundesbank, the Corporate Finance Days 2024, the Essex Finance Centre (EFiC) 2024 Conference in Banking and Corporate Finance, the ifo Dresden Workshop on Macroeconomics and International Finance and the ECB conference on financial stability and macroprudential policy 2024. Funding has been gratefully received by the Leibniz Association. The views presented are ours and do not necessarily reflect those of Deutsche Bundesbank or the Eurosystem. All errors are our own.

†Deutsche Bundesbank, Germany. Email: kirsten.schmidt@bundesbank.de.

‡Corresponding author. Otto-von-Guericke-University Magdeburg; Halle Institute for Economic Research (IWH), Kleine Märkerstraße 8, 06108 Halle, Germany. Email: lena-tonzer@iwh-halle.de

1 Introduction

Banks' international activities facilitate diversification of risks but they also constitute a spillover channel of shocks arising in the financial system (Buch and Goldberg, 2015; Doerr and Schaz, 2021). The related literature on financial integration and contagion risks reveals that in case of systemic shocks, spillovers across borders can threaten bank stability and credit supply to the real sector (De Haas and Van Horen, 2013; Hale et al., 2020; Ongena et al., 2015; Tonzer, 2015), and it illustrates recent fragmentation trends (Bremus and Fratzscher, 2015; Bremus and Neugebauer, 2018; Cerutti and Claessens, 2016; Claessens and Van Horen, 2015). At the same time, banks have been operating in a low interest rate environment in Europe for almost a decade, which increased the attractiveness of real estate investments (EBA, 2022; Battistini et al., 2022). We present stylized facts showing that real estate backed lending is an important component of banks' assets and banks are also active in foreign real estate markets. Selected studies focus on *domestic* housing developments and bank stability, however, there is a lack of evidence on the drivers of banks' *foreign* real estate activities and the consequences for bank stability.

To fill this gap in the literature and acknowledging the risks that might arise from real estate markets (Jiang et al., 2023; Jordà et al., 2015), we proceed in two steps. First, we assess in how far "search for yield" behavior drives banks into foreign real estate lending in a low interest rate environment conditional on borrower-country information advantages. For a sample of systemically important banks residing in one of the euro area countries and the period 2015-2022, we have information on loans backed by real estate for the bank's home country but also by destination country. Using this bilateral data structure to extract demand side effects, we find that if the foreign market offers higher lending rates compared to the home country, banks that have stronger ex-ante deposit relationships to the destination country expand their lending activities in the respective real estate market. Hence, similar to a study by Cao et al. (2024), we find that previous deposit relationships ease information frictions when expanding foreign real estate backed lending. The main result is especially present given a lack of or misalignment in macroprudential policies across home and destination country. These findings help understand recent dynamics in banks' foreign real estate backed lending and the effectiveness of macroprudential regulation.

Given that financial crises are often related to distress in housing markets and the sizable involvement of banks in these markets, we make use of the granularity of our data to assess implications of banks' foreign real estate backed lending for bank risk. Thus, in a second step, we investigate whether banks disclose potential losses given they invest in a foreign country with a higher lending spread compared to the home country and conditional on the bank's exposure to the considered foreign market. Our results reveal that especially better capitalized banks show higher forbearance ratios, whereas potential loss disclosures have a tendency to decline for weakly capitalized banks being exposed more to countries offering higher lending rates. The finding that capitalization matters for loss disclosures is in line with the more general result by Behn and Couaillier (2023b) who analyze the impact of the introduction of the "International Financial Reporting Standard 9" (IRFS 9) on loss reporting. During the pandemic, we find non-performing loans (NPLs) related to foreign loans backed by real estate to go up especially for weakly capitalized banks. This result suggests that search-for-yield motives in response to higher lending rates abroad resulted in risk-taking by weak banks.

The analysis is based on the reporting of euro area banks supervised directly by the European Central Bank (ECB) under its Single Supervisory Mechanism (SSM). These banks cover 82% of the participating countries' bank assets and are required to provide details under the common reporting (COREP) and financial reporting (FINREP).[1] The datasets do not only provide information on banks' consolidated balance sheet and income statements but also contain detailed information on banks' real estate backed lending activities and associated risk provisions as well as non-performing loans (NPLs). Drawing on this (so far rather unexploited) information, we construct a panel of banks' bilateral foreign real estate backed lending activities. The majority of our sample covering the years 2015-2022 is characterized by low interest rates and ample liquidity. Given that this macroeconomic environment has been stable for several years until the breakout of the Covid-19 pandemic, and applied to all euro area banks, we have a laboratory to analyze how differences in lending spreads between the country of the bank headquarters and the borrowing country have shaped foreign real estate lending and related risk.

We motivate our study by presenting stylized facts regarding the foreign real estate backed

[1]For more information on the SSM or banks' reporting standards, please see: https://www.bankingsupervision.europa.eu/about/thessm/html/index.en.html; https://www.ecb.europa.eu/stats/supervisory_prudential_statistics/html/index.en.html.

lending portfolios of banks supervised by the SSM. First, banks' loans backed by real estate arise to, on average, 31% of the total loan portfolio mirroring the importance of this loan type. Second, residential real estate (RRE) backed loans have a larger share in real estate backed loans, with commercial real estate (CRE) backed loans only having a share of around one third (which is higher than around one quarter found for US banks by Jiang et al. (2023)). Third, within real estate backed loans and for the average (median) bank, around three quarters (two thirds) are of domestic nature while one quarter (one third) are foreign loans. 44% of foreign loans can be attributed to the euro area reflecting a relatively high degree of integration within the euro area. In sum, these insights suggest that real estate backed lending constitutes a relevant share in banks' portfolio and results in financial linkages between euro area countries.

Our study contributes to three main strands of literature, whereas the first strand focuses on drivers of banks' international activities and the transmission of shocks through them (Buch and Goldberg, 2015; De Haas and Van Horen, 2013; Hale et al., 2020; Ongena et al., 2015). Key drivers have been found to relate to distance, both in terms of geographical and cultural distance, information asymmetries, as well as borrower country strength and regulatory stringency (see e.g. Buch (2003); Buch et al. (2010)). A general finding in the literature is that a home bias dominates banks' lending activities, which holds even more so after the financial crisis (Bremus and Fratzscher, 2015; García-Herrero and Vázquez, 2013). Cerutti et al. (2015) show instead that an increase in syndicated lending during crisis times can be driven by the draw-down of credit lines and diversification premises. Similar research on the determinants of institutional investors' real estate holdings and the diversification potential of real estate portfolios has been conducted by, e.g., Candelon et al. (2021); Lieser and Groh (2014); Mauck and Price (2017). We contribute to this literature by focusing on the banking sector and banks' foreign lending activities backed by real estate.

Second, selected studies analyze the role of housing prices for European banks' stability. Koetter and Poghosyan (2010) find for the period 1995-2004 that local house price deviations from fundamental values deteriorate German banks' stability, a result which suggests that banks expand lending to risky borrowers given default risk is perceived to be low. In contrast, results by Zurek (2022) based on German savings banks and the period 2011-18 show no direct channel from local house price growth to portfolio risk. For the United States, Pan and Wang

(2013) find that the level of regional income growth matters for the link between house prices and bank stability and Cuñat et al. (2018) show that following a shock to real estate prices, banks reallocate their loan portfolio and have more non-performing loans. A recent study by Jiang et al. (2023) evaluates the effect of rising interest rates and declining commercial property values following the rise in remote work for the default risk of CRE backed loans granted by US banks. While the previous studies take a domestic perspective, Böhm et al. (2022) show from a macro perspective that developments in the real estate sector are transmitted dynamically via banks' cross-border linkages.[2] Given the lack of micro-level evidence on the role of banks' foreign real estate activities for bank risk, we contribute to this literature by investigating whether banks disclose potential losses or show higher NPLs when being exposed to borrowing countries offering a higher lending spread.

Third, following the financial and sovereign debt crises in Europe, the regulatory landscape has been changed to include macroprudential regulation. One objective of related policy tools is to curb systemic risks stemming from the real estate market by imposing, for example, loan-to-value (LTV) or debt-to-income (DTI) ratios. An expanding strand of literature studies the effectiveness of such instruments. For example, Acharya et al. (2022) show for Irish banks that LTV-type of instruments are successful in lowering the feedback between house prices and lending. Yet, banks might reallocate their portfolios to non-targeted sectors, a finding which also applies to banks in Switzerland subject to the counter-cyclical capital buffer. The latter required banks to hold an additional capital buffer depending on the mortgage risk in their portfolio, which caused more affected banks to reallocate lending to non-targeted sectors (Auer et al., 2022). We offer another perspective on this research field by studying whether reallocation takes place in the same sector (real estate backed lending) but across countries depending on the stance of macroprudential regulation. This way, we also contribute to studies documenting spillovers of macroprudential instruments across countries (Buch and Goldberg, 2017; Danisewicz et al., 2017; Houston et al., 2012; Temesvary, 2018) as well as studies discussing the role of supranational cooperation such as Beck et al. (2023).

[2]The feedback effects between housing prices and mortgage provision is discussed in a theoretical model by Hott (2011), and addressed empirically by, e.g., Anundsen and Jansen (2013), Basten and Koch (2015) or Favara and Imbs (2015).

2 Does "search for yield" behavior drive banks' foreign real estate backed lending?

2.1 Regression model

We first aim at understanding whether banks' foreign real estate backed lending is related to "search for yield" behavior. The underlying sample period (2015-2022) is dominated by the low (and negative) interest rate environment inducing banks to reallocate assets to remain profitable (Brei et al., 2020; Bottero et al., 2022; Buchholz et al., 2020; Claessens et al., 2018). At the same time, housing markets have undergone significant growth, which continued even during the Covid-19 pandemic (Battistini et al., 2021; Roma, 2021). For the euro area, Figure 1 shows rising trends in housing prices with related borrowing rates being above monetary policy rates.

Banks might opt to lend to foreign countries in case lending rates compared to the country of residence are more attractive. Especially in times when the collateral value (i.e., the real estate price) is upward trending, information frictions when lending abroad might be eased due to the expected rise in the collateral value buffering potential losses. To test the hypothesis whether differences in lending rates, or a higher "lending spread", between the destination (or borrowing) country and the bank's home country is a driver of foreign real estate backed lending, we set up the following regression model:

$$\begin{aligned}\text{ForeignRealEstateBackedLoans}_{i,c,t} =& \beta_1 \text{LendingSpread}_{c,t-1} \times \text{ForeignExposure}_{i,c,t-1} \\ &+ \beta_2 \text{ForeignExposure}_{i,c,t-1} + \beta_3 \text{BankControls}_{i,t-1} + \zeta_i + \zeta_{ct} + \varepsilon_{i,c,t}.\end{aligned} \tag{1}$$

The dependent variable ($ForeignRealEstateBackedLoans_{i,c,t}$) is bank i's share of foreign real estate backed lending to destination country c in its total real estate backed lending in quarter t. We differentiate between the share of commercial real estate (CRE) backed loans and the share of residential real estate (RRE) backed loans.[3] The reason for considering these two loan types separately is that real estate backed lending to the residential sector is considered less risky than real estate backed lending to the commercial sector, which is more affected by

[3]CRE backed loans imply that non-financial firms provide own property as collateral. RRE backed lending implies that households own the property that serves as collateral. More details on the sample and data are provided in the following Section 2.2.

business cycle fluctuations. In Section 4, we also provide evidence that risk measures such as non-performing loan ratios for CRE backed loans are higher than those of RRE backed loans. Consequently, banks lending decisions might be driven by different risk-return considerations.

We are interested in the coefficient β_1 informing us about whether banks not only seek for profit by lending abroad but also respond heterogeneously to differences in lending rates between destination and home country depending on the bank's exposure to the borrowing country. The $LendingSpread_{c,t-1}$ is defined as the difference in lending rates between the destination and a bank's home country. In case we consider foreign lending backed by CRE, we refer to the three month average of the monthly cost of borrowing to non-financial corporations (NFCs) for new business. In case we consider foreign lending backed by RRE, we take the difference in the three month average of the monthly cost of borrowing to households for house purchase. The variable is lagged by one quarter to reduce simultaneity issues and to account for the fact that banks might not adjust lending decisions instantaneously.

We assess the role of the lending spread depending on bank i's deposit exposure to the destination country c in the previous quarter ($Foreign\ Exposure_{i,c,t-1}$). This variable is hence defined at the granular bank-country level and in the spirit of Cao et al. (2024) who study the role of deposit relationships for firms' likelihood to switch lenders or Badarinza and Ramadorai (2018) who find that foreign investment in real estate in London is subject to a "home bias abroad".[4] When we consider CRE (RRE) backed lending, the variable is defined as the share of deposits by NFCs (households) of bank i in destination country c in bank i's total deposits by NFCs (households).[5] Alternatively, and to have a more direct proxy for banks' expertise regarding the real estate sector, we define the exposure measure as the share of NFC loans dedicated to either the real estate or the construction sector in destination country c relative to a bank's total NFC loans to the respective sector.

Our coefficient of interest thus measures the differential impact of the lending spread on lending decisions depending on banks' prior linkages to the respective borrowing country. We hypothesize that given the existence of profit opportunities, banks with a stronger exposure to the foreign country might be more willing to engage in foreign markets. This would be

[4]In robustness checks, we take the average of the previous four quarters to further reduce simultaneity concerns.

[5]Due to the consolidated nature of the data, deposits obtained from customers in country c include both cross-border deposits placed at the bank headquarters or local deposits placed at the bank's foreign affiliates.

revealed by a higher sensitivity to the lending spread as captured by β_1. For example, these banks might find it easier to gather information, have an established customer network or specialization advantages.

We further include a vector of bank-level variables ($BankControls_{i,t-1}$) that encompasses the natural logarithm of bank size, return on assets to capture profitability, a measure for liquidity (liquid assets to total assets) and a bank's capitalization (CET1 ratio). The detailed variable definitions can be found in Table 1. We saturate the equation with bank fixed effects (ζ_i) to control for time-invariant characteristics that drive the decision to go abroad such as the business model or the location of the bank. Standard errors are clustered at the bank-destination country level.

When analyzing banks' real estate backed lending decisions, we need to account for reverse causality between real estate prices, loan supply and mortgage demand (Anundsen and Jansen, 2013). Especially when we consider lending backed by RRE, it is likely that households borrow from banks to finance a house purchase, and provide the house as a collateral. Higher house prices are likely to increase collateral value. This increase can reduce borrowing constraints and increase credit supply by banks. Higher credit supply for house purchases can feed back into rising house prices. In our set-up, banks' lending decisions regarding real estate backed loans should be based on two main components: lending rates and collateral value. Yet in the persistently low interest rate environment, banks' lending decisions can be plausibly assumed to be foremost driven by search for yield motives. House prices should be of second-order relevance as, from the perspective of the bank, they mostly come into effect in case borrowers default on real estate backed loans and the collateral value then serves to buffer banks' losses. In booming housing markets as observed during the sample period, widespread defaults were a negligible concern. Furthermore, rising house prices go hand in hand with declining yields which would rather counteract search for yield behavior.[6]

We exploit the bilateral nature of our data to extract house price and demand side effects in borrowing countries. More specifically, we add destination country-quarter fixed effects (ζ_{ct}). This approach controls for time-varying dynamics in the destination country, which includes local house price developments, mortgage demand as well as economic activity and changes

[6]In our sample, few banks use fair value accounting for real estate backed loans, and for these few banks the loan share is negligible, which rules out concerns that marked-to-market effects following changes in house prices affect bank behavior.

in the regulatory environment such as the introduction of a macroprudential policy (see also Cuñat et al. (2018)). The inclusion of destination country-quarter fixed effects is possible in case countries are linked to more than one foreign bank, which holds true for all countries in our sample. Hence, our results do not suffer from selection effects due to the inclusion of country-time fixed effects. It also has to be noted in this context that we are interested in the role of the *lending spread* for foreign lending decisions. Hence, confounding factors arise from a bilateral perspective, i.e., via the difference in variables between home and destination country. In robustness tests, we explicitly control for the spread in house prices between destination and home country to conduct a horse race test vis-à-vis the lending spread.

2.2 Data and descriptives

2.2.1 Sample and data

We employ information from the regulatory reporting standards, FINREP and COREP, of the Single Supervisory Mechanism (SSM) for the period from 2015Q1 to 2022Q3. These standards require financial institutions to provide detailed regulatory data and balance sheet information on a quarterly frequency. Our sample covers the significant institutions supervised by the SSM, which are either above the size criteria of €30 billion or are of high economic importance for the specific country or the euro area as a whole. Also significant cross-border activities or direct public financial assistance matter for the significance status of a bank. For each country belonging to the SSM, a minimum of three banks are considered to be significant – even if they do not fulfill one of the above criteria.[7]

For these significant financial institutions in the euro area, we obtain data at the consolidated level. We have access to both bank-level variables as well as information on banks' lending activities and risk exposures on a bank-country dimension. *Bank-country* refers always to the *bilateral* perspective of a bank lending to different destination countries. Hence, we know the real estate backed lending volumes not only at the bank level but also the volumes attributed to each borrowing country of a bank. For example, we observe for bank A having its headquarters in country $Home$ how much it is lending to customers residing in borrowing country $Destination$. Given the consolidated reporting standards, we cannot distinguish be-

[7]For more details on the significance criteria, please see here: https://www.bankingsupervision.europa.eu/banking/list/criteria/html/index.en.html

tween which group member is providing real estate backed loans to a certain country. Hence, the consolidated lending volumes by the headquarters can go back to both cross-border lending and local lending by its foreign affiliates (branches & subsidiaries) in the respective destination country. Variable descriptions for bank-level and bank-country data are provided in Table 1.

In contrast to the database AnaCredit[8] containing information on individual bank loans, the regulatory reporting (FINREP, COREP) covers not only commercial loans but also loans to households, yet on a more aggregated level. Hence, our dataset has the advantage that next to CRE backed loans, we can consider RRE backed lending, which would not be possible based on AnaCredit. The latter is especially useful to evaluate the effectiveness of macroprudential instruments, such as loan-to-value ratios, targeting mortgage access of households. Furthermore, we can span a much longer sample period compared to the time period spanned by AnaCredit.

Since we are interested in banks' foreign lending activities backed by real estate, we focus on the geographical breakdown of assets and liabilities by foreign country. This kind of data has to be provided if a bank hits the threshold of 10% of non-domestic exposure to total credit risk original exposure. Of 145 banks, 122 hit the reporting threshold and 127 report a geographical breakdown (five banks report it without obligation). In principle, the geographical breakdown spans all countries around the globe, whereas we focus on the breakdown towards euro area countries, which sums up to one half of total foreign exposures. Focusing on banks' real estate backed lending activities within the *euro area* has two advantages. First, lending takes place in the same currency, which eliminates currency risks, as well as the countries face the same monetary policy, which reduces concerns about differences in monetary policy driving our results. Second, we can draw on country-level lending rates provided by the ECB to construct lending spreads between the bank's country of residence and the destination country. Furthermore, we focus on the *intensive margin* of foreign real estate backed lending and keep an observation if bank i has non-zero loans in destination country c (Buch and Goldberg, 2017).

We provide different sets of descriptive statistics both at the bank and the bank-country level and in line with our estimation samples.[9] First, we consider bank-level aggregates and

[8] https://www.ecb.europa.eu/stats/money_credit_banking/anacredit/html/index.en.html

[9] As we include the control variables with a lag, the estimation sample starts in 2015Q2 and is based on lagged bank control variables from 2015Q1 to 2022Q2. At the bank level, we have 1,983 (2,345) observations for CRE (RRE) backed lending for the quarters from 2015Q2 to 2022Q3. For the bank-country level estimations, we have 9,881 (25,294) observations for CRE (RRE) backed lending. Across all estimation samples, the number of observations is quite balanced over the quarters with a slight tendency of a lower share of observations in

provide statistics on lending (Table 2) and riskiness (Table 3) of banks being active in CRE and RRE backed lending. In general, it can be seen that banks are rather large, which is not surprising as this criteria defines the SSM banks. The sample of banks involved in RRE backed lending is larger whereas banks do not differ substantially compared to the sample of banks reporting CRE backed lending (see Table 2). Second, we zoom into the bank-country level data and provide statistics for the banks reporting foreign real estate backed loans whereas loans are either backed by CRE or RRE (Table 4).

We complement our dataset by country-level information from various sources. From the ECB as well as Eurostat, we obtain information on macroeconomic and financial market variables such as interest rates. While the euro area shares a common monetary policy, interest rate differentials are still present across euro area countries. To account for differences in, e.g., fixed and variable interest rate usage, we consider composite cost of borrowing indicators by country.[10] Figures 2 and 3 show a downward trend as well as different levels in borrowing costs for non-financial corporations as well as mortgage rates across euro area countries until 2022. In line with rising policy rates, both NFC's and households' borrowing costs show a stark pickup after 2022Q1 marking the end of the low interest rate environment in the euro area. Information on national macroprudential policy instruments specific to residential and commercial real estate are taken from the European System Risk Board (ESRB).[11] Data on property price indices are provided by the OECD. A detailed variable description for the country-level data can be found at the bottom of Table 1.

2.2.2 Stylized facts

We derive stylized facts regarding the role of real estate backed lending in banks' portfolio based on the full sample of banks supervised by the SSM that report the geographical breakdown of assets.[12] We consider the relevance of real estate backed loans in banks' portfolio as well as the breakdown of real estate backed loans by home and foreign country (country of bank

2015.

[10] https://data.ecb.europa.eu/blog/blog-posts/comparing-bank-interest-rates-across-countries

[11] Further details one the ESRB's national macroprudential institutional framework can be found here: https://www.esrb.europa.eu/national_policy/html/index.en.html

[12] As outlined in the previous section, out of 145 banks in the dataset, 127 banks report the geographical breakdown.

headquarters versus foreign countries) and by sector (CRE versus RRE). It turns out that, first, banks' loans backed by real estate arise to, on average, 31% of the total loan portfolio mirroring the importance of this loan type. Panel A of Figure 4 visualizes that this share remains relatively stable over the sample period ranging between 30 and 40%. Second, it reveals that RRE backed loans have a larger share in the real estate backed loan portfolio, with CRE backed loans only having a share of around one third. Third, the average real estate backed loan portfolio is composed by two thirds of domestic and by one third of foreign loans. The share of domestic versus foreign real estate backed loans in total loans is relatively stable over time (Figure 4, Panel B). Hence, the "home bias" is present to some degree, as well as persistent, but probably weakened by the fact that we consider only larger and systemically important banks. These banks are highly active in the euro area, which is reflected by the fact that around half of their foreign real estate backed loans can be attributed to euro area countries (Figure 4, Panels C & D). A finding which not only provides a new angle on the landscape of financial links across euro area countries but also supports a careful monitoring of such activities on the supranational level, e.g. to assess potential spill overs of risks via these cross-border links.

As a first and simple test for our proposed mechanism, we evaluate whether banks in our sample adapt the share of *foreign* real estate backed loans in *total* real estate backed loans depending on the weighted lending spread of all destination countries to which a bank is borrowing. The NFC lending spread between destination country c and the home country of the respective bank is weighted with the bank's NFC deposit share in destination country c when analyzing the foreign share of CRE backed loans. Respectively, we weigh the house purchase lending spread between country c and the home country of the bank with the bank's household deposit share in country c.[13] Already when considering a bank's aggregate foreign real estate backed lending shares in Table 5, it turns out that a higher weighted lending spread between destination countries and the home country of banks relates positively to banks' lending activity in foreign markets. The result holds for both the share of foreign CRE and RRE backed loans. In the next section, we exploit the bilateral data structure and zoom more into this result.

[13]The regression equation looks as follows: $\text{ForeignRealEstateBackedLoans}_{i,t} = \beta_1 \text{WeightedLendingSpread}_{i,t-1} + \beta_2 \text{BankControls}_{i,t-1} + \beta_3 \text{CountryControls}_{c,t-1} + \zeta_i + \zeta_t + \varepsilon_{i,t}$. The weighted lending spread for each bank i in quarter t is defined as: $\sum_{c=1}^{N} DepositShare_{ict} \times LendingSpread_{ct}$, whereas N spans all non-domestic euro area countries to which the bank is lending.

2.3 Results

We now turn to answer the question whether there is evidence for search for yield behavior depending on banks' destination country exposure and thus information advantage. Our coefficient results inform us about whether banks more invested into the foreign country are more sensitive to lending spreads and re-allocate a larger share of their real estate backed loans away from the home country and towards the destination country.

Results are reported in Table 6 for CRE backed lending and in Table 7 for RRE backed lending. Column 1 of Table 6 reveals that banks are more sensitive to the lending spread and show a higher CRE backed lending share in case they have an ex-ante higher exposure towards the non-financial sector in the borrowing country. Our result is in line with the study by Cao et al. (2024) who show based on Norwegian data that firms are more likely to switch to outside lenders in the presence of previously established deposit relationships. When zooming further in to investigate whether local exposure translates into expertise and thus affects lending sensitivity, we find that previous exposure to the construction sector raises the significance of the interaction term with the lending spread (column 3). Yet we do not find evidence that exposure to the real estate sector plays a relevant role for banks' reaction to the lending spread (column 2). The results suggest that it is especially direct exposure to the construction sector that yields more expertise on the development of housing markets and makes banks more responsive to higher lending spreads. We also assess whether negative experiences with the respective loan type, proxied by the share of CRE backed NPLs, affect banks' sensitivity to the lending spread. Results in column 4 do not deliver a significant result tough, most likely because housing markets did on average quite well during our sample period.

With regard to RRE backed lending, we find weak evidence that banks are more sensitive to the lending spread in case they have higher exposure to the destination country proxied by the retail deposit share (Table 7, column 1). In contrast, the lending response to the lending spread is neither significantly driven by foreign exposure to the construction or real estate sector nor by NPL ratios in RRE markets (columns 2-4). While bank fixed effects seem to absorb much of the variation across banks, it turns out that larger banks have a higher share of RRE backed loans in foreign markets.

The interaction of the lending spread with country-exposure measures constitutes a proxy

for information or specialization advantages and can be considered as *"pull" factors* driving banks' internationalization decisions. We also considered bank-specific *"push" factors* such as banks' degree of capitalization, size or profitability. The majority of these bank traits turned out to not drive banks' sensitivity to lending spreads. However and in line with previous results as well as studies on the effects of the low interest rate environment on bank lending and risk-taking (Bottero et al., 2022; Heider et al., 2019), we found that banks with a higher non-domestic deposit share (in case of CRE backed lending) and a higher net interest margin (in case of RRE backed lending) are more sensitive to the lending spread regarding their foreign real estate backed lending activities. Especially those banks with higher deposit shares and interest margins are likely to be more negatively affected by a low interest rate environment and thus re-allocate lending to more profitable sectors (Buchholz et al., 2020; Heider et al., 2019). Yet results are only marginally significant and can be obtained upon request.

We conduct several robustness checks, for which the results can be found in the online appendix. First, we split the sample into the pre-pandemic period (until 2020Q1) and the pandemic period (2020Q2-2022Q3). Table OA1 shows that results are driven by the pre-pandemic period (e.g. comparing columns 1 & 2), which is in line with our expectations that in this stable environment of a low interest rate policy, search for yield behavior might be present and interact with borrower-country information advantages. During the pandemic, uncertainty about housing markets and global value chains increased, which might have changed the drivers of banks' foreign lending activities. Interestingly, it seems that the larger banks have retrenched from foreign real estate backed markets during this sub-period. Second, we conduct a "horse race" test to evaluate whether our results are driven by differences in house prices between a bank's home and destination country. For that purpose, we include another interaction term between the country-specific exposure variable and the house price spread. However, the coefficient of the additional interaction variable is insignificant and our baseline result remains robust (Table OA2, columns 2, 4 & 6). Third, we do not use the first lag of the country-specific exposure variable but its average of the last four quarters, which further reduces simultaneity issues. Again, results remain robust as shown in columns 2, 4 & 6 of Table OA3.

3 On the role of macroprudential policies at home and abroad

The global financial crisis has revealed that not only microprudential policies are needed to reduce the failure probability of individual banks but that also macroprudential instruments are relevant to stabilize the financial system. Various measures have since then been implemented, whereas the choice and intensity can differ across euro area countries. The literature shows that policies targeting housing markets can be effective in reducing banks' exposure to risky borrowers but also induce a re-allocation of bank loans. Also, from studies on banks' cross-border lending activities, it is well-known that banks try to circumvent tighter regulation in their home country by investing abroad (Danisewicz et al., 2017; Houston et al., 2012). It is thus plausible to assume that differences in the existence of macroprudential instruments related to real estate backed lending across euro area countries can shape banks' decisions on where to expand or retract related lending activities.

Consequently, we augment our analysis by testing whether national macroprudential instruments matter for banks' foreign lending shares collateralized by real estate. Based on the extensive dataset on macroprudential policy measures provided by the ESRB[14], we gather information on which country has implemented which type of macroprudential instrument. We focus on (residential or commercial) real estate specific measures such as risk weights based on different legal foundations[15] and borrower based measures such as debt service-to-income ratios (DStI), debt-to-income ratios (DtI), regulations on loan maturity, loan to income ratios (LtI), loan-to value ratios (LtV) and stress testing or sensitivity tests related to real estate markets (ST). Table 8 shows the different types of macroprudential instruments targeting residential real estate or commercial real estate by country and applied at some point during our sample period.[16]

Knowing which countries have implemented macroprudential tools, we conduct sample

[14]For more, see here: https://www.esrb.europa.eu/national_policy/html/index.en.html

[15]Art. 124 of the Capital Requirements Regulation states that "An exposure or any part of an exposure fully secured by mortgage on immovable property shall be assigned a risk weight of 100 % (...)." (Link). Art. 458 is used when macroprudential or systemic risk is identified and Art. 124 is no longer sufficient in targeting the situation (Link).

[16]For more details on the transmission mechanism of the different instruments, please see https://www.esrb.europa.eu/pub/pdf/other/esrb.handbook_mp180115.en.pdf.

splits. We first define subsamples based on the existence of at least one or more of these policies in a country but without differentiating by instrument type. Second, we consider each instrument separately and define subsamples based on the existence of one specific policy (see Table 8). We thereby focus on the policies most often observed across the sample countries. Tables 9 and 10 show the results of these subsample analyses. In column 1, we report the baseline result for the full sample. Then we consider country combinations in which some type of macroprudential regulation as listed in Table 8 is in place in the bank's home country *and* the borrowing country (column 2). Columns 3 and 4 report results for the cases in which in either home or foreign country a macroprudential policy is applied. Column 5 contains the subset of bank-country combinations in which neither the home country of the bank nor the foreign borrowing country has implemented a policy.

If regulatory arbitrage considerations are present, we would expect that differences in macroprudential regulation drive banks' lending decisions (columns 3 & 4). For example, if in the home country a LTV ratio applies to residential loans provided to the domestic market, domestic banks might find it more attractive to grant loans to creditors in foreign markets without such a policy. If the implementation of macroprudential tools is effective, we would expect to see at least nuanced differences in results for the subsample with harmonized regulatory stance (i.e. both countries have some type of policy) versus the case that home and foreign country do not have implemented any policy at all (column 2 versus column 5).

It turns out that the baseline result for CRE backed lending is driven by the subsamples in columns 3 and 5 (Tables 9). The first finding implies that search for yield behavior is most present when the home country has some macroprudential tool in place whereas the country to which the bank is lending has none. Similarly, Lepers (2023) finds based on aggregate data on cross-border CRE investment that tighter macroprudential regulation in the home country increases cross-border CRE flows. The second result indicates that a complete lack of macroprudential regulation targeting housing markets favours search for yield behavior and related lending activities abroad. Also when only constructing the subsamples based on the (non-)existence of one instrument, we can see in the second panel (loan-to-value ratio) and third panel (Art. 124 Risk weights for CRE loans) that our main result is driven by the bank-country pairs in which no such policy is active.

When moving to foreign RRE backed lending in Table 10, results confirm that foreign lending activities driven by search for yield behavior are present for countries with regulatory differences (column 3). Especially a laxer regulation abroad as regards loan-to-value ratios or rules on loan maturity, increases banks' lending response to the lending spread and conditional on their exposure variable.[17]

In sum, regulatory differences across banks' home and their borrowing countries seem to matter for search for yield behavior. For CRE backed lending, banks show a larger lending sensitivity to interest rate spreads in case of a non-existence of policies or implementation differences across countries. For RRE backed lending, it is mostly a tighter stance at home compared to abroad that generates a positive and significant lending response to the interest rate spread. Hence, internationally active banks in the euro area seem to monitor differences in regulatory tightness and depending on their country-specific exposure invest a higher share in real estate backed lending in the presence of return opportunities. On the one hand, in case banks make use of regulatory differences and invest across euro area countries, this can benefit diversification aspects, reduce the home bias, and contribute to financial integration in the euro area. On the other hand, this result can speak in favor of the harmonization of macroprudential policies across euro area countries to avoid regulatory arbitrage. In this context, the ESRB proposed in a concept note to consistently apply policy tools across countries, which suggests that related risks stemming from differences in macroprudential regulation are on the ESRB's radar.[18]

4 Banks' foreign homes and stability implications

Finally, we investigate the role of foreign lending activities backed by real estate for bank stability. The following analysis starts at the granular bank-country level to assess whether banks adjust risk provisions or report real estate backed non-performing loans (NPLs) for

[17] In unreported tests, we do not find significant results for different subsamples regarding Art. 458 Risk weights for RRE loans and debt-service-to-income ratios. There is some evidence that a lack of debt-to-income ratios in both countries stimulates foreign lending as a response to higher lending spreads. Similarly, there is weak evidence that the presence of stress testing at home but not abroad, increases banks' lending sensitivity with regard to the lending spread. A negative response is found when Art. 124 Risk weights on RRE loans are present abroad but not at home.

[18] https://www.esrb.europa.eu/pub/pdf/reports/esrb.reviewmacroprufframework.220331~65e86a81aa.en.pdf

destination country c depending on the lending spread and a bank's real estate backed loan exposure to the respective country. We then move back to the bank level to investigate aggregate implications for bank risk.

When banks search for yield by investing abroad and consequently loan default risk increases, the following mechanisms can be at play: A higher lending spread can be associated with higher risk as foreign investment being more risky than domestic investment is rewarded by a higher interest rate. Interacted with a larger loan exposure to the respective borrowing country, banks might face a higher probability that real estate backed loans will be non-performing. To analyze whether we observe such dynamics, we replicate our regression model (Equation 1) but exchange the dependent variable and the exposure measure:

$$\begin{aligned} &\text{ForeignRealEstateBackedLoanRisk}_{i,c,t} \\ &\quad = \beta_1 \text{LendingSpread}_{c,t-1} \times \text{ForeignExposure}_{i,c,t-1} \\ &\quad + \beta_2 \text{ForeignExposure}_{i,c,t-1} + \beta_3 \text{BankControls}_{i,t-1} + \zeta_i + \zeta_{ct} + \varepsilon_{i,c,t}, \end{aligned} \tag{2}$$

where the dependent variable ($ForeignRealEstateBackedLoanRisk_{i,c,t}$) is either bank i's forbearance ratio, the ratio of accumulated impairment for loans backed by real estate, or the NPL ratio. We measure the respective variable as the share in the gross carrying amount of real estate backed loans of bank i in destination country c.

The forbearance ratio refers to bank loans under forbearance measures such as refinancing, restructuring or modified terms and conditions. Precondition for applying forbearance measures is (foreseeable) doubt relating to the repayment ability of the debtor. Hence, the ratio can be considered a more early warning indicator of credit risk. Accumulated impairments refer to the reduction in the carrying amount of a loan portfolio with credit risk already materialized (at least to some extent). Since both ratios consider performing and non-performing loans, they provide information on the overall loan portfolio rather than the NPL ratio. All three ratios give indication about the quality of banks' loan portfolio in terms of credit risk. Again we have this information at the bank-country level and by sector (CRE versus RRE). We depict the average ratios for CRE and RRE backed loans in Figures 5 and 6. While NPL ratios show a downward trend for both CRE and RRE backed loans over the sample period, more recently

an increase in the forbearance ratio with respect to CRE backed loans can be observed.[19] [20]

Sub-samples by bank capitalization: We first evaluate the role of bank capitalization in the context of our research question. Banks with higher capital ratios can not only absorb losses to a better extent but might also be less hesitant to declare forborne or impaired loans. For example, a recent study shows that despite changes in accounting standards under IRFS 9, which should induce banks to increase provisioning early on, banks continue to increase provisioning close to default events (Behn and Couaillier, 2023a,b). Banks with lower capitalization tend to provision even less around defaults compared to well-capitalized banks. We directly split the sample into the pre-pandemic and pandemic period as different dynamics in terms of loss provisioning might be prevalent. For example, in response to the Covid pandemic, the ECB announced relief measures regarding asset quality deterioration and NPLs. For the pre-pandemic period and in line with Behn and Couaillier (2023b), we find that it is the better capitalized banks, i.e. those with a CET1 ratio larger than the median, which report a higher forbearance ratio in response to a higher lending spread and conditional on the country exposure (Table 11, column 6). Given that CRE backed loans can be considered more risky than RRE backed loans, a higher provisioning activity seems plausible. We do find no evidence for a relevant provisioning behavior for RRE backed loans (Table 12, columns 1-6). One reason could be that rising housing prices and low rates are likely to coincide with low provisioning needs for RRE backed loans. For the pandemic period, Table 12 provides in column 8 first hints that low capitalized banks faced increased loan defaults (NPL) in case they had higher exposures to countries with larger lending spreads.

Aggregation of bank-country level risks to the bank level: To gain a more aggregate perspective about risks at the bank level, we take the sum of the destination country specific risk measures across euro area counterparties and by bank. This yields a bank-level risk measure related to a bank's foreign real estate backed lending in the euro area. We then assess the role of the lagged and weighted lending spread interacted with a bank's exposure to euro area real estate backed loans. The exposure variable is defined as the share of euro area (non-domestic)

[19] While the decrease in NPLs is not central to our analysis, it is most likely connected to the heightened supervisory awareness of NPLs in the euro area. In 2017, the ECB published a related guidance increasing the pressure to reduce (legacy) stocks of NPLs.

[20] For descriptive statistics, please see Table 3. Due to introducing the loan exposure variable with a lag, the sample size is slightly reduced.

real estate backed lending in a bank's total real estate backed lending. The regression equation to evaluate the drivers of banks' riskiness stemming from foreign real estate backed loans is specified as follows:

$$\begin{aligned}&\text{ForeignRealEstateBackedLoanRisk}_{i,t}\\&\quad=\beta_1\text{WeightedLendingSpread}_{i,t-1}\times\text{ForeignRealEstateExposure}_{i,t-1}\\&\quad+\beta_2\text{WeightedLendingSpread}_{i,t-1}+\beta_3\text{ForeignRealEstateExposure}_{i,t-1}\\&\quad+\beta_4\text{BankControls}_{i,t-1}+\zeta_i+\zeta_t+\zeta_{jt}+\varepsilon_{i,t},\end{aligned}\tag{3}$$

where the dependent variable ($ForeignRealEstateBackedLoanRisk_{i,t}$) is bank i's forbearance ratio, the ratio of accumulated impairment for loans backed by real estate, or the related non-performing loans (NPL) ratio summed up over the euro area countries other than the bank's country of residence. The $WeightedLendingSpread_{i,t-1}$ is computed by weighing the lending spreads of all countries to which bank i is linked to with the respective real estate backed lending share ($ForeignRealEstateExposure_{i,t-1}$). The exposure variable is the sum of foreign real estate backed loan volumes by bank i across all euro area countries relative to total real estate backed lending of bank i in period t. We control for bank variables as described in Section 2.1 as well as bank fixed effects ζ_i, quarter fixed effects ζ_t and country-quarter fixed effects ζ_{jt} which capture all time-varying dynamics in the home country of the bank. Standard errors are clustered at the bank level. Descriptive statistics of these variables are provided in Table 3.

We split the sample again into the pre-pandemic and pandemic period. For the pre-pandemic period, there is evidence that low capitalized banks provision less in terms of the impairment ratio and the forbearance ratio as a result of being exposed more to foreign countries with a larger lending spread (Table 13, column 5 and Table 14, column 2). This can be observed for both CRE and RRE backed loans. With the start of the pandemic, regulators have been more lenient on provisioning, which might explain the non-significant results in the second sub-period (lower panels of Tables 13 & 14).

During the pandemic period and for CRE backed lending, low capitalized banks see an increase in their NPL ratio related to non-domestic loans in response to a previously higher lending spread and foreign lending activity (lower panel of Table 13, column 8). This result

provides some evidence that risks seem to be related to the amount of foreign real estate backed lending and possible search for yield behavior. Given that during the pandemic, especially non-financial firms have felt negative repercussions, the result suggests that banks faced negative spillovers as regards their CRE backed loans. For the household sector, related dynamics in NPLs are not observable and might only build up in case of a prolonged face of higher interest rates and house price reversals. In sum, the results do not (yet) reveal severe risks to financial stability. From a risk management perspective, there is consistent evidence that banks provision differently depending on capitalization, whereas better capitalized banks might be better prepared for future losses of their real estate backed lending portfolio.

5 Conclusions

Previous research has shown that yield differentials drive cross-border lending as well as that real estate lending bears financial stability risk. This study contributes to the literature by combining these two strands and by investigating whether there is evidence for a "search for yield" behavior of banks when deciding on their foreign real estate backed lending activities. Our sample spans the large and significantly important banks in the euro area and the period from 2015 to 2022. In this period of low interest rates and ample liquidity, a relative stable macroeconomic environment (until the Covid pandemic) and a steady demand for real estate related loans, we ask whether banks increased their foreign loan exposures backed by real estate in case higher interest rates compared to their country of residence could be realized and conditional on borrower-country information advantages.

Our results reveal that search for yield behavior was present and higher lending spreads relate positively to real estate backed lending, especially for banks with more expertise on the foreign market due to a higher local activity. The result holds for commercial and residential real estate backed loans and when controlling for differences in house prices between the borrowing and the home country of the bank.

We further assess the role of macroprudential regulation, which is a relevant policy tool in real estate markets. A key result that emerges is that search for yield behavior and a resulting increase in foreign real estate backed lending is found when macroprudential regulation is missing or misaligned between a bank's country of residence and the destination country. Hence,

on the bright side, differences in macroprudential regulation could be a driver for financial integration and induce foreign real estate backed lending activities and thus lower the home bias. Yet, it has to be ensured that differences in regulation do not result in excessive risk-taking, especially when considering that in contrast to supervision of the largest banks in the euro area, macroprudential regulation is still foremost a national task. Only recently, the ESRB issued warnings and recommendations on vulnerabilities in the CRE and RRE sectors and proposed harmonized regulatory standards.

When turning to the question of whether foreign lending activities driven by search for yield behavior result in more risk, we find that especially better capitalized banks show higher forbearance ratios as they might face less stigma effects compared to low capitalized banks.

In sum, we find that the low rate environment shaped real estate backed lending across euro area countries by the euro area's largest and significantly important banks. Especially, the re-allocation to foreign CRE collateralized loans might bear risks in case of increasing interest rates and declining property prices – like first evidence by Jiang et al. (2023) reveals for US banks. Hence, further analyses on the implications for bank stability in Europe are needed.

References

Acharya, V.V., Bergant, K., Crosignani, M., Eisert, T., Mccann, F., 2022. The anatomy of the transmission of macroprudential policies. The Journal of Finance 77, 2533–2575.

Anundsen, A.K., Jansen, E.S., 2013. Self-reinforcing effects between housing prices and credit. Journal of Housing Economics 22, 192–212.

Auer, R., Matyunina, A., Ongena, S., 2022. The countercyclical capital buffer and the composition of bank lending. Journal of Financial Intermediation 52, 100965.

Badarinza, C., Ramadorai, T., 2018. Home away from home? Foreign demand and London house prices. Journal of Financial Economics 130, 532–555.

Basten, C., Koch, C., 2015. The causal effect of house prices on mortgage demand and mortgage supply: Evidence from Switzerland. Journal of Housing Economics 30, 1–22.

Battistini, N., Falagiarda, M., Gareis, J., Hackmann, A., Roma, M., 2021. The euro area housing market during the COVID-19 pandemic. Economic Bulletin Articles 7.

Battistini, N., Gareis, J., Roma, M., 2022. The impact of rising mortgage rates on the euro area housing market. ECB Economic Bulletin Issue 6/2022.

Beck, T., Silva-Buston, C., Wagner, W., 2023. The economics of supranational bank supervision. Journal of Financial and Quantitative Analysis 58, 324–351.

Behn, M., Couaillier, C., 2023a. IFRS 9, accounting discretion and provisioning behaviour around credit events. Financial Stability Review May 2023. European Central Bank.

Behn, M., Couaillier, C., 2023b. Same same but different: credit risk provisioning under IFRS 9. Working Paper Series No 2841. European Central Bank.

Böhm, H., Schaumburg, J., Tonzer, L., 2022. Financial linkages and sectoral business cycle synchronization: Evidence from Europe. IMF Economic Review 70, 698–734.

Bottero, M., Minoiu, C., Peydró, J.L., Polo, A., Presbitero, A.F., Sette, E., 2022. Expansionary yet different: Credit supply and real effects of negative interest rate policy. Journal of Financial Economics 146, 754–778.

Brei, M., Borio, C., Gambacorta, L., 2020. Bank intermediation activity in a low-interest-rate environment. Economic Notes 49, e12164.

Bremus, F., Fratzscher, M., 2015. Drivers of structural change in cross-border banking since the global financial crisis. Journal of International Money and Finance 52, 32–59.

Bremus, F., Neugebauer, K., 2018. Reduced cross-border lending and financing costs of SMEs. Journal of International Money and Finance 80, 35–58.

Buch, C.M., 2003. Information or Regulation: What Drives the International Activities of Commercial Banks? Journal of Money, Credit and Banking 35, 851–869.

Buch, C.M., Driscoll, J.C., Ostergaard, C., 2010. Cross-border diversification in bank asset portfolios. International Finance 13, 79–108.

Buch, C.M., Goldberg, L.S., 2015. International banking and liquidity risk transmission: Lessons from across countries. IMF Economic Review 63, 377–410.

Buch, C.M., Goldberg, L.S., 2017. Cross-Border Prudential Policy Spillovers: How Much? How Important? Evidence from the International Banking Research Network. International Journal of Central Banking 13, 505–558.

Buchholz, M., Schmidt, K., Tonzer, L., 2020. Do conventional monetary policy instruments matter in unconventional times? Journal of Banking & Finance 118, 105858.

Candelon, B., Fuerst, F., Hasse, J.B., 2021. Diversification potential in real estate portfolios. International Economics 166, 126–139.

Cao, J., Garcia-Appendini, E., Huylebroek, C., 2024. Banking on Deposit Relationships: Implications for Hold-Up Problems in the Loan Market. Working Paper 04/2024. Norges Bank.

Cerutti, E., Claessens, S., 2016. The Great Cross-Border Bank Deleveraging: Supply Constraints and Intra-Group Frictions. Review of Finance 21, 201–236.

Cerutti, E., Hale, G., Minoiu, C., 2015. Financial crises and the composition of cross-border lending. Journal of International Money and Finance 52, 60–81.

Claessens, S., Coleman, N., Donnelly, M., 2018. "Low-For-Long" interest rates and banks' interest margins and profitability: Cross-country evidence. Journal of Financial Intermediation 35, 1–16.

Claessens, S., Van Horen, N., 2015. The impact of the global financial crisis on banking globalization. IMF Economic Review 63, 868–918.

Cuñat, V., Cvijanović, D., Yuan, K., 2018. Within-Bank Spillovers of Real Estate Shocks. The Review of Corporate Finance Studies 7, 157–193.

Danisewicz, P., Reinhardt, D., Sowerbutts, R., 2017. On a tight leash: Does bank organizational structure matter for macroprudential spillovers? Journal of International Economics 109, 174–194.

De Haas, R., Van Horen, N., 2013. Running for the exit? International bank lending during a financial crisis. The Review of Financial Studies 26, 244–285.

Doerr, S., Schaz, P., 2021. Geographic diversification and bank lending during crises. Journal of Financial Economics 140, 768–788.

EBA, 2022. Thematic note on residential real estate exposures of EU banks - risks and mitigants. European Banking Authority, Technical Note EBA/REP/2022/24.

Favara, G., Imbs, J., 2015. Credit supply and the price of housing. The American Economic Review 105, 958–992.

García-Herrero, A., Vázquez, F., 2013. International diversification gains and home bias in banking. Journal of Banking & Finance 37, 2560–2571.

Hale, G., Kapan, T., Minoiu, C., 2020. Shock Transmission Through Cross-Border Bank Lending: Credit and Real Effects. The Review of Financial Studies 33, 4839–4882.

Heider, F., Saidi, F., Schepens, G., 2019. Life below Zero: Bank Lending under Negative Policy Rates. The Review of Financial Studies 32, 3728–3761.

Hott, C., 2011. Lending behavior and real estate prices. Journal of Banking & Finance 35, 2429–2442.

Houston, J.F., Lin, C., Ma, Y., 2012. Regulatory arbitrage and international bank flows. The Journal of Finance 67, 1845–1895.

Jiang, E.X., Matvos, G., Piskorski, T., Seru, A., 2023. Monetary Tightening, Commercial Real Estate Distress, and US Bank Fragility. NBER Working Paper WP31970.

Jordà, O., Schularick, M., Taylor, A.M., 2015. Leveraged bubbles. Journal of Monetary Economics 76, 1–20.

Koetter, M., Poghosyan, T., 2010. Real estate prices and bank stability. Journal of Banking & Finance 34, 1129–1138.

Lepers, E., 2023. Cross-border real estate investment: a different animal? Comparative evidence from bilateral flow data. Review of World Economics URL: https://doi.org/10.1007/s10290-023-00505-5.

Lieser, K., Groh, A.P., 2014. The determinants of international commercial real estate investment. The Journal of Real Estate Finance and Economics 48, 611–659.

Mauck, N., Price, S.M., 2017. Determinants of foreign versus domestic real estate investment: Property level evidence from listed real estate investment firms. The Journal of Real Estate Finance and Economics 54, 17–57.

Ongena, S., Peydró, J.L., Van Horen, N., 2015. Shocks abroad, pain at home? Bank-firm-level evidence on the international transmission of financial shocks. IMF Economic Review 63, 698–750.

Pan, H., Wang, C., 2013. House prices, bank instability, and economic growth: Evidence from the threshold model. Journal of Banking & Finance 37, 1720–1732.

Roma, M., 2021. Euro area house price developments during the coronavirus pandemic. ECB Economic Bulletin Issue 4/2021. European Central Bank.

Temesvary, J., 2018. The role of regulatory arbitrage in U.S. banks' international flows: Bank-level evidence. Economic Inquiry 56, 2077–2098.

Tonzer, L., 2015. Cross-border interbank networks, banking risk and contagion. Journal of Financial Stability 18, 19–32.

Zurek, M., 2022. Real estate markets and lending: Does local growth fuel risk? Journal of Financial Services Research 62, 27–59.

Tables and Figures

Table 1: Variable definitions: Bank-country-level variables

Variable	**Description**
Bank-country-level	
Share of foreign commercial real estate (CRE) backed loans	Loans and advances (L&A) of bank i to non-financial corporations (NFCs) backed by CRE in country c to total NFC L&A backed by CRE of bank i
Share of foreign residential real estate (RRE) backed loans	L&As of bank i to households (HHs) backed by RRE in country c to total HH L&A backed by RRE of bank i
NFC deposit share	NFC deposits of bank i in country c to total NFC deposits of bank i
HH deposit share	HH deposits of bank i in country c to total HH deposits of bank i
Share of NFC loans to the real estate sector	NFC loans of bank i in country c to the NACE-sector real estate activities to total NFC L&A to the NACE-sector real estate activities of bank i
Share of NFC loans to the construction sector	NFC loans of bank i in country c to the NACE-sector construction to total NFC L&A to the NACE-sector construction of bank i
CRE backed NPL ratio	Non-performing NFC L&A backed by CRE of bank i in country c to the gross carrying amount (GCA) of NFC L&A backed by CRE of bank i in country c
RRE backed NPL ratio	Non-performing HH L&A backed by RRE of bank i in country c to the gross carrying amount (GCA) of HH L&A backed by RRE of bank i in country c
Acc. impairment ratio for CRE backed loans	Accumulated impairments for NFC L&A backed by CRE of bank i in country c to the GCA of NFC L&A backed by CRE of bank i in country c
Acc. impairment ratio for RRE backed loans	Accumulated impairments for HH L&A backed by RRE of bank i in country c to the GCA of HH L&A backed by RRE of bank i in country c
Forbearance ratio for CRE backed loans	Forborne NFC L&A backed by CRE of bank i in country c to the GCA of NFC L&A backed by CRE of bank i in country c
Forbearance ratio for RRE backed loans	Forborne HH L&A backed by RRE of bank i in country c to the GCA of HH L&A backed by RRE of bank i in country c

Variable definition cont'd: Bank-level variables

Variable	**Description**
Bank-level	
Share of foreign euro area CRE backed loans	Non-domestic euro area NFC L&A backed by CRE of bank i to total NFC L&A backed by CRE
Share of foreign euro area RRE backed loans	Non-domestic euro area HH L&A backed by RRE of bank i to total HH L&A backed by RRE
NFC deposit weighted NFC lending spread	Σ_c of NFC deposit share of bank i in country c (as described above) $\times$ NFC lending spread of country c (as described below), for all euro area countries
HH deposit weighted house purchase lending spread	Σ_c of HH deposit share of bank i in country c (as described above) $\times$ house purchase lending spread of country c (as described below), for all euro area countries
CRE euro area exposure weighted NFC lending spread	Σ_c of c CRE backed loans of bank i in country c (as described above) $\times$ NFC lending spread of country c (as described below), for all euro area countries
RRE euro area exposure weighted house purchase lending spread	Σ_c of RRE backed loans of bank i in country c (as described above) $\times$ house purchase lending spread of country c (as described below), for all euro area countries
Acc. impairment ratio for CRE backed loans	Accumulated impairments for euro area NFC L&A backed by CRE of bank i to the GCA of euro area NFC L&A backed by CRE of bank i
Acc. impairment ratio for RRE backed loans	Accumulated impairments for euro area HH L&A backed by RRE of bank i to the GCA of euro area HH L&A backed by RRE of bank i
Forbearance ratio for CRE backed loans	Forborne euro area NFC L&A backed by CRE of bank i to the GCA of euro area NFC L&A backed by CRE of bank i
Forbearance ratio for RRE backed loans	Forborne euro area HH L&A backed by RRE of bank i to the GCA of euro area HH L&A backed by RRE of bank i
CRE backed NPL ratio	Non-performing euro area NFC L&A backed by CRE of bank i to the gross carrying amount (GCA) of euro area NFC L&A backed by CRE of bank i
RRE backed NPL ratio	Non-performing euro area HH L&A backed by RRE of bank i to the gross carrying amount (GCA) of euro area HH L&A backed by RRE of bank i
ln assets	Natural logarithm of total assets
Return on assets	Profit and loss to total assets
Liquid assets to total assets	Cash, cash balances at central banks and other demand deposits to total assets
CET1 ratio	Common Equity Tier 1 capital to risk weighted assets

Variable definitions cont'd: Country-level controls

Variable	**Description**	**Source**
Country level		
NFC lending spread	Difference of foreign country lending rate and domestic lending rate. Lending rate of country c is the three month average of the monthly cost of borrowing to NFCs for new business.	ECB
House purchase lending spread	Difference of foreign country lending rate and domestic lending rate. Lending rate of country c is the three month average of the monthly cost of borrowing to households for house purchase.	ECB
GDP growth	Quarterly growth of GDP at market prices	Eurostat
Unemployment rate	Average unemployment rate, Labour Force Survey Indicators - IESS definition	ECB
HICP	Annual rate of change, neither seasonally nor working day adjusted, indices of consumer prices	Eurostat
Spread of RRE prices	Difference of the foreign country nominal house price index and the domestic nominal house price index.	OECD
Macroprudential instrument dummies	The dummies are based on the "national measures of macroprudential interest in the EU/EEA" of the European Systemic Risk Board (https://www.esrb.europa.eu/national_policy/html/index.en.html, as of 10th of February 2023), considering the description of measure, type of measure, country and time period information.	ESRB

Table 2: Descriptive statistics: Bank-level variables – Lending analysis

CRE sample (bank level)	**Observations**	**Mean**	**Std. dev.**
Share of foreign euro area CRE backed loans	1,983	0.169	0.200
NFC deposit weighted NFC lending spread (in pp)	1,983	0.036	0.613
ln assets	1,983	25.268	1.660
Return on assets	1,983	0.002	0.006
Liquid assets to total assets	1,983	0.124	0.088
CET1 ratio	1,983	0.165	0.056
GDP growth (in %)	1,983	0.598	3.450
Unemployment rate (in %)	1,983	7.766	4.486
HICP (in %)	1,983	1.647	2.176
RRE sample (bank level)			
Share of foreign euro area RRE backed loans	2,345	0.101	0.205
HH deposit weighted house purchase lending spread (in pp)	2,345	-0.086	0.509
ln assets	2,345	24.976	1.723
Return on assets	2,345	0.003	0.007
Liquid assets to total assets	2,345	0.120	0.090
CET1 ratio	2,345	0.167	0.058
GDP growth (in %)	2,345	0.610	3.422
Unemployment rate (in %)	2,345	7.813	4.310
HICP (in %)	2,345	1.688	2.341

Table 3: Descriptive statistics: Bank-level variables – Risk analysis

CRE sample (bank level)	**Observations**	**Mean**	**Std. dev.**
Acc. impairment ratio for CRE backed loans	1,960	0.051	0.077
Forbearance ratio for CRE backed loans	1,960	0.100	0.119
CRE backed NPL ratio	1,960	0.117	0.157
CRE euro area exposure weighted NFC lending spread (in pp)	1,960	0.006	0.252
Share of foreign euro area CRE backed loans	1,960	0.168	0.198
ln assets	1,960	25.277	1.661
Return on assets	1,960	0.002	0.006
Liquid assets to total assets	1,960	0.124	0.088
CET1 ratio	1,960	0.165	0.056
RRE sample (bank level)			
Acc. impairment ratio for RRE backed loans	1,838	0.018	0.034
Forbearance ratio for RRE backed loans	1,838	0.049	0.090
RRE backed NPL ratio	1,838	0.059	0.105
RRE euro area exposure weighted house purchase lending spread (in pp)	1,838	0.012	0.183
Share of foreign euro area RRE backed loans	1,838	0.107	0.198
ln assets	1,838	25.324	1.677
Return on assets	1,838	0.002	0.006
Liquid assets to total assets	1,838	0.122	0.087
CET1 ratio	1,838	0.162	0.055

Table 4: Descriptive statistics: Bank-country-level estimation – CRE and RRE sample

CRE sample (bank-country level)	**Observations**	**Mean**	**Std. dev.**
Dependent variables			
Share of foreign CRE backed NFC loans	9,881	0.034	0.082
Acc. impairment ratio for CRE backed loans	9,881	0.042	0.123
Forbearance ratio for CRE backed loans	9,881	0.074	0.195
CRE backed NPL ratio	9,881	0.102	0.243
Control variables			
NFC lending spread (in pp)	9,881	0.172	0.842
NFC deposit share	9,881	0.019	0.055
Share of NFC loans to the real estate sector	9,881	0.031	0.075
Share of NFC loans to the construction sector	9,881	0.030	0.097
CRE backed NPL ratio	9,582	0.103	0.241
ln assets	9,881	25.989	1.503
Liquid assets to total assets	9,881	0.106	0.072
CET1 ratio	9,881	0.153	0.041
Return on assets	9,881	0.002	0.004
Spread of RRE prices	9,612	0.438	19.11
RRE sample (bank-country level)	**Observations**	**Mean**	**Std. dev.**
Dependent variables			
Share of foreign RRE backed loans	25,294	0.009	0.059
Acc. impairment ratio for RRE backed loans	25,294	0.016	0.063
Forbearance ratio for RRE backed loans	25,294	0.024	0.094
RRE backed NPL ratio	25,294	0.049	0.136
Control variables			
House purchase lending spread (in pp)	25,294	0.073	0.751
HH deposit share	25,294	0.007	0.037
Share of NFC loans to the real estate sector	25,294	0.011	0.048
Share of NFC loans to the construction sector	25,294	0.011	0.054
RRE backed NPL ratio	25,218	0.049	0.135
ln assets	25,294	25.393	1.748
Liquid assets to total assets	25,294	0.118	0.088
CET1 ratio	25,294	0.163	0.057
Return on assets	25,294	0.003	0.005
Spread of RRE prices	23,447	0.847	20.66

Table 5: Drivers of real estate backed foreign lending (bank level)

Dependent variables	(1)	(2)	(3)	(4)
	Share of foreign euro area CRE backed loans$_{t,i}$		Share of foreign euro area RRE backed loans$_{t,i}$	
NFC deposit weighted NFC lending spread$_{t-1,i}$	0.019**	0.019*		
	(0.007)	(0.011)		
HH deposit weighted house purchase lending spread$_{t-1,i}$			0.012	0.034**
			(0.008)	(0.015)
ln assets$_{t-1,i}$	0.046	0.047	0.088*	0.097**
	(0.056)	(0.049)	(0.050)	(0.048)
Return on assets$_{t-1,i}$	0.075	-0.529	-0.399	-0.465
	(0.510)	(0.854)	(0.486)	(0.368)
Liquid assets to total assets$_{t-1,i}$	-0.161	-0.033	-0.046	-0.113
	(0.170)	(0.189)	(0.082)	(0.158)
CET1 ratio$_{t-1,i}$	0.131	0.217	0.137	-0.056
	(0.177)	(0.222)	(0.135)	(0.172)
GDP growth$_{t-1,c}$	-0.001*		-0.001	
	(0.001)		(0.001)	
Unemployment rate$_{t-1,c}$	0.002		-0.000	
	(0.004)		(0.002)	
HICP$_{t-1,c}$	-0.001		-0.004	
	(0.003)		(0.003)	
Observations	1,983	1,983	2,345	2,345
R-squared	0.035	0.230	0.063	0.313
Number of banks	92	92	101	101
Country controls	Yes	No	Yes	No
Quarter & bank FE	Yes	Yes	Yes	Yes
Quarter-home country FE	No	Yes	No	Yes

This table shows regression results at the bank level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign commercial real estate (CRE, columns 1 & 2) or residential real estate (RRE, columns 3 & 4) backed loans in the euro area of bank i in quarter t in total CRE or RRE backed loans. The explanatory variable of interest is the lagged and weighted NFC lending spread, respectively the lagged and weighted house purchase lending spread. We further include bank and country controls as well as quarter, bank, and quarter-country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 6: Drivers of real estate backed foreign lending (bank-country level): CRE

Dependent variable	(1)	(2)	(3)	(4)
	Share of foreign CRE backed loans$_{t,i,c}$			
NFC lending spread$_{t-1,c}$ × NFC deposit share$_{t-1,i,c}$	0.310**			
	(0.120)			
NFC deposit share$_{t-1,i,c}$	0.536***			
	(0.206)			
NFC lending spread$_{t-1,c}$ × Share of NFC loans		-0.001		
to the real estate sector$_{t-1,i,c}$		(0.097)		
Share of NFC loans to the real estate sector$_{t-1,i,c}$		0.352***		
		(0.091)		
NFC lending spread$_{t-1,c}$ × Share of NFC loans			0.239***	
to the construction sector$_{t-1,i,c}$			(0.052)	
Share of NFC loans to the construction sector$_{t-1,i,c}$			0.356***	
			(0.077)	
NFC lending spread$_{t-1,c}$ × CRE backed NPL ratio$_{t-1,i,c}$				0.004
				(0.005)
CRE backed NPL ratio$_{t-1,i,c}$				-0.011
				(0.010)
ln assets$_{t-1,i}$	-0.008	-0.002	-0.004	-0.005
	(0.010)	(0.012)	(0.010)	(0.013)
Return on assets$_{t-1,i}$	0.098	-0.048	0.008	0.104
	(0.205)	(0.196)	(0.165)	(0.214)
Liquid assets to total assets$_{t-1,i}$	-0.085	-0.067	-0.039	-0.076
	(0.054)	(0.055)	(0.040)	(0.059)
CET1 ratio$_{t-1,i}$	-0.018	-0.006	-0.009	0.000
	(0.061)	(0.056)	(0.050)	(0.065)
Observations	9,881	9,881	9,881	9,582
R-squared	0.127	0.130	0.236	0.054
Number of bank-country pairs	582	582	582	558
Bank & quarter FE	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign commercial real estate (CRE) backed loans of bank i in borrowing country j and quarter t in total CRE backed loans of bank i. The explanatory variable of interest is the lagged NFC lending spread interacted with different exposure measures towards the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 7: Drivers of real estate backed foreign lending (bank-country level): RRE

Dependent variable	(1)	(2)	(3)	(4)
	Share of foreign RRE backed loans$_{t,i,c}$			
House purchase lending spread$_{t-1,c}$ × HH deposit share$_{t-1,i,c}$	0.108*			
	(0.064)			
HH deposit share$_{t-1,i,c}$	0.348**			
	(0.144)			
House purchase lending spread$_{t-1,c}$ × Share of NFC loans to the real estate sector$_{t-1,i,c}$		-0.024		
		(0.064)		
Share of NFC loans to the real estate sector$_{t-1,i,c}$		0.094*		
		(0.053)		
House purchase lending spread$_{t-1,c}$ × Share of NFC loans to the construction sector$_{t-1,i,c}$			-0.052	
			(0.056)	
Share of NFC loans to the construction sector$_{t-1,i,c}$			0.069**	
			(0.035)	
House purchase lending spread$_{t-1,c}$ × RRE backed NPL ratio$_{t-1,i,c}$				-0.001
				(0.001)
RRE backed NPL ratio$_{t-1,i,c}$				-0.001
				(0.001)
ln assets$_{t-1,i}$	0.006**	0.006*	0.006*	0.007*
	(0.003)	(0.003)	(0.004)	(0.004)
Return on assets$_{t-1,i}$	-0.002	-0.027	-0.023	-0.018
	(0.036)	(0.031)	(0.028)	(0.030)
Liquid assets to total assets$_{t-1,i}$	-0.004	-0.002	0.000	-0.001
	(0.007)	(0.006)	(0.006)	(0.006)
CET1 ratio$_{t-1,i}$	-0.000	-0.001	-0.001	-0.000
	(0.007)	(0.008)	(0.008)	(0.008)
Observations	25,294	25,294	25,294	25,218
R-squared	0.102	0.048	0.047	0.028
Number of bank-country pairs	1,278	1,278	1,278	1,277
Bank & quarter FE	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign residential real estate (RRE) backed loans of bank i in borrowing country j and quarter t in total RRE backed loans of bank i. The explanatory variable of interest is the lagged house purchase lending spread interacted with different exposure measures towards the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 8: Macroprudential policy instruments on RRE & CRE backed loans by type

	Risk weight			Debt service-to-income ratio	Debt-to-income ratio	Loan maturity	Loan-to-income ratio	Loan-to-value ratio	Stress testing/sensitivity tests
	Art. 458	Art. 124	Other						
RRE	BE EE FI NL	IE MT SI	LU	AT EE FR LT LV MT PT SI SK	LV SK	AT EE FR LT LV MT NL PT SI SK	IE	AT BE CY EE FI IE LT LU LV MT NL PT SI SK	FI IE SK
CRE		IE LV				SK		BE CY LV PT SK	FI SK

Abbreviations: Austria (AT), Belgium (BE), Cyprus (CY), Estonia (EE), Finland (FI), France (FR), Ireland (IE), Lithuania (LT), Luxembourg (LU), Latvia (LV), Malta (MT), Netherlands (NL), Portugal (PT), Slovenia (SI), Slovakia (SK). Data source: ESRB

Table 9: Macroprudential policy and foreign CRE backed loans (bank-country level)

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Share of foreign CRE backed loans$_{t,i,c}$				
Sample	*Baseline*	*Home=1 & Foreign=1*	*Home=1 & Foreign=0*	*Home=0 & Foreign=1*	*Home=0 & Foreign=0*
	CRE Macroprudential dummy				
NFC lending spread$_{t-1,c}$ × NFC deposit share$_{t-1,i,c}$	0.310**	0.405	0.624***	0.189	0.286*
	(0.120)	(0.334)	(0.213)	(0.143)	(0.163)
NFC deposit share$_{t-1,i,c}$	0.536***	-0.576**	1.043***	0.536***	0.516**
	(0.206)	(0.206)	(0.185)	(0.109)	(0.254)
Observations	9,881	175	852	2,038	6,816
R-squared	0.127	0.922	0.455	0.368	0.119
	Loan-to-value				
NFC lending spread$_{t-1,c}$ × NFC deposit share$_{t-1,i,c}$	0.310**	n.a.	0.591	0.165	0.299**
	(0.120)		(0.398)	(0.193)	(0.142)
NFC deposit share$_{t-1,i,c}$	0.536***		1.090***	0.299*	0.504**
	(0.206)		(0.306)	(0.170)	(0.234)
Observations	9,881		373	1,124	8,380
R-squared	0.127		0.654	0.100	0.118
	Art. 124 Risk weights for CRE				
NFC lending spread$_{t-1,c}$× NFC deposit share$_{t-1,i,c}$	0.310**	n.a.	0.536	0.007	0.305**
	(0.120)		(0.348)	(0.066)	(0.144)
NFC deposit share$_{t-1,i,c}$	0.536***		1.073***	0.758***	0.529**
	(0.206)		(0.264)	(0.089)	(0.235)
Observations	9,881		518	609	8,754
R-squared	0.127		0.690	0.746	0.115
Bank controls	Yes	Yes	Yes	Yes	Yes
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign commercial real estate (CRE) backed loans of bank i in borrowing country j and quarter t. The sample is split into subsamples depending on the existence or lack of a macroprudential policy tool related to the housing sector in the country of residence of the bank headquarters and the foreign borrowing country. The top panel considers whether any of the instruments listed in Table 8 is in place or not. The lower panels focus on specific instruments (n.a. implies that no or too few observations applied to the subsample). The explanatory variable of interest is the lagged NFC lending spread interacted with exposure to non-financial corporations (deposit share) in the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 10: Macroprudential policy and foreign RRE backed loans (bank-country level)

Dependent variable	(1)	(2)	(3)	(4)	(5)
	Share of foreign RRE backed loans$_{t,i,c}$				
Sample	*Baseline*	*Home=1 & Foreign=1*	*Home=1 & Foreign=0*	*Home=0 & Foreign=1*	*Home=0 & Foreign=0*
	RRE Macroprudential dummy				
House purchase lending spread$_{t-1,c}$ ×	0.108*	-0.172	0.054*	0.138	0.236
HH deposit share$_{t-1,i,c}$	(0.064)	(0.125)	(0.029)	(0.113)	(0.188)
HH deposit share$_{t-1,i,c}$	0.348**	0.658***	0.049*	0.732***	0.115**
	(0.144)	(0.133)	(0.028)	(0.193)	(0.044)
Observations	25,294	8,568	4,737	8,017	3,972
R-squared	0.102	0.343	0.046	0.111	0.052
	Loan maturity				
House purchase lending spread$_{t-1,c}$ ×	0.108*	0.049	0.187***	0.071	0.055
HH deposit share$_{t-1,i,c}$	(0.064)	(0.126)	(0.047)	(0.247)	(0.042)
HH deposit share$_{t-1,i,c}$	0.348**	0.856***	0.449*	0.183	0.079
	(0.144)	(0.026)	(0.251)	(0.324)	(0.048)
Observations	25,294	2,353	4,896	5,533	12,512
R-squared	0.102	0.912	0.478	0.065	0.028
	Loan-to-value				
House purchase lending spread$_{t-1,c}$ ×	0.108*	0.014	0.052*	0.144	0.098
HH deposit share$_{t-1,i,c}$	(0.064)	(0.192)	(0.031)	(0.191)	(0.086)
HH deposit share$_{t-1,i,c}$	0.348**	0.805***	0.053*	0.293	0.083
	(0.144)	(0.078)	(0.032)	(0.335)	(0.050)
Observations	25,294	5,469	4,815	7,582	7,428
R-squared	0.102	0.705	0.084	0.117	0.033
Bank controls	Yes	Yes	Yes	Yes	Yes
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign residential real estate (RRE) backed loans of bank i in borrowing country j and quarter t. The sample is split into subsamples depending on the existence or lack of a macroprudential policy tool related to the housing sector in the country of residence of the bank headquarters and the foreign borrowing country. The top panel considers whether any of the instruments listed in Table 8 is in place or not. The lower panels focus on specific instruments. The explanatory variable of interest is the lagged house purchase lending spread interacted with exposure to households (deposit share) in the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 11: Risk analysis of CRE backed lending exposures (bank-country level)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable	Acc. impairment ratio for CRE backed loans$_{t,i,c}$			Forbearance ratio for CRE backed loans$_{t,i,c}$			CRE backed NPL ratio$_{t,i,c}$		
Sample	Full	Low cap.	High cap.	Full	Low cap.	High cap.	Full	Low cap.	High cap.
				Pre-covid: Q2 2015 - Q1 2020					
NFC lending spread$_{t-1,c}$ × Share of foreign	0.017	-0.126	0.029	0.126	-0.473	0.252**	0.018	-0.558	0.168
CRE backed loans $_{t-1,i,c}$	(0.057)	(0.310)	(0.082)	(0.087)	(0.362)	(0.100)	(0.081)	(0.454)	(0.109)
Share of foreign CRE backed loans$_{t-1,i,c}$	-0.046	-0.184	-0.026	-0.072	0.110	-0.054	-0.036	-0.147	-0.044
	(0.030)	(0.132)	(0.030)	(0.049)	(0.090)	(0.042)	(0.054)	(0.207)	(0.053)
Observations	6,179	3,090	3,089	6,179	3,090	3,089	6,179	3,090	3,089
R-squared	0.080	0.177	0.177	0.088	0.206	0.173	0.110	0.231	0.181
Number of id country	500	335	392	500	335	392	500	335	392
				Covid & post-covid: Q2 2020 - Q3 2022					
NFC lending spread$_{t-1,c}$ × Share of foreign	-0.027	-0.116	0.018	-0.055	-0.300	0.085	-0.141	-0.136	-0.125
CRE backed loans $_{t-1,i,c}$	(0.041)	(0.097)	(0.029)	(0.131)	(0.221)	(0.168)	(0.129)	(0.193)	(0.172)
Share of foreign CRE backed loans$_{t-1,i,c}$	-0.024	-0.106	-0.009	-0.071	-0.161	0.057	-0.182	0.120	-0.259
	(0.056)	(0.142)	(0.040)	(0.122)	(0.160)	(0.164)	(0.199)	(0.256)	(0.233)
Observations	3,393	1,697	1,696	3,393	1,697	1,696	3,393	1,697	1,696
R-squared	0.065	0.155	0.094	0.093	0.170	0.203	0.067	0.177	0.100
Number of bank-country pairs	418	283	257	418	283	257	418	283	257
Bank controls$_{t-1,i}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is a risk measure related to CRE backed loans of bank i in borrowing country j and quarter t. The sample is split into subsamples depending on bank capitalization (Low cap. contains banks with a capital ratio smaller than or equal to the sample median; High cap. includes those with a capital ratio larger than the median). The top panel considers the pre-pandemic period. The lower panel focuses on the period starting from 2020Q2. The explanatory variable of interest is the lagged NFC lending spread interacted with the share of CRE backed loans in the destination country in total CRE loans. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 12: Risk analysis of RRE backed lending exposures (bank-country level)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Acc. impairment ratio for RRE backed loans$_{t,i,c}$			Forbearance ratio for RRE backed loans$_{t,i,c}$			RRE backed NPL ratio$_{t,i,c}$		
Sample	Full	Low cap.	High cap.	Full	Low cap.	High cap.	Full	Low cap.	High cap.
				Pre-covid: Q2 2015 - Q1 2020					
House purchase lending spread_t-1,c × Share of foreign RRE backed loans$_{t-1,i,c}$	0.032	0.057	0.012	0.183	-0.030	0.481	0.100	-0.023	0.118*
	(0.035)	(0.059)	(0.025)	(0.149)	(0.048)	(0.303)	(0.073)	(0.090)	(0.067)
Share of foreign RRE backed loans$_{t-1,i,c}$	0.043*	0.065	0.014	-0.128	-0.015	-0.101*	-0.036	-0.008	-0.092
	(0.025)	(0.065)	(0.016)	(0.084)	(0.030)	(0.056)	(0.063)	(0.122)	(0.062)
Observations	15,754	7,878	7,876	15,754	7,878	7,876	15,754	7,878	7,876
R-squared	0.033	0.073	0.053	0.030	0.051	0.071	0.038	0.069	0.070
Number of bank-country pairs	1,162	776	852	1,162	776	852	1,162	776	852
				Covid & post-covid: Q2 2020 - Q3 2022					
House purchase lending spread$_{t-1,c}$× Share of foreign RRE backed loans$_{t-1,i,c}$	-0.153	0.002	-0.259	-0.058	0.007	-0.069	-0.095	0.046**	-0.192
	(0.139)	(0.005)	(0.267)	(0.058)	(0.012)	(0.101)	(0.116)	(0.021)	(0.212)
Share of foreign RRE backed loans$_{t-1,i,c}$	-0.481	0.010	-0.275	-0.433	0.002	-0.359	-0.629	0.104	-0.456
	(0.590)	(0.033)	(0.492)	(0.299)	(0.085)	(0.307)	(0.603)	(0.140)	(0.588)
Observations	9,461	4,734	4,727	9,461	4,734	4,727	9,461	4,734	4,727
R-squared	0.047	0.062	0.070	0.033	0.061	0.054	0.039	0.065	0.070
Number of bank-country pairs	1,121	733	707	1,121	733	707	1,121	733	707
Bank controls$_{t-1,i}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is a risk measure related to RRE backed loans of bank i in borrowing country j and quarter t. The sample is split into subsamples depending on bank capitalization (Low cap. contains banks with a capital ratio smaller than or equal to the sample median; High cap. includes those with a capital ratio larger than the median). The top panel considers the pre-pandemic period. The lower panel focuses on the period starting from 2020Q2. The explanatory variable of interest is the lagged house purchase lending spread interacted with the share of RRE backed loans in the destination country in total RRE loans. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 13: Risk analysis of banks' euro area CRE backed lending exposures (bank level)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Acc. impairment ratio for CRE backed loans$_{t,i}$			Forbearance ratio for CRE backed loans$_{t,i}$			CRE backed NPL ratio$_{t,i}$		
Sample	Full	Low cap.	High cap.	Full	Low cap.	High cap.	Full	Low cap.	High cap.
	Pre-covid: Q2 2015 - Q1 2020								
CRE EA exposure weighted NFC lending spread$_{t-1,i}$ x Share of foreign euro area CRE backed loans$_{t-1,i}$	-0.012	0.036	-0.131	-0.064	-0.735**	-0.070	-0.154	-0.003	-0.066
	(0.114)	(0.274)	(0.151)	(0.099)	(0.363)	(0.116)	(0.131)	(0.386)	(0.209)
CRE EA exposure weighted NFC lending spread$_{t-1,i}$	0.043	-0.021	0.099	0.078	0.195	0.101	0.111	0.016	0.086
	(0.066)	(0.140)	(0.097)	(0.054)	(0.145)	(0.071)	(0.088)	(0.191)	(0.140)
Share of foreign euro area CRE backed loans$_{t-1,i}$	-0.009	-0.033	-0.015	0.016	0.090*	-0.023	-0.004	-0.005	-0.078
	(0.026)	(0.040)	(0.056)	(0.031)	(0.047)	(0.051)	(0.044)	(0.046)	(0.084)
Observations	1,264	632	632	1,264	632	632	1,264	632	632
R-squared	0.589	0.658	0.573	0.603	0.671	0.677	0.659	0.763	0.644
Number of banks	84	58	64	84	58	64	84	58	64
	Covid & post-covid: Q2 2020 - Q3 2022								
CRE EA exposure weighted NFC lending spread$_{t-1,i}$ x Share of foreign euro area CRE backed loans$_{t-1,i}$	0.121	0.060	0.053	-0.166	0.112	0.003	0.254	0.814*	0.081
	(0.094)	(0.149)	(0.129)	(0.185)	(0.283)	(0.237)	(0.231)	(0.408)	(0.308)
CRE EA exposure weighted NFC lending spread$_{t-1,i}$	-0.061	0.007	-0.053	0.151	-0.066	0.213	-0.057	-0.208	0.009
	(0.051)	(0.069)	(0.071)	(0.102)	(0.135)	(0.143)	(0.124)	(0.138)	(0.173)
Share of foreign euro area CRE backed loans$_{t-1,i}$	-0.059	0.031	-0.123	-0.097	0.010	0.201	-0.112	0.100	-0.284*
	(0.045)	(0.039)	(0.096)	(0.177)	(0.064)	(0.193)	(0.083)	(0.094)	(0.163)
Observations	696	348	348	696	348	348	696	348	348
R-squared	0.535	0.784	0.515	0.362	0.753	0.512	0.489	0.808	0.479
Number of banks	79	52	50	79	52	50	79	52	50
Bank controls$_{t-1,i}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & home country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank level for a sample of significantly important banks and the period 2015-2022. The dependent variable is a risk measure related to CRE backed loans of bank i across all foreign euro area (EA) countries j and quarter t. The sample is split into subsamples depending on bank capitalization (Low cap. contains banks with a capital ratio smaller than or equal to the sample median; High cap. includes those with a capital ratio larger than the median). The top panel considers the pre-pandemic period. The lower panel focuses on the period starting from 2020 Q2. The explanatory variable of interest is the euro area exposure weighted NFC lending spread interacted with the share of foreign CRE backed loans across all euro area countries in total CRE loans. We further include bank controls as well as bank, quarter and quarter-home country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table 14: Risk analysis of banks' euro area RRE backed lending exposures (bank level)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Acc. impairment ratio for RRE backed loans$_{t,i}$			Forbearance ratio for RRE backed loans$_{t,i}$			RRE backed NPL ratio$_{t,i}$		
Sample	Full	Low cap.	High cap.	Full	Low cap.	High cap.	Full	Low cap.	High cap.
	Pre-covid: Q2 2015 - Q1 2020								
RRE EA exp. weighted house purchase lending spread$_{t-1,i}$ x	-0.002	-0.067*	-0.058	0.089	-0.054	0.471	0.150	0.213	0.287
Share of foreign euro area CRE backed loans$_{t-1,i}$	(0.022)	(0.037)	(0.061)	(0.082)	(0.038)	(0.365)	(0.115)	(0.297)	(0.300)
RRE EA exp. weighted house purchase lending spread$_{t-1,i}$	0.001	0.021*	0.042	-0.010	0.018	-0.091	-0.023	-0.016	-0.058
	(0.009)	(0.011)	(0.038)	(0.021)	(0.014)	(0.140)	(0.039)	(0.071)	(0.145)
Share of foreign euro area RRE backed loans$_{t-1,i}$	0.012	-0.001	0.011	-0.122	-0.030***	-0.225*	-0.122	-0.208	-0.101
	(0.008)	(0.009)	(0.012)	(0.080)	(0.008)	(0.132)	(0.078)	(0.180)	(0.069)
Observations	1,174	587	587	1,174	587	587	1,174	587	587
R-squared	0.641	0.724	0.550	0.469	0.791	0.470	0.322	0.331	0.370
Number of banks	79	56	61	79	56	61	79	56	61
	Covid & post-covid: Q2 2020 - Q3 2022								
RRE EA exp. weighted house purchase lending spread$_{t-1,i}$ x	-0.035	0.044	-0.155	-0.006	0.023	0.024	0.055	0.187	-0.046
Share of foreign euro area CRE backed loans$_{t-1,i}$	(0.066)	(0.060)	(0.232)	(0.032)	(0.051)	(0.070)	(0.079)	(0.139)	(0.188)
RRE EA exp. weighted house purchase lending spread$_{t-1,i}$	-0.014	-0.053	0.000	0.013	-0.033	0.016	-0.027	-0.184*	0.022
	(0.014)	(0.047)	(0.023)	(0.017)	(0.041)	(0.018)	(0.045)	(0.107)	(0.020)
Share of foreign euro area RRE backed loans$_{t-1,i}$	0.118	0.009	0.188*	-0.078	-0.029*	-0.083*	0.019	-0.054	0.073
	(0.076)	(0.034)	(0.110)	(0.070)	(0.015)	(0.048)	(0.173)	(0.067)	(0.148)
Observations	664	332	332	664	332	332	664	332	332
R-squared	0.436	0.821	0.302	0.737	0.945	0.504	0.692	0.827	0.472
Number of banks	76	50	48	76	50	48	76	50	48
Bank controls$_{t-1,i}$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter & home country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank level for a sample of significantly important banks and the period 2015-2022. The dependent variable is a risk measure related to RRE backed loans of bank i across all foreign euro area (EA) countries j and quarter t. The sample is split into subsamples depending on bank capitalization (Low cap. contains banks with a capital ratio smaller than or equal to the sample median; High cap. includes those with a capital ratio larger than the median). The top panel considers the pre-pandemic period. The lower panel focuses on the period starting from 2020Q2. The explanatory variable of interest is the euro area exposure weighted house purchase lending spread interacted with the share of foreign RRE backed loans across all euro area countries in total RRE loans. We further include bank controls as well as bank, quarter and quarter-home country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

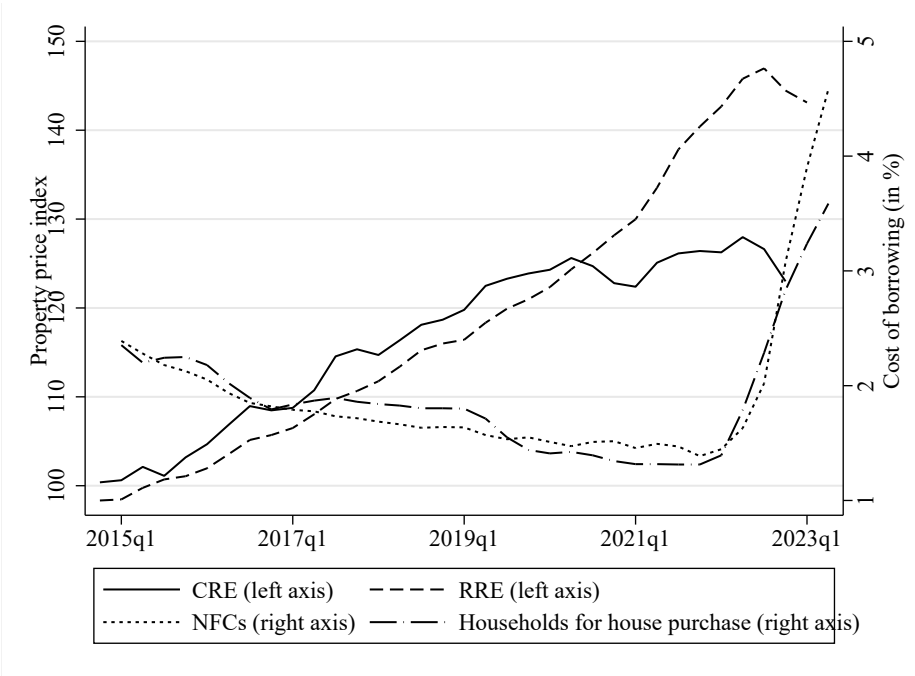


Figure 1: Real estate prices and borrowing costs in the euro area

Note: This figure shows the pattern for property price indices (left axis) for commercial (CRE) and residential (RRE) real estate in the euro area. On the right axis, the borrowing costs (in %) for non-financial corporations (NFC's) and the loan rates households have to pay when purchasing own property are shown. Data source: ECB.

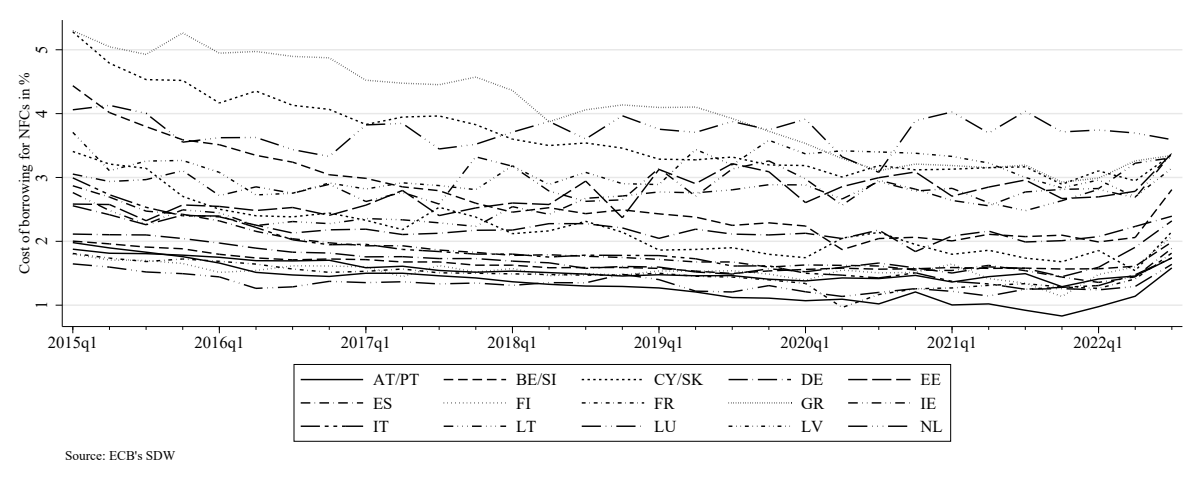


Figure 2: Borrowing costs of non-financial corporations by country

Note: This figure shows the different levels of borrowing costs (in %) for non-financial corporations across euro area countries. Data source: ECB.

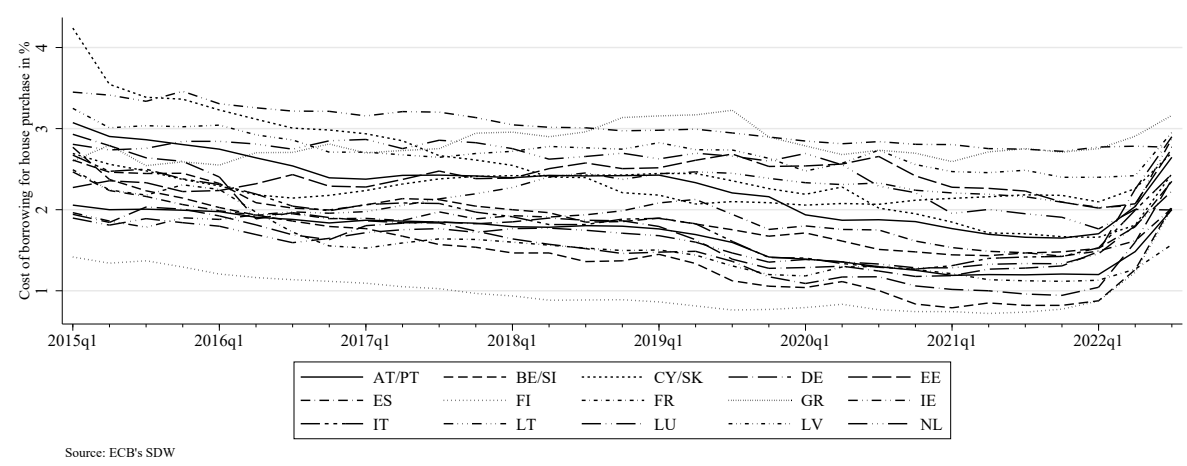


Figure 3: Borrowing costs of households for house purchase by country

Note: This figure shows the different levels of borrowing costs (in %) for households for house purchase across euro area countries. Data source: ECB.

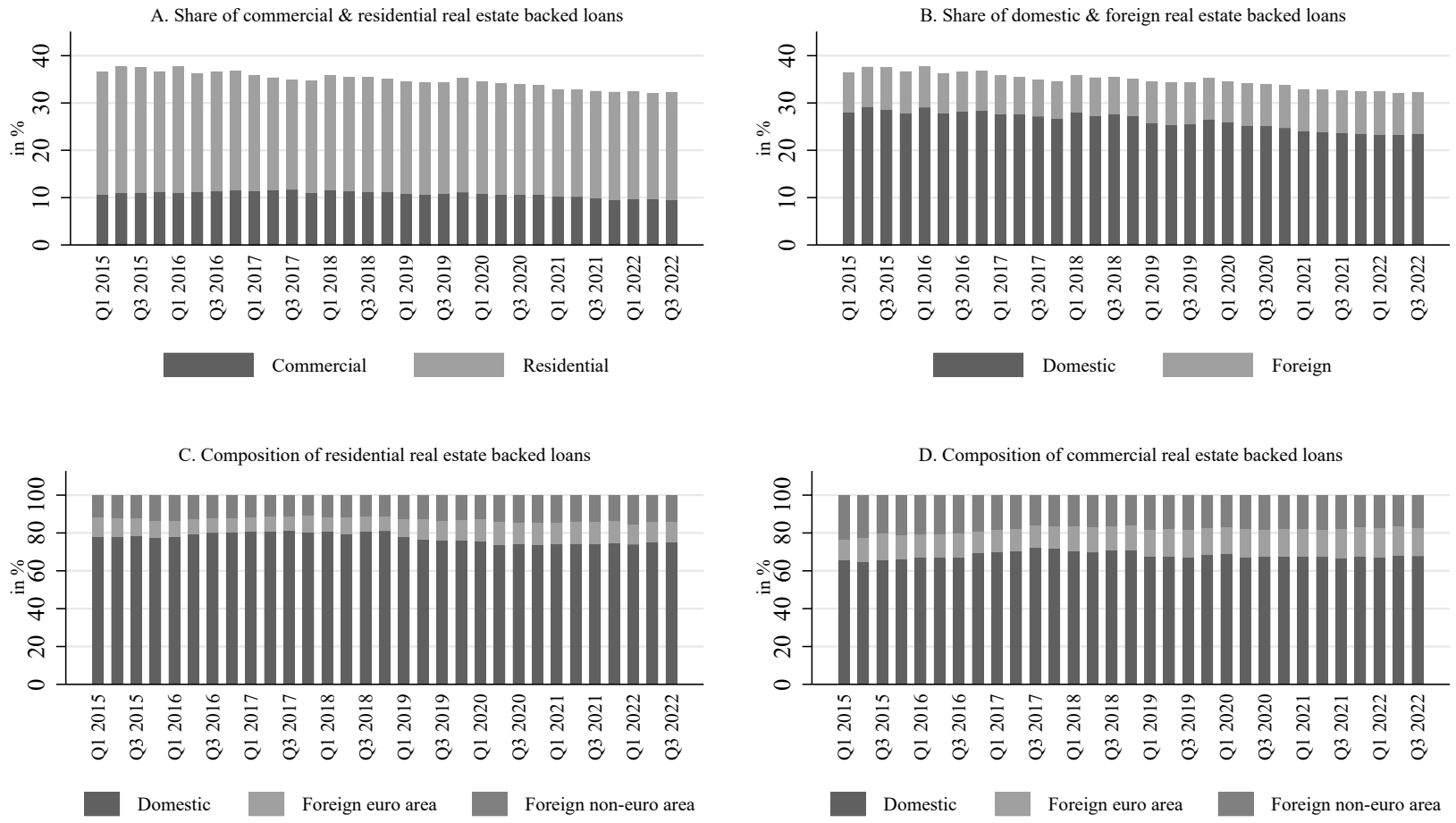


Figure 4: Real estate backed loans in total loans (%)

Note: The figure shows different breakdowns of real estate backed loans in the loan portfolio of banks supervised by the SSM that report the geographical breakdown of assets. Panel A shows the average share of RRE and CRE backed loans in total loans (in %). Panel B shows the average share of foreign and domestic real estate backed loans in total loans (in %). Panel C and Panel D show the average composition of RRE backed loans, respectively CRE back loans, hold domestically, in foreign euro area countries and in foreign non-euro area countries and relative to total RRE (CRE) backed loans. Data source: ECB, own calculations.

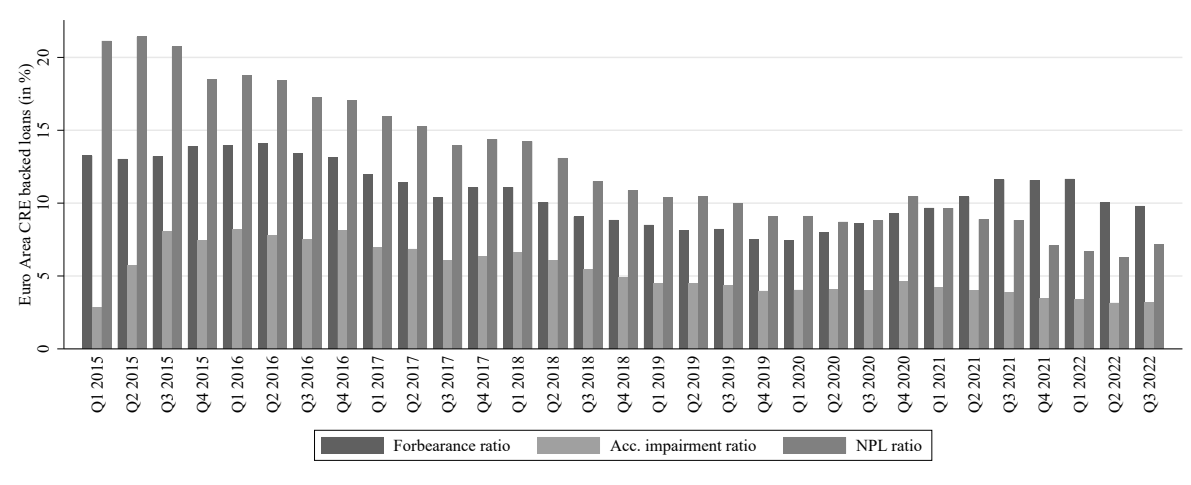


Figure 5: Risk measures of CRE backed loans (%)

Note: This figure shows the average of three bank-country level risk measures of bank-country level CRE backed loans: the forbearance ratio, the accumulated impairment ratio and the NPL ratio. The sample is based on the banks supervised by the SSM that report the geographical breakdown of assets. Data source: ECB, own calculations.

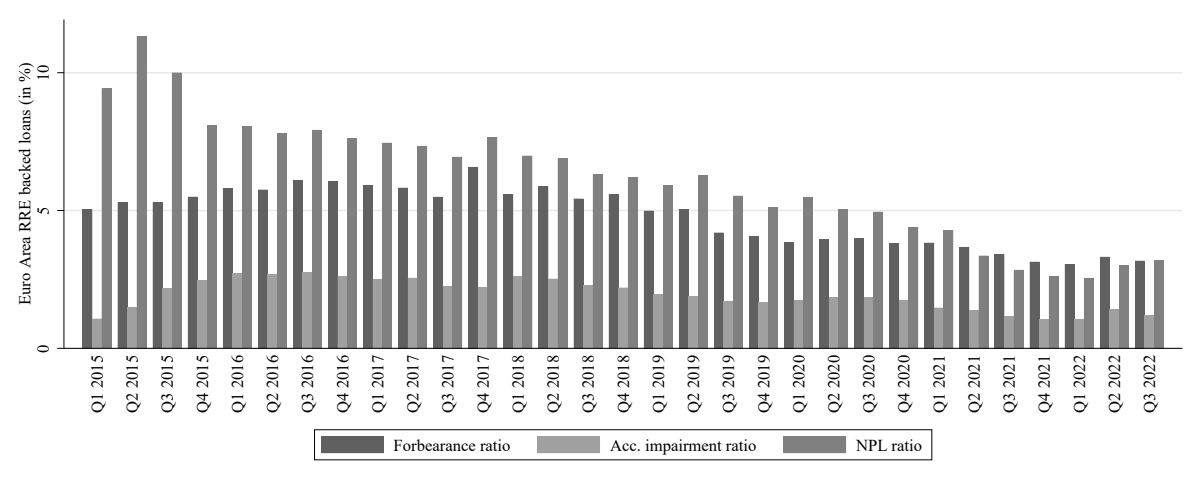


Figure 6: Risk measures of RRE backed loans (%)

Note: This figure shows the average of three bank-country level risk measures of bank-country level RRE backed loans: the forbearance ratio, the accumulated impairment ratio and the NPL ratio. The sample is based on the banks supervised by the SSM that report the geographical breakdown of assets. Data source: ECB, own calculations.

Online Appendix

Table OA1: Drivers of real estate backed foreign lending (bank-country level): Subsamples

Dependent variable	(1) Share of foreign CRE backed loans$_{t,i,c}$	(2)	(3)	(4)	(5) Share of foreign RRE backed HH loans$_{t,i,c}$	(6)
Sample period	*until 2020 Q1*	*from 2020 Q2*	*until 2020 Q1*	*from 2020 Q2*	*until 2020 Q1*	*from 2020 Q2*
NFC lending spread$_{t-1,c}$ x NFC deposit share$_{t-1,i,c}$	0.521**	0.076				
	(0.228)	(0.061)				
NFC deposit share$_{t-1,i,c}$	0.674***	-0.044				
	(0.241)	(0.121)				
NFC lending spread$_{t-1,c}$ x Share of NFC loans to the const. sector$_{t-1,i,c}$			0.223**	0.113		
			(0.103)	(0.072)		
Share of NFC loans to the construction sector$_{t-1,i,c}$			0.433***	0.221***		
			(0.131)	(0.067)		
House purchase lending spread$_{t-1,c}$ x HH deposit share$_{t-1,i,c}$					0.112	0.038
					(0.110)	(0.032)
HH deposit share$_{t-1,i,c}$					0.391**	0.005
					(0.159)	(0.063)
ln assets$_{t-1,i}$	-0.007	-0.026**	0.005	-0.025**	0.009**	-0.000
	(0.015)	(0.011)	(0.014)	(0.011)	(0.004)	(0.002)
Return on assets$_{t-1,i}$	0.002	0.243*	-0.054	0.198	-0.039	0.007
	(0.232)	(0.130)	(0.190)	(0.125)	(0.048)	(0.032)
Liquid assets to total assets$_{t-1,i}$	-0.188	0.016	-0.136	0.028	-0.019	0.003
	(0.124)	(0.027)	(0.107)	(0.023)	(0.018)	(0.003)
CET1 ratio$_{t-1,i}$	-0.025	-0.110*	-0.034	-0.113**	0.001	-0.001
	(0.058)	(0.058)	(0.049)	(0.055)	(0.010)	(0.008)
Observations	6,399	3,142	6,399	3,142	15,810	9,484
R-squared	0.185	0.059	0.254	0.135	0.115	0.016
Number of bank-country pairs	523	426	523	426	1,163	1,121
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign CRE or RRE backed loans of bank i in borrowing country j and quarter t. We show results for the full sample as well as for the pre-pandemic sample until 2020Q1 and the pandemic period (2020Q2-2022Q3). The explanatory variable of interest is the lagged lending spread interacted with different exposure measures towards the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table OA2: Drivers of real estate backed foreign lending (bank-country level): House price spread

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Share of foreign CRE backed loans$_{t,i,c}$				Share of foreign RRE backed HH loans$_{t,i,c}$	
NFC lending spread$_{t-1,c}$× NFC deposit share$_{t-1,i,c}$	0.310**	0.329***				
	(0.120)	(0.114)				
NFC deposit share$_{t-1,i,c}$	0.536***	0.532**				
	(0.206)	(0.208)				
Spread of RRE prices$_{t-1,c}$ × NFC deposit share$_{t-1,i,c}$		-0.002				
		(0.002)				
NFC lending spread$_{t-1,c}$ × Share of NFC loans to the const. sector$_{t-1,i,c}$			0.239***	0.279***		
			(0.052)	(0.049)		
Share of NFC loans to the construction sector$_{t-1,i,c}$			0.356***	0.343***		
			(0.077)	(0.079)		
Spread of RRE prices$_{t-1,c}$ × Share of NFC loans to the const. sector$_{t-1,i,c}$				-0.003		
				(0.002)		
House purchase lending spread$_{t-1,c}$ × HH deposit share$_{t-1,i,c}$					0.108*	0.104*
					(0.064)	(0.062)
HH deposit share$_{t-1,i,c}$					0.348**	0.366**
					(0.144)	(0.143)
Spread of RRE price$_{t-1,c}$ × HH deposit share$_{t-1,i,c}$						0.002
						(0.002)
ln assets$_{t-1,i}$	-0.008	-0.008	-0.004	-0.003	0.006**	0.006**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.003)	(0.002)
Return on assets$_{t-1,i}$	0.098	0.101	0.008	0.029	-0.002	-0.000
	(0.205)	(0.205)	(0.165)	(0.173)	(0.036)	(0.039)
Liquid assets to total assets$_{t-1,i}$	-0.085	-0.086	-0.039	-0.040	-0.004	-0.005
	(0.054)	(0.055)	(0.040)	(0.043)	(0.007)	(0.008)
CET1 ratio$_{t-1,i}$	-0.018	-0.016	-0.009	-0.006	-0.000	-0.001
	(0.061)	(0.061)	(0.050)	(0.048)	(0.007)	(0.008)
Observations	9,881	9,612	9,881	9,612	25,294	23,447
R-squared	0.127	0.128	0.236	0.246	0.102	0.109
Number of bank-country pairs	582	555	582	555	1,278	1,178
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign CRE or RRE backed loans of bank i in borrowing country j and quarter t. Compared to the baseline model (columns 1, 3 & 5), an interaction between the house price spread and the exposure variable is added (columns 2, 4 & 6). The explanatory variable of interest is the lagged lending spread interacted with different exposure measures towards the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

Table OA3: Drivers of real estate backed foreign lending (bank-country level): Average country exposure

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Share of foreign CRE backed loans$_{t,i,c}$				Share of foreign RRE backed HH loans$_{t,i,c}$	
NFC lending spread$_{t-1,c}$ × NFC deposit share$_{t-1,i,c}$	0.310**					
	(0.120)					
NFC deposit share$_{t-1,i,c}$	0.536***					
	(0.206)					
NFC lending spread$_{t-1,c}$× Average NFC deposit share$_{t-1\ to\ t-4,i,c}$		0.336**				
		(0.146)				
Average NFC deposit share$_{t-1\ to\ t-4,i,c}$		0.530***				
		(0.189)				
NFC lending spread$_{t-1,c}$ × Share of NFC loans to the const. sector$_{t-1,i,c}$			0.239***			
			(0.052)			
Share of NFC loans to the construction sector$_{t-1,i,c}$			0.356***			
			(0.077)			
NFC lending spread$_{t-1,c}$ x Share of NFC loans to the const. sector$_{t-1\ to\ t-4,i,c}$				0.252***		
				(0.058)		
Share of NFC loans to the construction sector$_{t-1\ to\ t-4,i,c}$				0.316***		
				(0.080)		
House purchase lending spread$_{t-1,c}$ × HH deposit share$_{t-1,i,c}$					0.108*	
					(0.064)	
HH deposit share$_{t-1,i,c}$					0.348**	
					(0.144)	
House purchase lending spread$_{t-1,c}$ × Average HH deposit share$_{t-1\ to\ t-4,i,c}$						0.050*
						(0.027)
Average HH deposit share$_{t-1\ to\ t-4,i,c}$						0.147*
						(0.088)
ln assets$_{t-1,i}$	-0.008	-0.009	-0.004	-0.004	0.006**	0.002
	(0.010)	(0.011)	(0.010)	(0.010)	(0.003)	(0.001)
Return on assets$_{t-1,i}$	0.098	0.042	0.008	-0.043	-0.002	-0.021
	(0.205)	(0.194)	(0.165)	(0.191)	(0.036)	(0.025)
Liquid assets to total assets$_{t-1,i}$	-0.085	-0.049	-0.039	-0.024	-0.004	-0.004
	(0.054)	(0.034)	(0.040)	(0.030)	(0.007)	(0.005)
CET1 ratio$_{t-1,i}$	-0.018	-0.014	-0.009	-0.002	-0.000	-0.001
	(0.061)	(0.059)	(0.050)	(0.049)	(0.007)	(0.007)
Observations	9,881	8,698	9,881	8,698	25,294	22,212
R-squared	0.127	0.107	0.236	0.181	0.102	0.026
Number of bank-country pairs	582	548	582	548	1,278	1,250
Bank & quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter-destination country FE	Yes	Yes	Yes	Yes	Yes	Yes

This table shows regression results at the bank-country level for a sample of significantly important banks and the period 2015-2022. The dependent variable is the share of foreign CRE or RRE backed loans of bank i in borrowing country j and quarter t. Compared to the baseline model (columns 1, 3 & 5), the exposure variable is defined as the average over the last four quarters (columns 2, 4 & 6). The explanatory variable of interest is the lagged lending spread interacted with different exposure measures towards the destination country. We further include bank controls as well as bank, quarter and quarter-destination country fixed effects as indicated at the bottom of the table. Detailed variable descriptions can be found in Table 1. We cluster standard errors at the bank-country level. ***, **, and * indicate significant coefficients at the 1%, 5%, and 10% levels, respectively.

The Centre for Responsible Banking & Finance
CRBF Working Paper Series
Department of Finance, University of St Andrews
The Gateway, North Haugh,
St Andrews, Fife,
KY16 9RJ.
Scotland, United Kingdom
https://crbf.wp.st-andrews.ac.uk/

Recent CRBF Working papers published in this Series

First Quarter | 2025

25-005 **Edoardo Lanciano, Daniele Previati, and Ornella Ricci:** Crypto Ownership among Young People: The Effect of Financial Literacy and Risk Propensity.

25-004 **Pejman Abedifar, Soroush Kamyab, Steven Ongena, and Amine Tarazi:** Relationship Banking: The Borrower's Incentives Channel.

25-003 **Alfred Duncan, João Pedro De Camargo Mainente, and Charles Nolan:** Monetary and Financial Policy with Privately Optimal Risk Taking.

25-002 **Mehmet Selman Çolak, Yavuz Kılıç, Yusuf Yıldırım, and Muhammed Hasan Yılmaz:** The Effect of Personal Credit Card Limits on Card Use: Micro Data Evidence from an Emerging Market.

25-001 **Hans Degryse, Olivier De Jonghe, Leonardo Gambacorta, and Cédric Huylebroek:** Bank Specialization and Corporate Innovation.

Fourth Quarter | 2024

24-030 **Dimitris K. Chronopoulos, John O.S. Wilson, and Muhammed H. Yilmaz:** State Ownership and Bank Lending: Evidence from Turkish Banking.

24-029 **Anna L. Sobiech, Lechedzani Kgari, Linh Nguyen, and John O.S. Wilson:** Implicit Guarantees and Cross-Border Bank Stability: Evidence from Geographic Ringfencing.

24-028 **Thomas Krause, Eleonora Sfrappini, Lena Tonzer, and Cristina Zgherea:** How Do EU Banks' Funding Costs Respond to the CRD IV? An Assessment Based on the Banking Union Directives Database.