Norges Bank

10 | 2024

Working Paper

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Norges Bank Research

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Cross-border bank flows, Households, Bank lending, Risk-taking, Credit booms

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ISSN 1502-8143 (online)

ISBN 978-82-8379-319-2 (online)

Cross-Border Bank Flows, Regional Household Credit Booms and Bank Risk-Taking*

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May 4, 2024

Abstract

This paper provides novel micro-level evidence that cross-border bank flows are important for households' access to credit not only in emerging markets but also in advanced economies and may drive local credit credit booms that increase banking sector risk. We study the impact of the influx of cross-border bank funding that followed the ECB's implementation of non-conventional monetary policy in 2014-15 on lending to households. To this end we employ supervisory bank-level data, and household-level credit - and consumption data for Germany. Our findings show that regional banks that are more exposed to inflows of foreign capital through their reliance on non-core funding increase consumer lending to riskier, lower-income households. This rise in bank credit is predominantly funded by an inflow of deposits from non-euro area banks that leads less capitalized banks to expand their lending on the extensive margin. The improved access to consumer credit enabled lower-income households with exposed banks as their main bank relationship to increase their non-durable, consumer expenditures. Data from a group of euro area countries confirm our conclusions.

Keywords: Cross-Border Bank Flows, Households, Bank Lending, Risk-Taking, Credit Booms

JEL Classifications: F3, G2, G5

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*This paper should not be reported as representing the views of the Bundesbank, the Eurosystem or Norges Bank. The views expressed are those of the authors and do not necessarily reflect those of the above institutions. We thank a referee for the Norges Bank working paper series, Nathan Converse, Linda Goldberg and Tim Schmidt-Eisenlohr for valuable comments and Tobias Schmidt for sharing his code. This paper uses data from the Bundesbank Panel on Household Finances and the Eurosystem Household Finance and Consumption Survey, accessed via scientific use files. Reported results and related observations and analyses may not correspond to the results or analyses of the data producers. The confidential Bundesbank data was accessed at its Research Data and Service Center via on-site use (Project No. 2023/0041). Te Kaat gratefully acknowledges financial support from the Dutch Research Council NWO, grant number VI.Veni.211E.023.

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1 Introduction

An extensive literature has documented, using aggregate, bank-level, or bank-firm data that foreign capital inflows increase overall bank lending, with credit shifting towards riskier firms and countries (e.g., Magud et al., 2014; Baskaya et al., 2017; Te Kaat, 2021). Capital inflows resulting from changing national or international financial conditions affect bank lending through both securities and interbank markets as well as intra-concern flows in large global banks (Cetorelli and Goldberg, 2012; Temesvary et al., 2018; Correa et al., 2021). Such wholesale sources of foreign bank funding are known to be important in developing and emerging economies. Little is known, however, about the potential impact of foreign funding inflows on either households or advanced economies. Although some recent research employs sector-level data for Brazil to show that *aggregate* credit to households rises following capital inflows (Garber et al., 2019), little effort has yet been made to identify the extent to which foreign capital inflows affect the composition and allocation of credit *between* households, particularly in advanced economies.

This paper aims to fill this gap by investigating the effects of a rise in foreign capital inflows on the household sector in Germany. Specifically, we focus on the period when the European Central Bank (ECB) implemented its negative interest rate policy and quantitative easing programs in 2014-2015. Net cross-border bank flows into the euro area then increased from -3.5 percent of GDP in 2014:Q1 to almost +3 percent in 2016:Q3, providing new funds to euro area banks. In Germany, the largest euro area economy, the increase in bank inflows was even more pronounced, as we document below.

To study the effects of these inflows, we use granular household-level data combined with detailed supervisory bank balance sheet information. We find that the rise in cross-border bank inflows induced banks with greater initial dependence on non-core funding (NCF), i.e., interbank borrowing, money market funding and debt securities financing, to raise their consumer loan supply to low-income households. In economic terms lower income households experience a 51 percentage points (pp) higher growth rate in uncollateralized consumer credit than higher income households. Lower income households who have their main bank relationship with a more exposed bank, i.e., with greater dependence on non-core funding, have an even faster growth in consumer credit of 83 pp. When a bank is weakly capitalized, the effects are yet stronger, consistent with the literature on the risk-taking channel of monetary policy transmission (e.g., Jiménez et al., 2014). The growth in consumer credit mainly benefits households on the extensive margin, i.e., households, who did not receive uncollateralized credit before, experience increases in consumer credit volumes. We find no evidence of increased risk-taking in banks' mortgage lending.

The increase in banks' consumer lending to riskier households we find is consistent with theoretical predictions. Acharya and Naqvi (2012) show that an increase in bank liquidity caused, for instance, by capital inflows, worsens bank agency problems and induces loan officers to increase their lending to riskier loan applicants. Martinez-Miera and Repullo (2017) argue that a rise in the supply of savings, as through capital inflows, will reduce interest rate margins and incentivize banks to sustain their profitability by cutting back on costs, in particular on monitoring and screening. This leads to more lending to riskier borrowers. Rajan (2006) also points out that lower interest rates, which could be due to capital inflows, can cause risk-taking and a search for yield by banks.

We study the impact of cross-border flows on banks' lending to households by leveraging two granular household-level data sets. The first one, for our benchmark analysis, is the German Panel on Household Finances (PHF), which contains detailed survey information on households' credit, income, wealth, consumption and background characteristics. In our main analyses we exploit a peculiar feature of the German banking system: certain banks—savings and cooperative—are only allowed to operate within the specific geographical boundaries of administrative regions. These regions match with the regional information we have on households. As the PHF also contains questions to households about their primary banking relationship, we can link households to a specific bank if their main relationship is with a savings or cooperative bank. With the help of rich supervisory data from the

Bundesbank, we can then quantify the link between bank flows and lending to households as a function of banks' exposure to cross-border flows. In the second part, we provide external validation for our findings by employing household data from the ECB's Household Finance and Consumption survey (HFCS) for the euro area. These data enable us to reconfirm in a wider sample that bank flows affect banks' lending to some households disproportionately, although at the cost of losing the direct link between households and the individual banks.

We exploit the surge in euro area bank inflows in 2015-17, which was driven to a large extent by the ECB's implementation of non-conventional monetary policy tools, to estimate difference-in-differences regressions for various measures of credit and consumption for these households and banks. Our main outcome variable of interest is the growth rate of a household's consumer or mortgage credit. In the German benchmark sample, we measure a bank's exposure to cross-border bank flows as its pre-2015 NCF ratio, i.e., the share of interbank borrowing plus money market - and debt securities issued over total assets. This follows Baskaya et al. (2017), who show that the lending behavior of banks with greater NCF ratios is more sensitive to cross-border capital flows. Intuitively, banks that rely heavily on interbank funding and other types of non-core funds should be more affected by cross-border bank flows, while retail deposits are typically quite sticky and hence largely unrelated to cross-border flows. To gauge whether more exposed banks especially raise their lending to more risky households, we inspect the interaction between the banks' non-core dependence and a proxy for households' riskiness (Mayer, 2023, Beer et al., 2018, American Express, 2022), i.e., initial income. We further identify the accompanying real effects by studying various components of a household's consumption expenditures. Finally, we validate our findings using euro area-wide household data. While the European sample does not permit us to condition on individual banks' capital inflow exposure, it allows us to exploit the cross-country heterogeneity in capital flow sensitivity by using BIS Locational Banking Statistics (BIS-LBS).

We make four main contributions. First, we present new evidence that foreign bank inflows are quantitatively important for lending to households in advanced economies like Germany, not only in emerging and developing markets. Foreign bank flows not only work through the international network of large global banks (Cetorelli and Goldberg, 2012, Correa et al., 2021) but also via regional banks when these are dependent on non-core funding. Second, we show that more exposed banks, i.e., those more dependent on interbank funding, increase their lending to low-income households in response the bank inflow shock. Economically, our estimates imply that a low-income household, at the 25th percentile of the income distribution, relative to a high-income household, at the 75th percentile, has a 51 pp higher growth rate of consumer credit after the bank inflow shock. This growth rate differential rises to 83 pp when a low-income household has its main relationship with a more exposed bank, i.e., that is at the 75th percentile of the NCFR distribution. Mortgage credit, in contrast, is largely unaffected by the inflow of foreign bank funds. The effect for low-income households is robust to including a range of fixed effects and household characteristics. We also identify a weakly positive shift in consumer lending towards younger and migrant households. The growth of credit is driven by the extensive margin, i.e., by loans to households that did not borrow from exposed banks before the foreign inflow shock. We further establish that the increase in lending to low-income households is most pronounced for poorly capitalized banks. Third, we show that low-income households who have their main bank relationship with a bank with greater non-core funding dependence increase their consumption expenditures, mainly via a rise in their non-durable consumer expenditures. Fourth, euro area household level data confirm that low-income households improve their access to credit.

We investigate a number of potential threats to our analysis and identification strategy and find our results are highly robust. First, our exposure measure, the NCF ratio (NCFR), may not randomly distributed across banks but correlated with bank controls and thereby bias our estimates. We therefore include a large set of bank controls and additionally interact them with household characteristics. Our results remain quantitatively and qualitatively unchanged. Second, our findings could be specific to our chosen net exposure measure. To check this, we rerun our regressions using banks' gross exposure to non-core funding flows and find our results are unaffected. Finally, we run a placebo test using data from a period without any substantial change in cross-border bank flows. We find no shift in more exposed banks' consumer lending to low-income households during that period. Similarly, we estimate our regressions with placebo outcomes, such as households' change in income or net worth, or use the share of tangible fixed assets over total assets as a placebo bank-level *exposure* variable. In all of these regressions, our coefficients of interest turn statistically insignificant, providing indirect evidence in support of the parallel trend assumption.

Overall, the findings in this paper advance our understanding of the importance of cross-border capital flows for the availability and quality of credit via the bank lending and the risk-taking channel. Our findings make clear that foreign capital inflows can increase banks' risk-taking towards household, thereby potentially raising financial stability concerns. However, poorer households also get better access to unsecured credit, which allows them to raise their expenditures on non-durable consumption. Our data do not allow us to take a normative view on the trade-off between enabling earlier consumption for low-income households and future credit risks.

We contribute to four strands of literature. A first strand of research shows that emerging economy banks have a highly procyclical access to non-core funding from global capital markets (Giovanni et al., 2021) and, when more dependent on NCF, raise their loan supply in response to foreign NCF inflows (Baskaya et al., 2017).[1] Te Kaat (2021) shows that cross-border debt flows increase credit to less profitable firms in the euro area. Garber et al. (2019) study credit to the aggregate household sector in Brazil. While these papers identify the effects of cross-border flows on *aggregate* bank lending, including lending to the household sector or firms, we complement them with unique micro evidence on how households' access to - and composition of credit is affected by cross-border bank flows. By studying granular

[1] Sarmiento (2022) studies the taper tantrum episode and shows that Colombian firms experienced a worsening of credit access from banks receiving funding abroad. Using bank level data, Kneer and Raabe (2019) show that higher capital affect lending by UK banks.

household level data we can show that particularly low-income households benefit from a rise in credit supply and that foreign-funding induced credit growth primarily translates into uncollateralized, riskier, consumer credit by weaker banks.

Second, we add to studies of banks as transmitters of financial and monetary shocks. Cetorelli and Goldberg (2012), Baskaya et al. (2017), Temesvary et al. (2018), and Correa et al. (2021) examine how global banks transmit shocks. Iyer and Peydró (2011), Puri et al. (2011), Schnabl (2012), Ongena et al. (2015), Hale et al. (2020) explore how negative financial shocks emanating from different types of crises affect lending by banks - through bank linkages across states and countries - and their business customers. These effects depend both on the banks' ownership, their sources of funding, liquidity and local importance. We complement this literature in two ways. We show that not only large global banks but also small regional banks, in Germany, without access to foreign branches but exposed to fluctuations in international funding flows through securities - and interbank markets, raise lending to *households* in response to a rise in banking inflows. In addition, we document how *positive* shocks are transmitted through cross-country interbank linkages.

Third, we contribute to the literature on financial crisis predictors.[2] Schularick and Taylor (2012) and Jordà et al. (2013) show that credit expansions are associated with deeper recessions and heightened financial crisis risk, while Müller and Verner (2024) demonstrate that particularly credit booms in the household sectors can lead to boom-bust cycles and predict financial crises. Jordà et al. (2016) document that mortgage credit expansions lead to elevated financial fragility, while Mian et al. (2017) establish that faster household debt growth presages lower future GDP growth, especially when countries rely heavily on external debt. Caballero (2016) finds that capital inflow bonanzas increase the probability of banking crises. We contribute to this literature by detailing the mechanism through which bank inflows affect household borrowing. Particularly, we show that funding inflows can induce more exposed banks to raise their lending to lower income, riskier, households, via

[2]See Sufi and Taylor (2022) for an extensive literature survey on this relationship.

uncollateralized credit, thus making especially worse capitalized banks more vulnerable.

Finally, we complement the literature that uses credit register data to estimate the impact of different macroeconomic shocks on banks' credit allocation. Altavilla et al. (2020) establish that expansionary monetary policy raises banks' credit supply to the household sector, especially when banks are poorly capitalized. Gyöngyösi et al. (2024) study the effects of a capital account liberalization period in Hungary and find that foreign currency mortgages reinforce the risk-taking channel of monetary policy because weakly capitalized banks lend more in foreign currency to riskier borrowers. Epure et al. (2024) show that macroprudential policies dampen the impact of global financial conditions on local bank credit cycles. We enhance this literature by detailing how credit shifts across heterogeneous households and how this translates into consumption responses.

This paper proceeds as follows. Section 2 presents the data. In Section 3, we report the aggregate dynamics of cross-border bank flows. Section 4 discusses our identification strategy. Section 5 present our main results using German household-bank-level data. To show external validity, we also provide complementary results with household-level data for several euro area countries. Section 6 studies the mechanisms through which cross-border bank inflows affect banks' household lending. In Section 7, we gauge the extent to which credit growth spills over to household consumption. Section 8 concludes.

2 Data

This paper leverages two unique data sets to investigate the relationship between capital flows, household lending and consumption. First, we analyze household-bank level data from Germany to establish a robust causal link. Second, we employ household-level data from a selection of euro area countries to show the external validity of our findings. In the following two sub-sections, we provide a comprehensive description of each data set.

2.1 Household-Bank-Level Data for Germany

For our benchmark analysis, we rely on household-level data from the Deutsche Bundesbank's Panel on Household Finances (PHF).[3] This data set contains information on households' characteristics, wealth, indebtedness, and income across three waves (2010-2011, 2014, and 2017), with between 3,500 and 5,000 households in each wave. In cases where households do not respond to specific questions, the Bundesbank employs imputation methods, utilizing households' responses to other survey questions. The PHF is an integral part of the euro area's (EA) Household Finance and Consumption Survey (HFCS) that collects ex ante harmonised micro data on households in every EA country.

We follow the approach of Kindermann et al. (2021) and use only the first of five available PHF datasets for our analysis because few variables in their study suffer from missing observations. We calculate our primary outcome variable, household-level credit growth, as the change in the logarithm of either consumer loans or mortgages.[4] To proxy for a household's riskiness (American Express, 2022, Beer et al., 2018), we follow Mayer (2023) and use the logarithm of household income.[5] Other household characteristics we control for are the log of net worth, a dummy for households renting their main residence, the household head's age, a dummy for foreign citizenship and a dummy indicator for households expecting a rise in real income over the next twelve months. In some specifications, we also include dummies for self-employment, unemployment benefits or other regular social transfers.

In the final part of our analysis, we study the household-level consumption effects of improved credit access. We compute several consumption variables, including the logarithm of durable and non-durable consumption. The PHF does not contain direct information on durable consumption. We follow Le Blanc and Schmidt (2018) and compute total house-

[3] We use the following PHF versions: `https://DOI10.12757/Bbk.PHF.01.04.01` (Wave 1), `https://DOI10.12757/Bbk.PHF.02.04.01` (Wave 2), and `https://DOI10.12757/Bbk.PHF.03.02.01` (Wave 3).

[4] To prevent exclusion of households with zero credit volumes, we add a one to all self-reported credit volumes.

[5] Beer et al. (2018) and American Express (2022) provide data showing that income is negatively correlated with default risk. Campbell and Cocco (2015) explain that lower income households are more likely to default on their (ARM) mortgage loans because a default has bigger cash-flow relief effect.

hold consumption as the difference between income and net saving, where net saving is the change in financial assets after accounting for changes in outstanding debt. To obtain a household's durable consumption, we then subtract non-durable consumption from total consumption. The PHF does have information about two distinct sub-components of non-durable expenditures, food and drinks at home and expenses on food and drinks outside the home ("restaurant"). We add their log-values to our regression specifications.[6]

The PHF data allow us to identify the link between households and their main bank because it contains information on whether the household's primary bank is a savings bank, a cooperative bank, a commercial bank, a Landesbank, or any other type of bank. Savings and cooperative banks in Germany are only permitted to operate within the geographical boundaries of particular administrative districts, so called "Landkreise". We can therefore connect households who have their primary relationship with a savings or a cooperative bank to their main bank using regional identifiers.[7] This applies to 67 percent of our households.

This link enables us to estimate the effect of bank flows on household lending as a function of a bank's exposure to cross-border flows. Specifically, we utilize data from the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (GuV) to compute a bank's exposure to cross-border bank flows as the sum of its 2014 interbank deposits plus money market and debt securities issued over total assets.[8] The intuition behind this choice is that banks with a greater non-core dependence are likely to benefit more from bank inflows that increase the availability of interbank funding. In contrast, as retail deposits are relatively sticky and hence largely unrelated to such flows, banks dependent on retail

[6]To maximize the number of observations and not to lose zero-valued consumption values, we add a one to all consumption values before taking the log.

[7]We determine the area of operation of a savings or cooperative bank based on the location of its headquarter. Several banks also operate in multiple regions, but as we do not know banks' market shares in the various regions, we decided to match banks only with the region where they are headquartered. In the worst case, matching a particular bank to all regions where it has some operations would have overrepresented large banks, which often focus their activities on the region of the headquarter and only provide a small number of loans in neighboring regions. Note as well that, when multiple banks operate in a specific administrative region, making an exact match between households and banks impossible, we calculate a weighted average bank ratio for those households, with banks' total assets serving as weights.

[8]See Schaefer and Stahl (2023) and Stahl and Scheller (2023) for data details.

deposits will be less affected by a surge in bank flows. For robustness, we compute banks' 2014 exposure to cross-border bank flows both as net and gross interbank deposits over total assets. We also break down gross interbank deposits into their domestic, euro area, and non-euro area components - thus neglecting the money market and debt securities components. Regressions include several bank controls from BISTA: size (log of total assets), return on assets, the liquidity ratio (cash, central bank reserves, and treasuries held over total assets), and the leverage ratio (total capital over total assets), all at their 2014 values.

Finally, we make two assumptions about the link between households and banks. First, because data on a household's main bank (type) is only available in the first and second wave, we assume that households do not switch main bank between waves two and three. Second, we assume that a household takes out any new loan at its main bank and not at another bank. This is consistent with Germany's tradition of strong relationships between households and banks. For instance, Puri et al. (2017) find that households typically apply for a loan at the bank where they have their bank account, with more than 80 % of loan applicants having been customers for five years or more. Long-standing bank–depositor relationships also facilitate access to uncollateralized credit, including consumer loans. In Section 5, we provide further evidence in support of these assumptions.

Table 1 reports summary statistics for the German household-bank dataset. Both consumer and mortgage credit were contracting during our sample period. Of the households in our sample, 31 percent rent their main residence and 6 percent have foreign citizenship. The average household age is 59.7 years. In our sample, 29 percent of households have at least one member receiving unemployment benefits or other regular social transfers excluding pensions, and 18 percent receive income from self-employment. Banks have an average NCFR of 13.5 percent, a return on assets of 0.15 percent, a leverage ratio of 5.6 percent and a liquidity ratio of 1.4 percent. Table A2 shows that most of these characteristics are similar for households having their main relationship with both more and less exposed banks, with the exception of the dependent variables. More exposed banks have higher growth rate of mortgage credit, but lower consumer credit growth over the sample period.

Table 1 SUMMARY STATISTICS FOR GERMAN HOUSEHOLDS

Variable	Observations	Mean	SD	5th	95th
ΔMortgages	1,536	-15.08	415.86	-1012.67	999.88
ΔConsumerloans	1,536	-31.12	396.71	-851.74	829.43
Consumption(non-durable)	1,536	9.26	0.73	8.19	10.31
Consumption(durable)	1,468	9.79	1.19	8.19	11.09
Consumption(food)	1,536	8.53	0.56	7.62	9.39
Consumption(restaurant)	1,536	6.46	2.12	0.00	8.34
Net wealth	1,536	12.05	1.87	8.22	14.31
Income	1,536	10.85	0.75	9.61	11.95
Renter	1,536	0.31	0.46	0.00	1.00
Age	1,536	59.71	14.30	32.00	80.00
Foreign	1,536	0.06	0.24	0.00	1.00
Income Exp.	1,536	0.08	0.27	0.00	1.00
Unemployed	1,536	0.29	0.45	0.00	1.00
Self-Employed	1,536	0.18	0.38	0.00	1.00
Non-Core	1,536	13.47	5.84	5.13	23.77
Gross Interbank	1,536	12.54	5.65	4.54	21.65
Gross Domestic Interbank	1,536	0.02	0.98	-1.41	1.63
Gross EA Interbank	1,536	0.02	1.02	-0.38	1.98
Gross Non-EA Interbank	1,536	-0.02	0.36	-0.08	0.10
Net Interbank	1,536	4.93	7.72	-8.42	16.86
Size	1,536	14.46	1.17	12.64	16.22
ROA	1,534	0.15	0.08	0.02	0.28
Equity	1,536	5.67	1.02	4.02	7.55
Liquidity	1,536	1.40	0.43	0.85	2.32

NOTE. The table reports summary statistics of the German bank-household data set. Bank variables are for 2014. Household-level data come from the PHF and spans three periods: 2010-2011, 2014, and 2017. We provide data definitions and sources in Table A1.

2.2 Household-Level Data for the Euro Area

We incorporate a second data set sourced from the European Central Bank's Household Finance and Consumption Survey (HFCS), encompassing comprehensive household-level data from 22 European countries. The data set spans three distinct periods: 2009-2011, 2013-2014, and 2016-2018. However, not all countries in the data set conduct their national surveys as a panel. Since our identification strategy relies on the comparison of households' credit volumes before and after cross-border bank inflow shocks, we therefore exclude countries that do not gather repeated household data across waves. Consequently, our final regression sample comprises almost 18,000 households from seven countries: Belgium, Cyprus, Germany, Finland, France, Italy, and Spain. To maintain consistency, we utilize the same data imputation method as for the German dataset.

Because the PHF is a subset of the euro area-wide HFCS, the questions in both panels are nearly identical. As a result, we can calculate the same variables mentioned in Section 2.1 using these data with two exceptions. First, Finland and France only provide data for two of the survey waves. We therefore use the log of credit volumes instead of log-differences as the outcome variables to avoid reducing our sample size. Second, the HFCS only contains income expectations only in the third survey wave. This means we cannot include this variable in our difference-in-differences regressions.

To account for the varying intensity of cross-border bank flows across countries in the euro area, we match the European household data with aggregate cross-border bank flow data obtained from the BIS-LBS. This measure is computed as the FX - and break-adjusted change in a country's banking sector liabilities vis-a-vis banks in all other countries, net of the corresponding change in the banking sector's foreign assets, as a fraction of nominal GDP.[9]

Table 2 contains the summary statistics for the European sample. The two credit variables (in logs) have average values of 2.3 and 3.3, respectively, with a larger standard deviation for mortgages than for consumer loans. The heterogeneity across households is more distinct in net wealth than in income. The average age of household heads in our sample is 57 years, about 10 percent of households hold foreign citizenship, and one fifth are renters. Finally, the ratio of net bank inflows over GDP has an average value of 0.6 percent, ranging from -1.4 to 7.0 percent between the 5th and 95th percentile. In Table A3, we also present the summary statistics separately for more - and less exposed countries.

[9]Break-adjusted means that the BIS corrects cross-border flows for breaks in the reporting population and/or reporting methodology.

Table 2 Summary Statistics for European Households

Variable	Observations	Mean	SD	5th	95th
Ln(ConsLoans)	34,980	2.3	4.0	0.0	10.1
Ln(Mortgages)	34,980	3.3	5.1	0.0	12.2
Net wealth	34,980	12.1	1.9	8.3	14.6
Income	34,980	10.6	0.9	9.2	12.0
Renter	34,980	0.2	0.4	0	1
Age	34,980	57.1	15.3	31	81
Foreign	28,270	0.1	0.3	0	1
Bank flows	34,980	0.6	2.9	-1.4	7.0

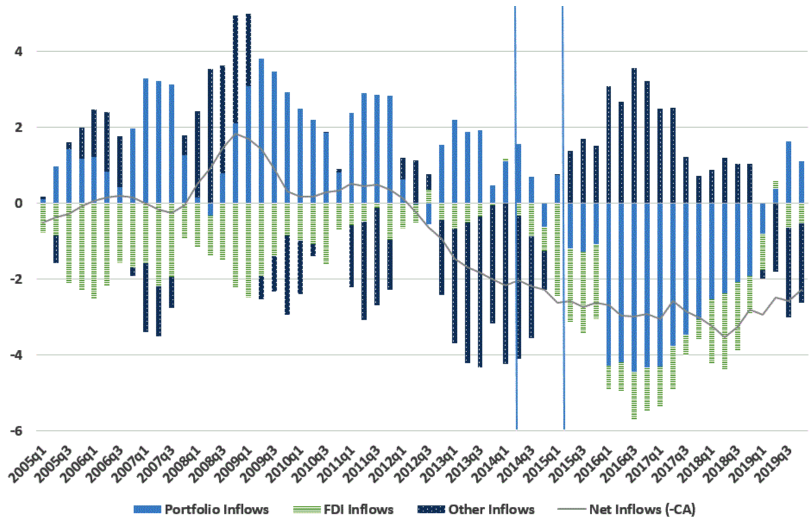
Note. The table reports summary statistics of the sample from the European Central Bank's Household Finance and Consumption Survey (HFCS). This contains household-level data from 22 European countries. The data set spans three periods: 2009-2011, 2013-2014, and 2016-2018. We exclude data from countries that do not conduct the surveys as a panel. Our final regression sample comprises data from Belgium, Cyprus, Germany, Finland, France, Italy and Spain. The summary statistics are reported for all households that are included in Table 9, column (1). We provide data definitions and sources in Section 2.2.

3 Cross-Border Bank Flow Dynamics

Figure 1 shows the dynamics of euro area net cross-border capital flows, as measured by the negative of the current account, broken down into net FDI, net portfolio investment, and net other investment inflows. The latter mainly comprises cross-border interbank credit. The figure shows that overall capital flows were persistently negative between 2011 and 2019. However, after the ECB's implementation of a negative rate policy in 2014:Q2 and its QE program in 2015:Q1, portfolio inflows as a percentage of GDP declined, and turned negative, while other investment inflows, including interbank inflows, increased substantially. These dynamics reflect that, as foreign investors sold euro-denominated government bonds to accommodate the ECB's asset purchase program (Bergant et al., 2020), the revenues from those asset sales provided new funds to euro area banks.

Figure 2, Panel A shows that when we break down the financial account using BIS-LBS data and instead use net cross-border bank inflow we obtain a similar pattern of higher inflows to banks located in the euro area. When we split net bank inflows into gross inflows and outflows, Panel B reveals that a change in gross inflows was driving the increase in net flows, i.e., banks located outside of the euro area expanded their interbank lending to

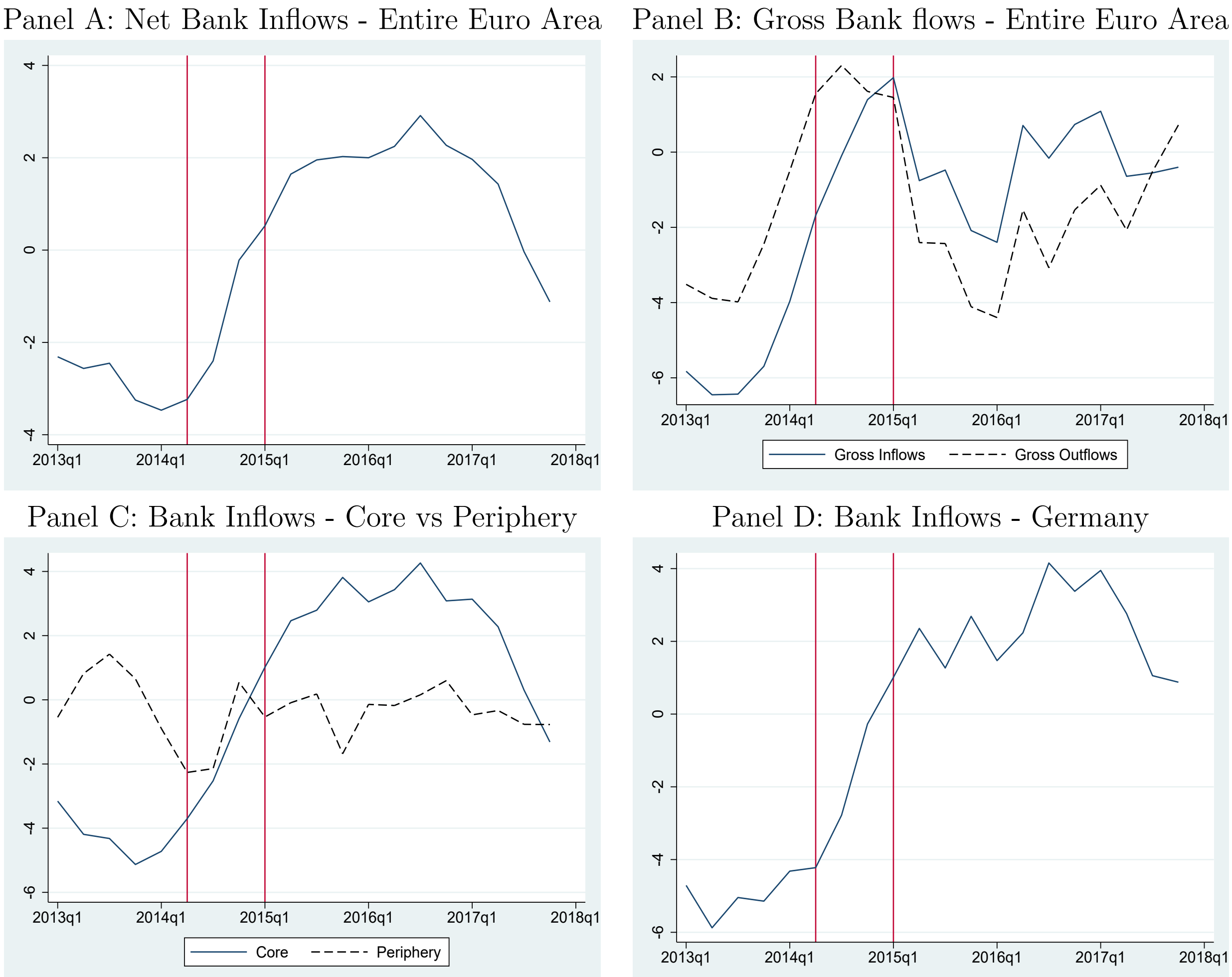
Figure 1 The Euro Area Financial Account



Note. This figure shows the euro area financial account, with the solid line being total net capital inflows (the negative of the current account), and the bars representing portfolio investment, FDI, and other investment inflows, respectively, all in net terms and as a percentage of euro area GDP. The flow variables are smoothed by using four-quarter moving averages before dividing by GDP. The vertical lines mark the implementation of negative rates in 2014:Q2 and of the ECB's QE program in 2015:Q1. Sources: BIS, ECB and FRED. See Data Appendix for details.

banks within the euro area. Panel C makes clear that countries in the core of the euro area weer the recipients of the growing inflows in 2015-17. Foreign investors were thus mainly providing cross-border funds to banks located in the north of the euro area that at the time were considered safer. Banks located in Germany saw bank inflows rising from minus six percent in 2013 to plus four percent in 2016 (Panel D). In our main regression specifications, we leverage this sharp increase in German bank inflows in a difference-in-differences setting that exploits the varying intensity with which these flows affect different banks. When we investigate the external validity of our results with data from the euro area, we exploit the cross-country variation in bank inflows in Panel C.

Figure 2 Bank Flows in the Euro Area



Note. This figure depicts the dynamics of net cross-border bank inflows in the euro area (Panel A), its breakdown into gross inflows and outflows (Panel B), net inflows separately for countries in the periphery (Cyprus, Greece, Ireland, Italy, Portugal, Spain) vs. core (all other countries) of the euro area (Panel C), and for Germany only (Panel D). Bank flows are scaled by nominal GDP and then smoothed by computing four-quarter moving averages. The vertical lines mark the implementation of negative rates in 2014:Q2 and of the ECB's QE program in 2015:Q1. Sources: Fred and BIS-LBS

4 Empirical Specification

4.1 German Benchmark Specification

In our benchmark specification, we use German survey data and identify the effect of cross-border bank flows on banks' lending to households by estimating a difference-in-differences model that exploits the increase in cross-border bank flows into Germany after the ECB's implementation of its negative interest rate policy and QE programs in 2014/15. Our regressions take the following form:

$$\Delta Y_{h,b,t} = \alpha_t + \alpha_h + \beta \cdot (\text{Post}_t \times \text{X}_{h,2014}) + \epsilon_{h,b,t}, \tag{1}$$

where Y represents either the logarithm of total mortgage or consumer loans of household h borrowing from bank b. The primary variable of interest is the interaction between the Post-dummy, which takes a value of one for the survey wave after the recovery of bank flows (wave 3) and zero otherwise, and various pre-inflow household characteristics. These controls include the logarithm of household income, as we are particularly interested in whether bank inflows induce an increased credit allocation towards low-income, riskier, households. We also control for the potential impact of several other household characteristics, by adding them to our specifications, interacted with the Post-dummy. Equation (1) also contains household and time fixed effects, denoted by α_h and α_t to control for unobserved household-specific, time-invariant characteristics and aggregate conditions that equally impact all households. The standard errors here and in the following specification are heteroskedasticity-robust, but clustering them at the country level leads to consistent results (not reported).

In a second step, our benchmark specification, we expand the regression by incorporating a triple interaction term involving the interaction between the Post-dummy, the various household characteristics, fixed at their pre-treatment levels, and a bank's initial NCFR.

The expanded equation takes the following form:

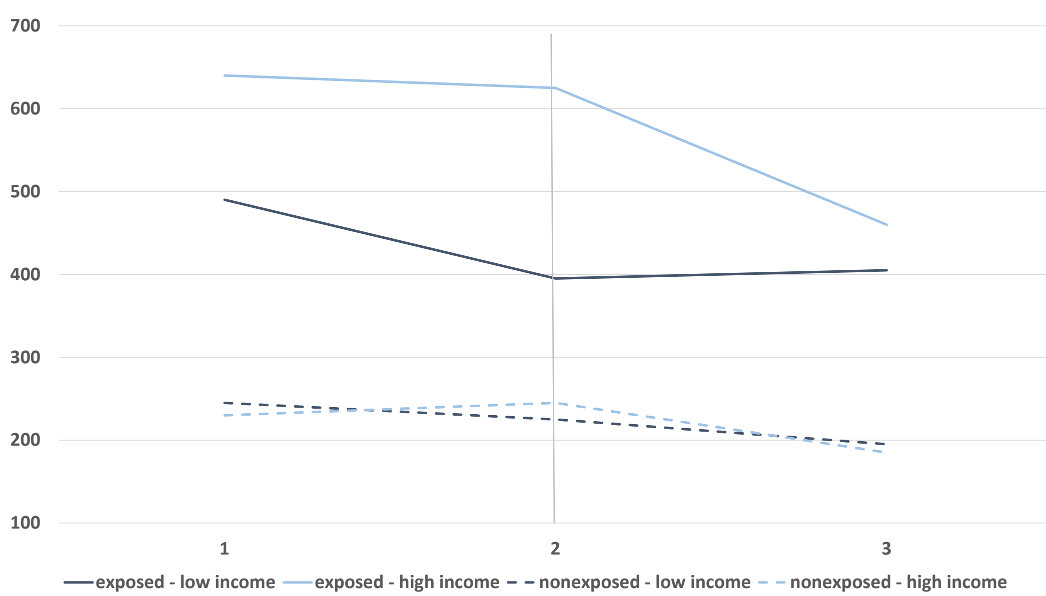
$$\Delta Y_{h,b,t} = \alpha_t + \alpha_h + \gamma \cdot (\text{Post}_t \times \text{Non-core}_{b,2014}) + \sigma \cdot (\text{Post}_t \times \text{X}_{h,2014}) +$$
$$\nu \cdot (\text{Non-core}_{b,2014} \times \text{X}_{h,2014}) + \omega \cdot (\text{Post}_t \times \text{X}_{h,2014} \times \text{Non-core}_{b,2014}) + \epsilon_{h,b,t}. \quad (2)$$

This will be our preferred specification because it enables us to explore whether cross-border bank flows induce *more exposed* banks to exhibit a heightened risk appetite in their lending practices towards households, where exposure is measured by banks' NCFR. This follows Baskaya et al. (2017), who show for Turkey that banks with greater NCFRs are more affected by cross-border flows than banks reliant on customer deposits. Our hypothesis is therefore that the coefficient ω is positive, i.e., banks expected to benefit more from the upswing in cross-border bank flows will increase their lending to risky households relative to other banks.

In our most saturated model specification, we not only include household and time fixed effects, but also include bankgroup-location-income-time fixed effects. Here bankgroup is either a savings or cooperative bank as a household's main relationship bank, location is one of the 401 administrative German regions, time is the wave number and income refers to the decile of the income distribution to which a household belongs. These fixed effects follow Degryse et al. (2019), who show that industry-location-size-time fixed effects control for loan demand in bank-firm relationships in a similar manner as Khwaja-Mian's firm-time fixed effects (Khwaja and Mian, 2008). Similarly, our bankgroup-location-income-time fixed effects intend to absorb any heterogeneity that is specific to a cluster of households in a certain region, with a certain bank group preference, of a specific income, at a particular point in time. By controlling for the bulk of households' changes in loan demand, our estimation will identify shifts in credit supply following cross-border bank inflows.

The central assumption underlying the difference-in-differences regressions is that, in the absence of cross-border bank flows, banks with a higher non-core dependence would have exhibited the same trend in lending behavior as banks with a lower dependence. To validate this assumption, as a first step, Figure 3 shows the time series dynamics of the logarithm of consumer credit—the outcome variable we find most affected by cross-border bank flows—for four distinct bank-household combinations: more (less) exposed banks and low (high) income households. As becomes clear from Figure 3, before the increase in bank inflows starting in 2015, more exposed banks, i.e., those with a NCFR in the upper 67% of the distribution, and less exposed ones (below the 33rd percentile) followed the same trends in lending to low-income households. After the increase in bank inflows, more exposed banks increase their consumer lending to these households, while less exposed banks don't. For high-income households, we see similar consumer credit dynamics independent of bank inflows and bank exposure. In Section 5.4, we will also estimate a proper placebo regression on a sample period without a surge in bank flows. When doing so our benchmark results disappear, providing further evidence in support of the parallel trend assumption.

Figure 3 PARALLEL TRENDS BEFORE THE BANK INFLOW SHOCK



NOTE. This figure shows the aggregate log of consumer credit volumes in our German final PHF sample for four distinct bank-household combinations: (i) low-income households (lowest 50%) and exposed banks (top 67% of non-core ratios); (ii) low-income households and less exposed banks (lowest 33%); (iii) high-income households (upper 50%) and exposed banks; (iv) high-income households and less exposed banks. The vertical line depicts the start of cross-border bank flows into Germany. Sources: PHF, Bundesbank Supervisory Data.

For the difference-in-differences estimates to be unbiased, the treatment status should be assigned randomly. When this condition is not satisfied, for example because banks' non-core ratio is correlated with other bank covariates, properly controlling for these other bank covariates will satisfy the conditional mean zero assumption and ensure one obtains unbiased estimates (Roberts and Whited, 2013). We therefore include a large set bank covariates fixed at their pre-inflow wave 2 level interacted with the Post dummy and the household characteristics in the matrix X. We show later on that the inclusion of these interactions has a negligible impact on our baseline estimates, suggesting that non-random treatment allocation does not pose a severe problem in our specifications.

4.2 External Validity: Euro Area Data

To show externally validity of our results, we also use data for nearly 18,000 households from seven euro area countries: Belgium, Cyprus, Finland, France, Germany, Italy, and Spain. As described in Section 2, the European data do not allow for a linkage between households and individual banks. This is why we cannot condition the effects of cross-border bank flows to household credit on banks' exposure to such flows, making identification much weaker in this part of the analysis.

Instead, these specifications use cross-country variation in the intensity of bank inflows. Specifically, we estimate the following regression:

$$\begin{aligned} Log(Y_{h,c,t}) = \alpha_t + \alpha_h + \zeta \cdot (\text{Post}_t \times \text{Bank Inflows}_{c,2016/17}) + \kappa \cdot (\text{Post}_t \times \text{X}_{h,2014}) + \\ \tau \cdot (\text{Post}_t \times \text{X}_{h,2014} \times \text{Bank Inflows}_{c,2016/17}) + \epsilon_{h,c,t}, \qquad (3) \end{aligned}$$

where *Log(Y)* is the logarithm of mortgage or consumer credit. In the euro area regressions, we define the outcome variables in log-levels instead of first differences as in the benchmark regressions. The latter definition requires data from at least three survey waves and lead to the exclusion of 6,000 observations from Finland and France. The matrix X with controls includes all variables of the benchmark regressions, apart from income expectations, which is missing in waves one and two of the HFCS survey. The Post dummy equals one for survey wave three, and zero otherwise.

Because we cannot lean on historical bank-level exposures to capital inflows, a key difference in the euro area regressions is that changes in credit now will depend on a *country's* net cross-border bank inflows as a share of GDP during 2016-17. The results from these regressions should therefore be treated as complementary, not as causal evidence. At the country-household level, we expect that larger bank inflows will also be associated with a stronger shift in credit towards riskier households. The regressions include household and wave fixed effects to control for heterogeneity across households and over time. Some specifications add country-wave fixed effects to better absorb loan demand shifts following cross-border bank flows. Standard errors are clustered at the country-wave level.

Importantly, the cross-country, cross-household regressions do help us establish that our benchmark results for Germany aren't driven by the adoption of negative rates or QE themselves, but instead work through relative changes in cross-border bank flows. Both monetary policy instruments were set equally across all euro area countries. The cross-country regressions enable us to disentangle bank inflow effects from monetary policy and investigate to what extent only countries encountering bank inflows experienced changes in the allocation of household-level credit, as we expect from the bank-household results for German households.

5 Empirical Findings: Credit Allocation

5.1 Benchmark Results for German Households

Here, we present our benchmark results corresponding to Equations 1 and 2. In Table 3, columns (1)-(2), we present the results for mortgage and consumer loans in specifications that only interact the Post-dummy with household income, for now disregarding banks' differential exposures to cross-border bank flows. After the bank inflow shock, low-income households have more consumer credit, while their mortgage credit volumes are unaffected. In columns (3)-(4), we take into account bank heterogeneity by interacting the Post-dummy not only with household income, but also the main bank's pre-shock NCFR. In line with our expectations, the double interaction between bank exposure and the Post-dummy is positive and statistically significant at the 1% level. In contrast, the triple interaction term has a negative coefficient estimate that is statistically significant at the 1% level, reflecting that more exposed banks raise their consumer lending, and disproportionately more to low-income households. In this triple interaction model, the coefficients on the post-income double interaction are not directly comparable to those of the double interaction model of columns (1)-(2). When we combine the direct treatment effect with the interaction term on income, we find that the marginal treatment effect on the supply of consumer credit turns negative for annual income levels exceeding about 66,000 euro, i.e., slightly more than the sample mean. Again, we do not find a significant effect for mortgage lending.

In columns (5)-(6), we run a horse race between the household income triple interaction term and the corresponding triple interactions with other household characteristics, whose coefficients are not shown in Table 3 for reasons of space. Our income triple interaction estimate maintains its significance and while the coefficient estimate increases somewhat, the increase is not statistically significant. Without affecting the allocation along the income dimension, credit allocation displays heterogeneity along a few other household characteristics following the rise in foreign bank inflows: younger households and those with lower income expectations receive more (consumer) credit. This means that not only households with lower past income but also those with lower income expectations for the future receive more credit, pointing to a reallocation of credit towards young households and those with structurally lower incomes.

Combining the estimates of columns (2) and (6), our results imply that a low-income household at the 25th percentile of the income distribution, relative to one at the 75th percentile, has on average a 51 pp higher consumer credit growth rate after the bank inflow shock. This growth rate even increases to 83 pp when this low-income household has its main relationship with a more exposed bank, defined as one at the 75th percentile of the non-core funding distribution.

In the most saturated specification, we add location-bankgroup-income-time fixed effects to better absorb, as we described in Section 4, changes in households' loan demand. The data demands of this specification lead to a substantial reduction in the number of observations. Although the uncertainty of our estimates rises somewhat as a result of this, columns (7)-(8) show that our main results are unaffected, and the size of the triple coefficient even increases by a magnitude of 10, which should not be overinterpreted as the additional fixed effects lead to a very special sample that mostly includes larger (urban) regions. In unreported regressions, we also used the log-difference in *total* outstanding household credit as outcome variable, summing up mortgages and consumer loans. There, the triple income interaction coefficient is also negative and significant when we use location-bankgroup-income-time fixed effects. The rise in consumer credit thus quantitatively dominates the dynamics of mortgage credit.

Overall, these results show that low-income households benefit most from cross-border bank inflows, especially when they have their main bank relationship with a bank that is more dependent on non-core funding. The rise in lending is completely driven by a change in consumer credit, not by mortgages. For this reason, we will focus on consumer loans as our main outcome variable of interest in the remainder of this paper. Results for mortgage credit are available upon request. Our findings deepen our understanding of earlier work showing that banks increase risk-taking after significant cross-border capital inflows. We contribute to this literature by establishing that a similar mechanism exists for consumer credit at the bank-household level, and complement earlier work at the bank- and bank-firm level.

Table 3 The Effect of Cross-Border Bank Flows on Credit Allocation: Benchmark Results

	(1) ΔMortgages	(2) ΔConsLoans	(3) ΔMortgages	(4) ΔConsLoans	(5) ΔMortgages	(6) ΔConsLoans	(7) ΔMortgages	(8) ΔConsLoans
Post × Non-Core			-34.64	138.4***	-23.40	208.4***		
			(68.83)	(48.59)	(89.88)	(61.81)		
Post × Income	-19.95	-40.75**	-85.02	93.00	-98.48	153.2*	-90.63	1,565*
	(21.81)	(19.74)	(97.65)	(62.62)	(123.1)	(83.48)	(1,130)	(931.8)
Post × Income × Non-Core			3.735	-12.60***	2.520	-18.78***	-4.634	-138.4*
			(6.467)	(4.514)	(8.271)	(5.875)	(83.68)	(71.24)
Other Household Controls Interacted	No	No	No	No	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Bankgroup-location-income-time FE	No	No	No	No	No	No	Yes	Yes
Obs	3,056	3,056	1,536	1,536	1,536	1,536	528	528
R^2	0.366	0.290	0.372	0.286	0.385	0.297	0.711	0.690

Note. Regressions are based on the PHF data. Bank exposure variables are from Bista and GuV. Dependent variables are household-level changes in the logarithm of mortgage or consumer credit. Main regressors are interactions between a Post-dummy equalling to one for the third wave of the PHF survey, zero otherwise, and the following household-level variables fixed at their wave 2 value: log(income), log(net wealth), a dummy indicating if a household rents its main residence, age of the household head, a dummy for foreign citizenship, and income expectations. Columns (3)-(8) also include triple interactions between the Post dummy, the aforementioned household characteristics and bank-level NCFRs from survey wave 2, where for reasons of space only the coefficients corresponding to the income triple interaction coefficient and its components are shown. Data details can be found in Table A1. Regressions include time and household fixed effects; columns (7)-(8) add bankgroup-location-income-time fixed effects. Heteroscedasticity-robust standard errors in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels.

5.2 Robustness Checks

We next present the results of several robustness checks. First we investigate if access to securities markets is crucial for the transmission of shocks to capital inflows. Much of the earlier research on cross-border bank flows has, for natural reasons, focused on global or at least large international banks. We want to understand if the effects we identify crucially hinge on smaller regional banks having similar access to securities markets. We therefore generate two alternative measures of banks' exposure to cross-border flows, namely their gross *interbank* dependency ratio, defined as total interbank borrowing over total assets, and net interbank dependency ratio. Table 4, column (1) shows that our benchmark results are highly robust to excluding money market and debt securities funding from non-core funding. When capital inflows rise, as during the 2015-2017 period, foreign capital reaches banks not only through securities markets but also directly through interbank markets. Column (2) indicates that the strength of the transmission of foreign shocks will depend on banks' net exposure to cross-border interbank funding.

Our analysis relies on exploiting the unique regional role of savings - and cooperative banks. Although we have no regional credit data available, the local market shares of savings and cooperative banks will typically be larger in rural areas. Larger, commercial banks have a greater office presence in urban areas, likely implying a smaller market share for regional banks. If switching behavior is important and large banks are differently affected by the capital inflows than regional banks, we expect our findings to be weakened in urban areas. In columns (3) and (4), we therefore split the sample into banks located in urban areas (Stadtkreise) or rural areas (Landkreise). Consistent with our prior, our benchmark results are highly robust in rural areas. In urban areas, our results are less conclusive because the triple interaction estimate is still negative and quantitatively almost identical to that in rural areas, but not statistically significant, which could be driven by the substantially smaller sample size in this specification. The smaller sample implies that households in urban areas often have credit relationships with large, commercial banks. As these are not

Table 4 ALTERNATIVE BANK EXPOSURE MEASURES, RURAL VS URBAN REGIONS, ALTERNATIVE DEFINITION OF CREDIT

	(1) Gross Exposure	(2) Net Exposure	(3) Urban	(4) Rural	(5) IHS Credit
Post × Income	105.2	-46.65	101.7	98.68	168.1*
	(79.99)	(39.74)	(130.8)	(108.0)	(90.47)
Post × Bank Exp.	197.4***	107.0**	190.8	132.5*	227.0***
	(64.02)	(46.22)	(118.2)	(78.45)	(67.08)
Post × Income × Bank Exp.	-16.23***	-9.731**	-15.08	-14.82**	-20.49***
	(6.071)	(4.549)	(10.32)	(7.276)	(6.361)
Household FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Obs	1,536	1,536	458	1,062	1,536
R^2	0.454	0.545	0.333	0.295	0.295

NOTE. The dependent variable is the household-level change in the logarithm of consumer credit (columns 1-4) or the change in IHS transformed consumer credit(column 5). IHS is the inverse hyperbolic sine ("arcsinh") transformation as in Bellemare and Wichman (2020). These regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The main regressors are the triple interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, bank-level exposure to cross-border flows measured in wave 2, and the following household-level characteristics fixed at the wave 2 value: log of income, log of net wealth, a dummy measuring whether a household rents the main residence, age of the household head, a dummy measuring whether a household has a migrant background, and income expectations. The bank exposure variable is the NCFR in columns (3)-(5), and the gross and net interbank liabilities, respectively, in columns (1)-(2). Most interaction estimates are not displayed to conserve space. In columns (3) and (4), we split the sample into urban and rural regions. Data details can be found in Table A1. The regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

part of our dataset, it might be the case that the transmission in urban areas is similar to that in rural areas, but our empirical setting just does not allow for its identification.

To check the sensitivity of our findings to the particular definition of credit growth, we next employ an alternative transformation of our main outcome variable, the inverse hyperbolic sine, that allows for including zero values. Column (5) shows that doing so has no effect on the significance of our coefficient estimates.[10]

[10] Instead of computing the outcome variable as $\Delta log(1+x)$ so as to keep zero-valued observations, we apply an inverse hyperbolic sine ("arcsinh") transformation before computing the difference in consumer credit volumes between the different waves. This follows Bellemare and Wichman (2020), who argue that it both approximates the natural logarithm and is defined at zero.

As mentioned earlier, we only observe a household's main bank in the two pre-inflow waves. Our empirical strategy thus implicitly assumes that an unobserved rise in switching behavior from regional to national banks, possibly with a greater lending capacity, between waves two and three is not driving our findings. Generally, German households are very loyal to their banks; only 117 households, i.e., seven percent, change their main bank between the first and second wave. We therefore do not expect a large number of households to switch their main bank between the second and third waves. To mitigate any residual concerns for an unobservable switching effect, we test if households with a greater tendency to switch in "normal" times are driving our main findings. In Table 5, we therefore drop all households that changed their main bank between waves one and two and re-estimate our benchmark regression. Column (1) shows this reduces the size of our measured effect somewhat but maintains the significance of our coefficient.

In columns (2) and (3), we conduct two additional sensitivity tests of our benchmark findings that in a more granular way control for potential shifts in the demand for credit. In column (2), we exclude households that were unemployed before the capital inflows from the estimation of Equation 2, while in column (3) we exclude self-employed households. Unemployed households are more likely to have little or no consumer credit to start with and may therefore be more inclined to experience a rise in credit if they, for example, find employment as the rise in foreign bank inflows occurs. Their inclusion in the benchmark regressions may consequently bias our coefficient estimate towards finding a significant effect on household credit. Column (2) of Table 5 shows that this is an unwarranted concern as the coefficient estimate is more or less unchanged when unemployed are excluded from the regression. Self-employed households, on the other hand, might may experience a bigger rise in credit in the post-inflow period if the inflows boosted general economic activity and generated an increase in the demand for credit that we didn't capture with our fixed effects. This could also bias our regressions towards finding a significant effect on lending to households. In column (3) we exclude these self-employed households and see the coefficient of interest on the triple

Table 5 Excluding Bank Switchers and Other Income

	(1) No switchers	(2) No UI	(3) No self-employed
Post × Income	102.1	61.39	188.8*
	(88.29)	(100.4)	(101.3)
Post × Non-Core	172.1***	157.5**	202.9***
	(64.04)	(71.87)	(68.99)
Post × Income × Non-Core	-11.56*	-15.25**	-20.06***
	(6.278)	(7.244)	(6.673)
Household FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Obs	1,302	1,264	1,090
R^2	0.311	0.306	0.308

Note. The dependent variable is the household-level change in the logarithm of consumer credit volumes. These regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The main regressors are the triple interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, bank-level NCFRs measured in wave 2, and the following household-level characteristics fixed at the wave 2 value: log of income, log of net wealth, a dummy measuring whether a household rents the main residence, age of the household head, a dummy measuring whether a household has a migrant background, and income expectations. Most interaction estimates are not displayed to conserve space. In column (1), we drop households that switched their main bank between wave 1 and 2. Column (2) drops unemployed, column (3) drops self-employed households. Data details can be found in Table A1. The regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

interaction term remains negative and significant at the 1% level.

As mentioned, our bank-level analysis relies on households obtaining their loans from their main relationship bank. We base this assumption on Puri et al. (2017), who find that German households have very strong relationships with their savings banks. They show that more than 80 % of loan applicants have been customers for at least five years. Previous bank–depositor relationships also increase access to uncollateralized credit, such as consumer loans. To provide further support for this notion, we further restrict our sample and run separate regressions for relatively older households, i.e. those who are likely to have longer bank relationships. Columns (1) and (2) of Table 6 confirm that when we restrict our sample to households aged 30 years or more, and 40 years or more, respectively, our coefficient estimates are nearly the same as in the benchmark regressions.

Table 6 Heterogeneity: Relationship length, discarding non-bank credit

	(1) Age $\geq$ 30	(2) Age $\geq$ 40	(3) No student loans	(4) Formal credit
Post × Income	160.0*	88.31	97.10	99.37
	(84.31)	(86.97)	(85.11)	(85.25)
Post × Non-Core	178.7***	150.1**	150.2**	152.4**
	(61.97)	(68.23)	(64.52)	(64.65)
Post × Income × Non-Core	-18.65***	-14.56**	-15.15**	-15.27**
	(5.884)	(6.069)	(5.921)	(5.926)
Household FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Obs	1,488	1,380	1,536	1,534
R^2	0.295	0.308	0.313	0.313

Note. The dependent variable is the household-level change in the logarithm of consumer credit. Regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The main regressors are the triple interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, bank-level NCFRs measured in wave 2, and the following household-level characteristics fixed at the wave 2 value: log(income), log(net wealth), a dummy for households renting their main residence, age of the household head, a dummy for foreign citizenship, and income expectations. Most interaction estimates are suppressed to conserve space. In columns (1) and (2), we drop households aged below 30 or 40, respectively. Columns (3) and (4) use a tighter definition of consumer credit, excluding student loans and loans from friends. Data details can be found in Table A1. Time and household fixed effects are included. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level.

Finally, we account for the fact that some sources of credit are unaffected by fluctuations in cross-border bank funding. The PHF's definition of consumer loans includes consumer installment loans, bank overdrafts, credit card debt, loans from friends or employers, and student loans. As the latter two components are independent of bank loan supply, we redefine consumer credit in a stricter sense by excluding loans from friends or employers, and student loans. Because the PHF, unfortunately, combines consumer installment loans and employer loans into one variable, we exclude only student loans in column (3). In column (4), we then remove households with loans from their employer. Either change of the sample has virtually no effect on the estimated coefficient, although the significance level is slightly reduced as the sample size shrinks.

5.3 Non-Random Treatment

A potential threat to our main regressions is that banks' exposure to cross-border flows may not be distributed randomly. While not shown here, we find that non-core ratios have a small but statistically significant correlation with several bank characteristics, such as size and capitalization. As explained in Section 4.1, controlling for these bank covariates will increase the likelihood that the conditional mean zero assumption is satisfied and we hence produce unbiased estimates (Roberts and Whited, 2013). To this end, we next run several additional regressions that control for the triple interactions between a rich set of bank covariates, fixed at their pre-inflow wave 2 values, the Post dummy and our household covariates. Column (1) of Table 7 shows that their inclusion changes neither the size nor significance of our coefficient of interest. While we do not report the coefficients on the additional interaction terms in Table 7, most of them are statistically insignificant. We do find, however, that following the bank inflow shock, better capitalized banks increase consumer lending to younger, high-net worth households and those with foreign citizenship.

5.4 Placebo Test

In Section 4.1 we performed a first check of the parallel trends assumption. Figure 3 indicated that more and less exposed banks have similar lending patterns until 2014 and diverged, particularly for lending to lower income households, from the moment when bank flows into Germany started rising in 2014. In an ideal setting, our survey data would contain a long pre-treatment time series for each household to verify if the parallel trends assumption is satisfied. We instead provide further support for the parallel trends assumption by running several placebo regressions. The first one estimates equation 2 on a pre-inflow sample. For this, we re-run our benchmark regression while restricting the data to the first (2010-2011) and second (2014) survey waves. With only two sample waves, we cannot compute the outcome

Table 7 Non-Random Bank Treatment and Placebo Tests

	(1) Triple bank interactions Δ Ln(ConsLoans)	(2) Benchmark Ln(ConsLoans)	(3) Placebo Ln(Consloans)
Post × Income	921.4	0.0301	-0.0729
	(594.3)	(0.386)	(0.500)
Post × Non-Core	203.7***	0.427	0.180
	(70.01)	(0.283)	(0.307)
Post × Income × Non-Core	-17.73**	-0.0453*	0.0163
	(6.986)	(0.0275)	(0.0322)
Household FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Other Bank Interactions	Yes	No	No
Obs	1,534	2,910	1,958
R^2	0.328	0.702	0.694

Note. These regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The dependent variable is the household-level change in the logarithm of consumer credit volumes (column 1) or the logarithm of consumer credit volumes (columns 2-3). The main regressors are the triple interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, bank-level NCFRs measured in wave 2, and the following household-level characteristics fixed at the wave 2 value: log of income, log of net wealth, a dummy measuring whether a household rents the main residence, age of the household head, a dummy measuring whether a household has a migrant background, and income expectations. In column (1), we control for the corresponding triple interactions between the Post-dummy, the aforementioned household characteristics, and the following additional bank covariates: bank size, capitalization, liquidity, and return on assets. Most interaction estimates are not displayed to conserve space. Data details can be found in Table A1. The regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

variable in log-differences and therefore instead use the logarithm of consumer credit as the dependent variable. In column (2), we first rerun the benchmark regression for the log of consumer credit on the benchmark data sample to confirm we obtain the same main results with this alternative transformation of the credit variable. Then, we estimate that regression specification on the *pre-inflow* sample. Column (3) shows that in this placebo regression, the difference in lending patterns between more and less exposed banks disappears, providing further support for the parallel trend assumption, i.e., that affected and unaffected banks were following similar paths in lending before the sudden rise in international bank inflows.

Next, we perform two additional sets of placebo regressions to re-confirm that the affected and unaffected banks displayed similar lending trends before the bank inflow shock. First, we run our benchmark regression with the log-change in consumer credit as outcome variable but use a placebo bank exposure variable, the bank-level share of tangible fixed assets over total assets. Cross-border bank inflows furnish banks that are dependent on non-core funding with additional liquidity, irrespective of how banks' asset side is structured, and in particular independently of the share of a bank's tangible assets. We therefore expect this regression to produce insignificant treatment effects. Column (1) of Table 8 confirms that the supply of consumer credit by "placebo-treated" and "untreated" evolves equally, providing further support in favor of the banks in our sample following parallel pre-trends.

Second, instead of using a placebo treatment variable, we replace the dependent variable with outcomes that should be unrelated to cross-border bank flows. For this we use five household-level variables: growth in income, the growth of net worth, the change in the share of stocks in the asset portfolio, the change in the share of housing in total assets, and the change in housing tenure status. Columns (2)-(6) show for each of these regressions that the triple interaction coefficient on post x income x NCFR is statistically insignificant. Households with relationships with more or less exposed banks do not have diverging dynamics in placebo outcomes, again providing support in favor of the banks in our sample following parallel trends.

5.5 External Validity: Euro Area Households

So far, we have established that German households benefited from a rise in cross-border bank inflows. In this section, we show that our main findings have external validity in a larger data set for households from seven euro area countries. As explained above, these data do not contain a link between households and their banks. We therefore focus on the effect of cross-border bank inflows on credit volumes, without distinguishing between more and less exposed banks. Instead, we measure households' exposure by means of *country*-level bank inflows over GDP, as displayed in Figure 2.

In Table 9, we present evidence that even other euro area economies than Germany

Table 8 ADDITIONAL PLACEBO TESTS

	(1) Δ Ln(ConsLoans)	(2) Δ Ln(Income)	(3) Δ Ln(NetWorth)	(4) Δ Stocks	(5) Δ Housing	(6) Δ Tenure
Post × Income	37.17	19.60**	-21.92	-0.306	3.206	-0.0959***
	(26.28)	(8.014)	(15.62)	(0.37)	(3.1)	(0.0366)
Post × Tangible	-162.3					
	(586.6)					
Post × Income × Tangible	32.72					
	(47.54)					
Post × Non-Core		-1.698	-6.521	0.49	-0.0647	-0.0004
		(12.84)	(17.18)	(0.85)	(4.993)	(0.0482)
Post × Income × Non-Core		0.5	2.443	-0.0769	0.161	-0.0026
		(1.191)	(1.534)	(0.0731)	(0.471)	(0.0044)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,536	1,494	1,468	1,536	1,536	1,536
R^2	0.29	0.541	0.462	0.383	0.39	0.5

NOTE. These regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The dependent variable is the household-level change in the logarithm of consumer credit volumes (column 1), the log-change in income (column 2), the log-change in net worth (clumn 3), the change in the share of stocks over a household's total portfolio value (column 4), the change in the share of housing wealth over the total portfolio value (column 5) and the change in a household's housing tenure status (column 6). When a household reports zero stock or housing wealth, we set the portfolio share equal to zero. Housing tenure equals 1 when a household first rents the main residence and then owns it; zero when tenure status does not change; minus one when a household first owns and then rents its main residence. The main regressors are the triple interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, bank-level tangible fixed assets over total assets (column 1) or bank-level NCFRs (columns 2-6) measured in wave 2, and the following household-level characteristics fixed at the wave 2 value: log of income, log of net wealth, a dummy measuring whether a household rents the main residence, age of the household head, a dummy measuring whether a household has a migrant background, and income expectations. Most interaction estimates are not displayed to conserve space. Data details can be found in Table A1. The regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

experienced a rise consumer credit to low-income households as cross-border bank flows into these countries grew. In column (1) we estimate Equation 3 on the largest possible dataset - by excluding the foreign citizenship dummy that is missing for Spain. Consumer credit to low-income households increases significantly in countries that experience greater cross-border bank inflows, as can be seen from the implied t-statistics for the triple interaction post x country-level bank inflows x household income.

Our coefficient of interest is essentially unaffected when we make the set of controls as similar as possible to that in our regressions for Germany, and include the foreign citizenship dummy (column 2) as well as country-time fixed effects (column 3). In column (4), we only include the log income triple interactions and leave out all other household interactions, and still obtain a significant coefficient estimate. The same holds when, in column (5), we remove the 5,546 German households that were included in columns (1)-(4). In column (6), for completeness, we finally use the log of mortgage credit volumes as the outcome variable. Again, in line with our German benchmark results, we do not see a shift in *mortgage* credit across households.

Taken together, the results in Table 9 provide evidence that other euro area countries exhibited a similar rise of consumer credit towards low-income households in response to the inflow of foreign bank funding. The results also demonstrate that the findings for German households weren't driven by the ECB's non-conventional monetary policy itself as euro area countries faced the same monetary policy mix. Only euro area countries subject to greater bank inflows experienced a shift in consumer credit towards low-income households.

6 Mechanisms

In this section, we identify the mechanisms underlying our results. We start by examining to what extent our results are driven by regional banks obtaining interbank liquidity from abroad directly, or whether cross-border interbank liquidity trickles down to regional German banks through large banks. Next, we study the extensive versus the intensive margin of lending. Finally, we investigate why banks especially raise their consumer loan supply to low-income, higher-risk households, focusing in particular on the role of bank agency problems.

6.1 Direct or Indirect Transmission?

So far, we have only shown that regional banks dependent on non-core funding raise their consumer lending to low-income households. This could be driven through a direct access to foreign wholesale liquidity by means of a trickle down effect, where larger banks attract

Table 9 RESULTS FOR THE EUROPEAN HOUSEHOLD SAMPLE

	(1) Ln(ConsLoans)	(2) Ln(ConsLoans)	(3) Ln(ConsLoans)	(4) Ln(ConsLoans)	(5) Ln(ConsLoans)	(6) Ln(Mortgages)
Post × Income	-0.197**	-0.134**	-0.122**	-0.089*	-0.170*	-0.059
	(0.08)	(0.05)	(0.04)	(0.04)	(0.08)	(0.01)
Post × Income × Flows	-0.034*	-0.027*	-0.035**	-0.025***	-0.026	-0.019
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-Time FE	No	No	Yes	No	No	No
Household Controls × Post × Flows	Yes	Yes	Yes	No	Yes	Yes
Obs	34,980	28,270	34,980	35,034	29,434	34,980
No. of Countries	7	6	7	7	6	7
R^2	0.726	0.735	0.727	0.725	0.727	0.873

Note: The regressions are based on waves 2 and 3 of the HFCS survey. The dependent variable in columns (1)-(5) is the logarithm of consumer loans. In column (6), it is the logarithm of mortgages. The main regressor is country-level net bank inflows over nominal GDP, averaged during 2016-2017, and interacted with household-level income measured in wave 2 as well as a dummy equal to one after the significant change in bank flows (wave 3), zero otherwise. All columns, apart from column (4), include time and household fixed effects and the following household controls, measured in wave 2, interacted with the Post-dummy and country-level bank flows: net worth, age, and a renter dummy. Only column (2) includes a dummy for foreign citizenship. All these interactions, as well as all lower-order interactions of the triple interactions, are included in all regressions unless they are absorbed by fixed effects, but we suppress their coefficients to save space. Column (3) additionally controls for country-time fixed effects. Standard errors, clustered at the country-time level, are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

cross-border bank inflows and pass on their liquidity ”surplus” to smaller banks.

Here, we disentangle both effects by exploiting the granularity of the supervisory data, which allows us to break down interbank deposits - the largest component of banks' non-core funding - into its domestic, euro area, and non-euro area parts.[11] If our benchmark results arise from a trickle-down mechanism, we should expect the triple interaction with domestic interbank deposits to be significant, but not those for the foreign components. In contrast, if a direct pass-through from foreign to regional banks is behind our results, the foreign interbank deposit interactions should be significant.

Columns (1) - (3) of Table 10 show that the coefficients on both domestic and non-euro area interbank deposits are statistically significant, but that on within-euro area interbank deposits is not. Economically, the impact of non-euro interbank deposits on bank lending to low-income households dominates that of German interbank deposits; the normalized coefficient on non-euro area deposits is five times that of German interbank deposits. Our benchmark results are thus mostly driven by direct deposits of non-euro area banks at regional German banks, but are amplified through a trickling down of funds deposited at large, nationally active banks. The supervisory data available to us restrict our analysis to the inflows and outflows at German banks. We are therefore unable to further examine why flows of euro area interbank deposits into Germany played no role of significance in the transmission mechanism. Euro area banks only accounted for 14% of the inflows into Germany during 2015-2017. Instead, inflows from the UK into Germany were on average eight times larger than those from France and seven times larger than flows from the Netherlands. This may, for example, reflect the depth of large global, non-euro area, banks' relations into the German banking system or regional portfolio preferences.

[11] This breakdown is not available for the other variables used in the construction of non-core ratios. We standardize all three variables by subtracting the mean and dividing by the standard deviation to make the associated results comparable to each other.

Table 10 Mechanisms: Funding Sources, Extensive Margin and Bank Capital

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
						Low-Cap	High-Cap
	ΔLn(ConsLoans)	ΔLn(ConsLoans)	ΔLn(ConsLoans)	Prob(NewLoan)	Prob(MoreCred)	ΔLn(ConsLoans)	ΔLn(ConsLoans)
Post × Income	-96.06**	-94.01**	-117.8***	3.01	-1.73	293.3***	-39.55
	(40.56)	(41.26)	(41.96)	(5.27)	(5.13)	(72.58)	(155.7)
Post × Exp.				6.31*	0.718	235.3***	143.4
				(3.82)	(3.55)	(72.58)	(117.2)
Post × Income × DE Exp.	-90.06***						
	(34.78)						
Post × Income × EA exp.		-67.8					
		(62.75)					
Post × Income × Non-EA exp.			-521.4**				
			(236.9)				
Post × Income × Exp.				-0.607*	0.00	-26.29***	-6.630
				(0.362)	(0.364)	(6.907)	(11.55)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,536	1,536	1,536	1,502	1,502	784	752
R^2	0.296	0.289	0.291	0.454	0.545	0.333	0.295

Note. Regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The dependent variable is the household-level change in the logarithm of consumer credit volumes (columns 1-3, 6-7), a dummy equal to one when a household had zero consumer credit in the pre-period, but a positive value in the post-period (column 4), and a dummy equal to one when a household had positive consumer credit in the pre-period and consumer credit was higher in the post-period (column 5). Coefficients in columns (4-5) have been multiplied x100 and thus reflect marginal changes in the percentage probability of granting credit. The main regressors are the triple interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, bank-level exposure measured in wave 2, and the following household-level characteristics fixed at the wave 2 value: log of income, log of net wealth, a dummy equal to one if a household rents the main residence, age of the household head, a dummy measuring if a household head has foreign citizenship, and income expectations. Most interaction estimates are not displayed to conserve space. As measure of exposure, column (1) uses a bank's domestic interbank deposit ratio, column (2) a bank's euro area interbank deposit ratio, column (3) a bank's non-euro area interbank deposit ratio and columns (4)-(7) the NCFR. In columns (6) and (7), we split the sample into low-capitalized banks (below median) and well-capitalized ones (above median). Data details are available in Table A1. The regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

6.2 Intensive versus Extensive Margin

Next, we investigate to what extent our key result that more exposed banks raise consumer lending to low-income households is driven through changes in the intensive or extensive margin of lending. For this purpose, we compute the credit variables as (i) a dummy that equals one if consumer loans were zero in the pre-inflow period and positive during the period of large inflows, and zero otherwise, and (ii) a second dummy equalling one if consumer loans were already positive in the pre-period but grew during the post-period, and zero otherwise. We then run regressions on these dummy variables using OLS. Table 10, column (4), shows that more exposed banks expand their lending to low-income households along the extensive margin. The coefficient estimate on the triple interaction term is negative, as before, and statistically significant at the 10% level. The estimate implies that treated relative to non-treated banks are 4.4% more likely to give credit to new borrowers at the 75th percentile of the income distribution than to borrowers at the 25th percentile of the income distribution. We obtain similar results when we employ a probit or logit model. The extensive margin thus plays an important role for the overall rise in credit, which suggests that households with initially limited access to credit experienced a loosening of such constraints following the rise in bank inflows. The intensive margin, in contrast, does not play a role, as the insignificant estimate in column (5) shows.

6.3 Bank Capitalization

Why do more exposed banks raise their consumer lending to higher-risk and not to lower-risk borrowers. The extant literature on the risk-taking channel of both monetary policy - and capital flow transmission finds that poorly capitalized banks tend to engage (more) in riskier lending (e.g., Jiménez et al., 2014; Altavilla et al., 2020; Dinger and Te Kaat, 2020; Te Kaat, 2021). The theoretical rationale underlying this empirical result is that bank agency problems become more severe as banks' capitalization falls, because banks do not fully internalize the consequences of a potential default. As a consequence, they are less likely to screen and monitor borrowers intensively (Holmstrom and Tirole, 1997). We therefore examine if our main results are driven by banks with poor capitalization. To this end, we re-estimate our benchmark regression on two sub-samples: one that consists of banks with a capital-to-asset ratio below the in-sample median and another that is composed of above-median banks.

Columns (6) and (7) of Table 10 show that only poorly capitalized banks more exposed to cross-border flows raise their consumer lending to low-income households after the bank inflow shock. The coefficient estimate is 1.5-2 times as large as our benchmark estimate in Table 3, implying a credit growth differential between low- and high-income households of 189 pp when they borrow from a more relative to a less exposed bank. In contrast, for the sub-sample of well-capitalized banks, we do not find a shift in more exposed banks' consumer lending towards low-income households. Our analysis thus documents that the transmission of foreign capital inflow shocks to households through bank funding follows a similar risk-taking channel as earlier research has reported for monetary policy transmission and firm funding.

7 Real Effects of Local Credit Booms

Having established that German households experienced a growth in their consumer credit following a rise in cross-border bank inflows, we next investigate the real effects of households' improved credit access. Particularly, we are interested in understanding if households that benefit more from the increase in consumer lending raise their consumption relative to other households. To this end, we re-estimate equation 2 using the logarithm of non-durable or durable consumption as outcome variable. For expenses on non-durable consumption, we can further differentiate between two distinct components: expenses on food and drinks at home, or, alternatively, outside households' home. We will hereafter refer to these categories as "food" and "restaurant".

Table 11 Bank Flows, Credit and Consumption Effects

	(1) Non-durable	(2) Durable	(3) Food	(4) Restaurant
Post × Income	-0.0411	-0.0151	-0.0158	-0.134
	(0.0251)	(0.0677)	(0.0203)	(0.0839)
Household FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Obs	2,910	2,674	2,910	2,910
R^2	0.741	0.654	0.813	0.772

Note. Regressions are based on the PHF data. Bank exposure variables originate from Bista and GuV. The dependent variable is the household-level logarithm of durable, non-durable, food and restaurant consumption. The main regressors are double interactions between a Post-dummy equalling one for wave 3 of the PHF survey, zero otherwise, and the following household-level variables fixed at the wave 2 value: log (income), log(net wealth), a dummy for households rent their main residence, age of the household head, a dummy foreign citizenship, and income expectations. Most interaction estimates are suppressed to conserve space. Data details can be found in Table A1. Regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels.

In Table 11 we first look at a plain regression that highlights treatment effects by household income. Then, in Table 12 we split our sample into households borrowing from banks with low versus high NCF ratios to determine if changes in consumption occur across the board or only among households related to more exposed banks. All regressions include household and time fixed effects, as well as household controls interacted with the Post-dummy. Table 11 shows that low-income households indeed increase consumption expenditures following the bank inflow shock. The coefficient estimates are weakly identified, however, and not statistically significant. This is consistent with our findings in Table 3 where we demonstrated that only low-income households borrowing from exposed banks experienced a rise in credit.

We therefore proceed by splitting the sample into households borrowing from more and less exposed exposed banks, i.e., with higher and lower non-core ratios. Columns (1)-(4) in Table 12 show that households borrowing from less exposed banks do not increase consumption. Low-income households banking with more exposed credit providers do however

Table 12 BANK FLOWS AND CONSUMPTION: DISTINGUISHING BY BANK EXPOSURE

	Less Exposed Banks				More Exposed Banks			
	(1) Non-durable	(2) Durable	(3) Food	(4) Restaurant	(5) Non-durable	(6) Durable	(7) Food	(8) Restaurant
Post × Income	-0.0225	-0.0320	0.00984	-0.0500	-0.0553*	-0.00768	-0.0316	-0.177*
	(0.0383)	(0.119)	(0.0330)	(0.158)	(0.0322)	(0.0815)	(0.0254)	(0.0992)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	950	874	950	950	1,960	1,800	1,960	1,960
R^2	0.751	0.680	0.838	0.781	0.738	0.648	0.803	0.769

NOTE. The dependent variable is the household-level logarithm of durable, non-durable, food and restaurant consumption. The main regressors are the double interactions between a Post-dummy equal to one for the third wave of the PHF survey, zero otherwise, and the following household-level characteristics fixed at the wave 2 value: log of income, log of net wealth, a dummy measuring whether a household rents the main residence, age of the household head, a dummy measuring whether a household has a migrant background, and income expectations. Most interaction estimates are not displayed to conserve space. Data details can be found in Table A1. In columns (1)-(4), we focus on households having their main relationship with a less exposed bank (lowest 33% of non-core distribution) and in columns (5)-(8), we focus on more exposed banks (upper 67%). The regressions include time and household fixed effects. Heteroscedasticity-robust standard errors are shown in parentheses. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

add to their non-durable consumption, particularly food and beverages consumed outside the home (columns (5)-(8)), although the coefficients in columns (1)-(4) are not statistically different from those in columns (5)-(8). Durable consumption by low-income households, on the other hand, is not affected by bank inflows. The effect on non-durable consumption is not only statistically, but also economically significant. After the shock, a low-income household, i.e., at the 25th percentile of the income distribution, has a 28.7% higher consumption of non-durables relative to their pre-inflow consumption and relative to a higher-income household, i.e. at the 75th percentile of the income distribution.

Overall, these findings provide valuable insights about the effects of international capital flows. While cross-border bank inflows have been shown to bear in them the potential of increasing financial instability risks through sudden increases in lending, our analysis also shows they relax credit constraints for poorer households with a previously unmet demand for credit. The improvement in their access to credit translates exclusively into a growth of shorter term, consumer credit, that these households use to raise non-durable consumption, which is of a more transitory nature.

8 Conclusions

We study the effects of cross-border capital flows on regional German banks' risk-taking and their credit supply to households. We employ granular matched bank-household data from Germany and establish that cross-border bank inflows induce regional German banks with a greater non-core funding dependency to increase their uncollateralized lending to riskier, lower-income households. Banks do not increase risk-taking in their mortgage lending, however. When investigating through what channels foreign funding flows affect lending, we find that the rise in credit by regional German banks occurred through funding inflows from primarily non-euro area banks and to a lesser extent by through interbank funding from other German banks. Consistent with the presence of a risk-taking channel similar to that in earlier research on the transmission of monetary policy, we establish that worse capitalized banks are responsible for the rise in credit, while better capitalized display no growth of their credit to households. When we further investigate how banks channel the more credit to households, we show this occurs through the extensive margin while no growth of credit occurs on the intensive margin. Finally, as access to credit improves, lower income households who are clients of less capitalized banks increase their consumption expenditures, in particular on non-essential non-durables. We establish the external validity of our main results using cross-country household data from almost 18,000 households in the euro area.

While earlier research has shown that cross-border capital inflows raise banks' lending to risky *firms*, we provide new household-level evidence that a similar risk-taking effect exists in banks' *household* lending. We also document that cross-border capital flows generate large fluctuations in the supply of credit through smaller regional banks in the context of Germany, an advanced economy and the largest member state of the euro area.

Other research has recently demonstrated that particularly credit booms in the household sector can lead to boom-bust cycles and predict financial crises. A rise in credit may thus raise financial stability risks. At the same time, greater access to credit allows lower-income households to increase consumption and therefore reduce consumption inequality, at least in the short run. In the longer run, poorer households will face increased debt levels, however.

Overall, our analysis thus lays bare the trade-offs policymakers face when foreign capital inflows in the interbank market lead to local fluctuations in the availability of credit. A complete assessment of the *long-term* effects of cross-border capital inflows on (consumption) inequality and to understand the mechanisms behind these effects requires further research.

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Appendix

'Cross-Border Bank Flows, Regional Household Credit Booms and Bank Risk-Taking'

by D. Boddin, D. te Kaat and K. Roszbach

May 4, 2024

A Additional Tables

Table A1 Variable Definitions and Sources

Variable	Definition	Unit	Source
ΔConsumerloans	The log-difference in households' outstanding consumer credit volumes	%	HFCS or PHF, respectively
ΔMortgages	The log-difference in households' outstanding mortgage credit volumes	%	HFCS/PHF
Consumption(non-durable)	The logarithm of households' non-durable consumption	ln(x)	PHF
Consumption(durable)	The logarithm of households' durable consumption, defined as income less net saving less non-durable consumption	ln(x)	PHF
Consumption(food)	The logarithm of households' food at home consumption	ln(x)	PHF
Consumption(restaurant)	The logarithm of households' food outside home consumption	ln(x)	PHF
Net wealth	The logarithm of a household's net wealth (assets less liabilities)	ln(euro)	HFCS/PHF
Income	The logarithm of a household's total gross income	ln(euro)	HFCS/PHF
Renter	=1 if household is a renter in the main residence	0/1	HFCS/PHF
Foreign	=1 if a household's country of birth is outside of Germany	0/1	HFCS/PHF
Age	Age of the household head	-	HFCS/PHF
Income Exp.	=1 if a household expects its income to rise more than inflation	0/1	PHF
Self-Employed	=1 if a household generates self-employment income	0/1	PHF
Unemployed	=1 if a household receives unemployment benefits or any other regular social transfers	0/1	PHF
Non-Core	Banks' sum of interbank deposits, as well as money market securities and bonds issued, over total assets	%	Deutsche Bundesbank
Gross Interbank	Banks' interbank deposits over total assets	%	Deutsche Bundesbank
Gross Domestic Interbank	Banks' standardized domestic interbank deposits over total assets	%	Deutsche Bundesbank
Gross EA Interbank	Banks' standardized within-euro area interbank deposits over total assets	%	Deutsche Bundesbank
Gross Non-EA Interbank	Banks' standardized non-euro area interbank deposits over total assets	%	Deutsche Bundesbank
Net Interbank	Banks' interbank deposits net of interbank loans over total assets	%	Deutsche Bundesbank
Size	Bank size, defined as the log of total assets	ln(euro)	Deutsche Bundesbank
Roa	Banks' return on assets	%	Deutsche Bundesbank
Liquidity	Banks' sum of cash, central bank reserves and treasuries held over total assets	%	Deutsche Bundesbank
Capitalization	Banks' total capital over total assets	%	Deutsche Bundesbank
Other flows	Net other investment inflows over nominal GDP	%	International Financial Statistics
Portfolio flows	Net portfolio investment inflows over nominal GDP	%	International Financial Statistics
FDI Flows	Net foreign direct investment inflows over nominal GDP	%	International Financial Statistics
Bank flows	FX and break-adjusted change in banks' liabilities less the equivalent change in assets vis-a-vis all other banks over GDP	%	BIS LBS

Table A2 COMBINED SUMMARY STATISTICS: MORE AND LESS EXPOSED BANKS

	More		Less	
Variable	Observations	Mean	Observations	Mean
ΔMortgages	1,050	.	486	-41.89
ΔConsumerloans	1,050	-34.18	486	-24.51
Consumption(non-durable)	1,050	9.29	486	9.22
Consumption(durable)	1,004	9.76	464	9.87
Consumption(food)	1,050	8.52	486	8.55
Consumption(restaurant)	1,050	6.42	486	6.54
Net wealth	1,050	12.06	486	12.02
Income	1,050	10.88	486	10.79
Renter	1,050	0.30	486	0.33
Age	1,050	59.45	486	60.27
Foreign	1,050	0.07	486	0.05
Income Exp.	1,050	0.07	486	0.09
Unemployed	1,050	0.29	486	0.28
Self-employed	1,050	0.18	486	0.17
Noncore	1,050	16.37	486	7.22
Gross Interbank	1,050	15.18	486	6.84
Gross Domestic Interbank	1,050	0.47	486	-0.96
Gross EA Interbank	1,050	0.16	486	-0.29
Gross Non-EA Interbank	1,050	-0.02	486	-0.03
Net Interbank	1,050	8.01	486	-1.73
Size	1,050	14.50	486	14.38
ROA	1,048	0.16	486	0.14
Equity	1,050	5.70	486	5.61
Liquidity	1,050	1.32	486	1.57

NOTE. The table reports summary statistics of the German bank-household data set for households having their main relationship with a more exposed bank (upper 67% of the non-core distribution) and less exposed bank (lowest 33% of the non-core distribution). The mean for ΔMortgages cannot be displayed due to data confidentiality reasons. We provide data definitions and sources in Table A1.

Table A3 Summary Statistics for European Households: Differences Between More and Less Exposed Countries

	Less Exposed Countries		More Exposed Countries	
Variable	Observations	Mean	Observations	Mean
Ln(ConsLoans)	23,542	2.1	11,438	2.7
Ln(Mortgages)	23,542	2.9	11,438	4.0
Net wealth	23,542	12.1	11,438	12.0
Income	23,542	10.5	11,438	10.9
Renter	23,542	0.2	11,438	0.2
Household age	23,542	57.8	11,438	55.7
Foreign citizenship	16,832	0.1	11,438	0.1
Bank flows	23,542	-1.1	11,438	4.1

Note. The table reports summary statistics of the European HFCS sample, separately for countries with positive bank inflows during 2016-17 (more exposed countries) and those with negative bank inflows (less exposed countries). The summary statistics are reported for all households that are included in Table 9, column (1). We provide data definitions and sources in Section 2.2.