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## Cross-border bank flows, regional household credit booms, and bank risk-taking

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# CROSS-BORDER BANK FLOWS, REGIONAL HOUSEHOLD CREDIT BOOMS, AND BANK RISK-TAKING

*Dominik Boddin, Daniel Marcel te Kaat, and Kasper Roszbach*

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## ABSTRACT

This paper provides novel microlevel evidence that cross-border bank flows are an important means for households to access credit, not only in emerging markets but also in advanced economies. Using supervisory bank-level data alongside household credit and consumption data from Germany, we study how lending to households was impacted by the influx of cross-border bank funding following the European Central Bank's implementation of nonconventional monetary policy in 2014 and 2015. Regional banks that were highly exposed to fluctuations in foreign capital inflows increased consumer lending to riskier, lower-income households by 50% more than other banks. Rising deposit inflows from non-euro area banks induced less-capitalized banks to expand their lending on the extensive margin. The analysis concludes that Improved access to credit enables lower-income customers of exposed banks to increase nondurable consumer spending. Data from a larger group of euro area countries confirm that conclusion.

**Keywords:** cross-border bank flows, households, bank lending, risk-taking, credit booms, funding shocks

**JEL codes:** F3, G2, G5

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# 1 INTRODUCTION

The literature has documented extensively that foreign capital inflows increase overall bank lending, with credit shifting toward riskier firms and countries (e.g., Magud, Reinhart, and Vesperoni 2014; Baskaya et al. 2017; Kaat 2021). Capital inflows resulting from changing national or international financial conditions affect bank lending through securities and interbank markets as well as transfers of funds or assets within large global banks (Cetorelli and Goldberg 2012; Temesvary, Ongena, and Owen 2018; Correa et al. 2021). Such wholesale sources of foreign bank funding are known to be important in developing and emerging market economies. Whether foreign funding inflows affect households, notably in more advanced economies, has received limited attention. Whereas that research used aggregate data on bank lending to firms, recent research on sector data in emerging markets by Garber et al. (2019) documents that aggregate credit to households rises in response to capital inflows. While Saffie, Varela, and Yi (2020) show that financial openness triggers resources to relocate to firms with high expenditure elasticity activities, attention has yet to focus on whether foreign capital inflows affect the composition and allocation of credit between households.

This paper aims to address this gap in the literature by investigating the effects of increased foreign capital inflows on the household sector in Germany. Specifically, the focus is on the period when the European Central Bank (ECB) implemented a negative interest rate policy and quantitative easing in 2014 and 2015. Net cross-border bank flows into the euro area rose from -3.5% of GDP in the first quarter of 2014 to almost +3% in the third quarter of 2016, providing new funds to euro area banks. In Germany, the largest euro area economy, the increase in bank inflows was even more pronounced.

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 noncore funding (i.e., interbank borrowing, money market funding, and debt securities financing) to raise

their consumer loan supply to low-income households. In economic terms, after the inflow shock, lower-income household experienced growth in uncollateralized consumer credit that was 51 percentage points above that of higher-income households. Breaking that down further, lower-income households whose main bank relationship was with a more exposed bank (i.e., one with greater dependence on noncore funding), had an even larger growth differential of 83 percentage points in the period from 2014 to 2017. For a weakly capitalized bank, the effects were even stronger. This is consistent with the literature on the risk-taking channel of monetary policy transmission (e.g., Jiménez et al. 2014). Growth in consumer credit mainly benefits households on the extensive margin—i.e., consumer credit volumes increase for households that cannot access uncollateralized credit. We find no evidence of increased risk-taking in banks' mortgage lending.

The increase in banks' consumer lending to riskier households is consistent with theoretical predictions. Acharya and Naqvi (2012) show that an increase in bank liquidity—for instance, one caused by capital inflows—worsens bank agency problems and induces loan officers to increase lending to riskier loan applicants. Martinez-Miera and Repullo (2017) argue that a rise in the supply of savings—as occurs through capital inflows—reduces interest rate margins and incentivizes banks to maintain profitability by cutting back on costs, particularly on monitoring and screening. This leads to increased lending to riskier borrowers. Similarly, Rajan (2006) highlights that lower interest rates, potentially stemming from capital inflows, can lead banks to take on more risk and search for yield.

We study the impact of cross-border flows on banks' lending to households by leveraging two granular household data sets. The first data set, used for our benchmark analysis, is the German Panel on Household Finances (PHF), which contains detailed survey information on household credit, income, wealth, consumption, and background characteristics. In our main analyses we exploit a peculiar feature of the German banking system, in that savings and cooperative banks are restricted to operating within

specific geographical boundaries of administrative regions which align with regional information available for households. As the PHF also includes questions about households' primary banking relationships, households can be linked to a specific bank when their main relationship is with a savings or cooperative bank. Using rich supervisory data from the Bundesbank, we quantify the relationship between bank flows and lending to households as a function of banks' exposure to cross-border flows. In the second part of our analysis, 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 confirmation, within a broader sample, that bank flows disproportionately affect bank lending to lower-income households.

We exploit the surge in euro area bank inflows in 2015–2017, which was driven by the ECB's implementation of nonconventional monetary policy tools, to estimate difference-in-differences regressions for 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. We measure a bank's exposure to cross-border bank flows as its pre-2015 noncore funding ratio—i.e., interbank borrowing plus money market and debt securities issued as a share of total assets. This follows Baskaya et al. (2017), who demonstrate that banks with higher noncore funding ratios exhibit a lending behavior more sensitive to cross-border capital flows. Intuitively, banks that depend heavily on interbank funding and other types of noncore funds should be more affected by cross-border bank flows, while retail deposits are typically quite sticky and hence largely unrelated to such flows. To assess whether more exposed banks lend more to riskier households, we analyze the interaction between banks' noncore dependence and households' riskiness, proxied by initial income (Beer, Ionescu, and Li 2018; American Express 2022; Mayer 2024). We further identify the accompanying real effects by studying various components of a household's consumption expenditures.



Our analysis provides three main results. First, we show that more exposed banks (those more dependent on interbank funding) increase lending to low-income households in response to a bank inflow shock. A low-income household is in the 25th percentile of income distribution, while a high-income household is in the 75th percentile. Our estimates imply that low-income households on aggregate experience a rate of growth rate in consumer credit after the bank inflow shock that is 51 percentage points higher than for high-income households. This growth rate differential rises to 83 percentage points for those low-income households whose main banking relationship is with a more exposed bank (i.e., a bank in the 75th percentile of the distribution of noncore funding ratios. In contrast, mortgage credit is largely unaffected by the inflow of foreign bank funds. These effects remain robust when accounting for a range of fixed effects and household characteristics. In addition, we observe a weakly positive shift in consumer lending toward younger and migrant households.

The growth in credit is driven by loans to households who had not previously borrowed from exposed banks before the foreign inflow shock (i.e., the extensive margin). We further establish that the increase in lending to low-income households is most pronounced for poorly capitalized banks, whose profitability improves because of the credit expansion. Micro data from a group of euro area countries confirm our findings in a broader sample of households. Second, we show that consumption expenditures increase for lower-income households whose primary banking relationship is with a bank with greater dependence on noncore funding. Households in the 25th percentile of the income distribution increase their nondurable expenditures by 28.7% more than those in the 75th percentile. Third, using confidential supervisory bank data, we provide a blueprint of the precise channel through which foreign bank inflows reach German regional banks and their household customers. We establish that German banks with a higher noncore funding ratio before the foreign bank inflow shock experience a relative rise in noncore funding volumes after the shock. Direct deposits by non-area banks at regional German banks grow about five

times faster than indirect deposits, where foreign banks make deposits at large German banks that pass on “excess liquidity” to smaller regional banks. Non-euro area banks thus directly reach smaller German banks through the interbank market, but this mechanism is reinforced through a trickledown effect from large German banks.

Together, these results provide new evidence that foreign bank inflows are quantitatively important for household lending in advanced economies like Germany with a large domestic banking sector, not only in emerging and developing markets. While earlier studies (Cetorelli and Goldberg 2012; Correa et al. 2021) have documented that foreign bank flows operate through the international network of large global banks, we find that large international banks are not the single connection between countries and global markets. Our analysis shows that smaller, regional banks without international activities, when they depend on noncore funding, also create a link to fluctuations in global capital flows. Given the well-documented role of household credit (growth) as a driver of future financial fragility, our findings imply that even advanced economies should pay attention to fluctuations in international capital flows and the pass-through to domestic credit markets. Our results also mean that such attention should not be limited to large banks and include even smaller, regional financial institutions if they accept deposits from foreign banks.

We address several potential threats to our analysis and identification strategy, demonstrating that our findings are highly robust. First, our exposure measure, the noncore funding ratio, may not be randomly distributed across banks and could correlate with bank controls, potentially biasing our estimates. We therefore include a large set of bank controls and interact them with household characteristics. Our results remain quantitatively and qualitatively unchanged. Second, our findings could depend on the specific gross exposure measure that we chose. To check this, we rerun our regressions using banks’ net exposure to noncore funding flows and find that our results are unaffected. Third, our analysis assumes that households borrow primarily from their

main relationship bank. To dispel any concern that an unobserved shift to increasingly important online banks could drive our results, we rerun our main regressions on a subsample of the most loyal bank customers. The results confirm the robustness of our findings for households with tightly defined banking relationships.

Finally, we conduct a placebo test using data from a period without any substantial change in cross-border bank flows. We find that more exposed banks' consumer lending to low-income households did not shift during that period. Similarly, we estimate our regressions with placebo outcomes, such as changes in households' 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.

We contribute to four strands of literature. First, a strand of research shows that (emerging economy) banks have a highly procyclical access to noncore funding from global capital markets (di Giovanni et al. 2021) and, when more dependent on noncore funding, raise their loan supply in response to foreign noncore inflows (Baskaya et al. 2017).<sup>1</sup> 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 or corporate lending, 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 household 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.

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<sup>1</sup> Sarmiento (2022) studies the taper tantrum episode and shows that Colombian firms experienced a worsening of credit access from banks receiving funding from abroad. Kneer and Raabe (2019) show that higher capital affects bank lending in the United Kingdom.

Second, we contribute to the literature on banks as transmitters of financial and monetary shocks. Cetorelli and Goldberg (2012), Baskaya et al. (2017), Temesvary, Ongena, and Owen (2018), and Correa et al. (2021) examine how global banks transmit shocks. Iyer and Peydró (2011), Puri, Rocholl, and Steffen (2011), Schnabl (2012), Ongena, Peydró, and Horen (2015), Ongena, Tümer-Alkan, and Von Westernhagen (2018), Jonghe et al. (2020), and Hale, Kapan, and Minoiu (2020) investigate how negative financial shocks from crises impact bank lending practices through linkages across states and countries, as well as their effects on business customers. These effects depend on the banks' ownership, sources of funding, liquidity, and local importance. This study complements the 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.<sup>2</sup> Schularick and Taylor (2012) and Jordà, Schularick, and Taylor (2013) show that credit expansions are associated with deeper recessions and increased financial crisis risk. Müller and Verner (2024) further demonstrate that credit booms in the household sectors can trigger boom-bust cycles and predict financial crises. Jordà, Schularick, and Taylor (2016) document that mortgage credit expansions lead to elevated financial fragility. Mian, Sufo, and Verner (2017) establish that faster household debt growth presages lower future GDP growth, especially when countries rely heavily on external debt. Caballero (2016) adds 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. Specifically, we show that funding inflows can induce more

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<sup>2</sup> See Sufo and Taylor (2022) for an extensive literature survey on this relationship

exposed banks to lend more to lower-income, riskier households through uncollateralized credit, thereby making poorly capitalized banks more vulnerable.

Finally, we complement the literature that employs credit register data to estimate the impact of different macroeconomic shocks on banks' credit allocation. Altavilla, Laeven, and Peydró (2020) finds that expansionary monetary policy increases banks' credit supply to the household sector, particularly when banks are poorly capitalized. Gyöngyösi, Ongena, and Schindele (2019) 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.

## **2 DATA**

This paper leverages two unique data sets to investigate the relationship between capital flows, household lending, and consumption. First, we analyze household and bank data from Germany to establish a robust causal link. Second, we employ household data from a selection of euro area countries to demonstrate the external validity of our findings. In the following two subsections, 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 data from the Deutsche Bundesbank's Panel on Household Finances (PHF).<sup>3</sup> This data set contains information on household characteristics, wealth, indebtedness, and income across three waves

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<sup>3</sup> 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).

(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 uses imputation methods, utilizing household responses to other survey questions. The PHF is an integral part of the euro area’s Household Finance and Consumption Survey (HFCS) that collects forecast-based harmonized micro data on households in every euro area country.

We follow the approach of Kindermann et al. (2021) and use the first of the five available PHF implicates for our analysis because only a few variables in the data set suffer from missing observations. We calculate our primary outcome variable, household nominal credit growth, as the change in the logarithm of either consumer loans or mortgages.<sup>4</sup> To proxy for a household’s riskiness, we follow Mayer (2024) and use the logarithm of household income.<sup>5</sup> 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 12 months. In some specifications, we also utilize information on households’ self-employment income, as well as unemployment benefits or other regular social transfers.

In the final part of our analysis, we study the household consumption effects of improved credit access. We compute several consumption variables, including the logarithm of durable and nondurable consumption.<sup>6</sup> The PHF does not contain direct information on durable consumption. Following Le Blanc and Schmidt (2018), we compute total household consumption as the difference between income and net saving,

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<sup>4</sup> To prevent exclusion of households with zero credit volumes, we add one to all self-reported credit volumes. Given low German inflation rates during 2010–2017 we obtain, in line with expectations, similar results when we use real credit growth as outcome variable. The attendant results are available upon request.

<sup>5</sup> Beer, Ionescu, and Li (2018) and American Express (2022) also provide evidence 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 a bigger cash-flow relief effect.

<sup>6</sup> 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.

where net saving is defined as the change in financial assets after accounting for changes in outstanding debt. To obtain a household's durable consumption, we then subtract nondurable consumption from total consumption. The PHF provides information about two distinct subcomponents of nondurable expenditures, food and drinks at home and expenses on food and drinks outside the home ("restaurant").

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, *Landkreise*, which correspond to US counties. We can therefore connect 67% of households in our sample who have their primary relationship with a savings or a cooperative bank to their main bank using regional identifiers.<sup>7</sup> This direct 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 use 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 as a proportion of total assets.<sup>8</sup> The intuition behind this choice is that banks with a greater noncore dependence are likely to benefit more from bank inflows that increase the availability of interbank funding. In contrast, as retail

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<sup>7</sup> We determine the area of operation of a savings or cooperative bank based on the location of its headquarters. Some banks operate in multiple regions. Because data on banks' market shares in the various regions is not available, we assign each bank to the region where it is headquartered. The alternative (i.e., matching banks to all regions where they have non-zero operations) would lead to a strong overrepresentation of the larger regional banks. These typically focus activities on their headquarter region while providing a small number of loans to firms and households in neighboring regions. In such cases where multiple banks operate in a specific administrative region and an exact match between a household and its bank is not possible (which is the case for 37% of the savings banks and 75% of the cooperative banks across all 401 German regions), we use weighted average bank ratios for such households, with banks' total assets serving as weights. Our results are robust to excluding observations without exact identification of the bank-household relationship.

<sup>8</sup> See Schaefer and Stahl (2023) and Stahl and Scheller (2023) for details of the data.

deposits are sticky and hence largely unrelated to such flows, banks dependent on retail deposits will be less affected by a surge in bank flows.

For robustness, we compute banks' 2014 exposure to cross-border bank flows, both in terms of net and gross interbank deposits as a share of total assets, while abstracting from money market and debt securities components. We further focus on the interbank transmission channel and break down gross interbank deposits into their domestic, euro area, and non-euro area components. Regressions include several bank controls from BISTA: size (log of total assets), return on assets or equity, 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, Rocholl, and Steffen (2017) find that households typically apply for a loan where they have their bank account, with more than 80% of loan applicants having been customers for 5 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 and bank data set. Both consumer and mortgage credit were contracting during our sample period. Of the households in our sample, 31% rent their main residence and 6% have foreign citizenship. The average household age is 59.7 years. In our sample, 29% of households have at least one member receiving unemployment benefits or other regular social transfers excluding pensions, and 18% receive income from self-employment.



Banks have an average noncore funding ratio of 13.5%, a return on assets of 0.15%, a capital ratio of 5.7%, and a liquidity ratio of 1.4%. As the appendix Table A2 shows that most of these characteristics are similar for households whose main relationship is with more exposed and less exposed banks, with the exception of the main dependent variables.<sup>9</sup>. Specifically, more exposed banks have lower consumer credit growth over the sample period.

## **2.2 Household-Level Data for the Euro Area**

We incorporate a second data set sourced from the HFCS, encompassing comprehensive household 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 comparison of household credit volumes before and after cross-border bank inflow shocks, we exclude countries that lack repeated household data across waves. Consequently, our final regression sample comprises almost 18,000 households from seven countries: Belgium, Cyprus, Finland, France, Germany, Italy, and Spain. To maintain consistency, we utilize the same data imputation method as for the German data set.

Because the PHF is a subset of the euro area-wide HFCS, the questions in both panels are nearly identical. Consequently, we can calculate the same variables outlined in Section 2.1 using these data, with two exceptions. First, Finland and France provide data for only 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 contains income expectations only in the third survey wave, which prevents incorporation of this variable into difference-in-differences regressions.

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<sup>9</sup> The Appendix is available at <http://dx.doi.org/10.22617/WPS250175-2>.

**Table 1** Summary Statistics for German Households/Banks

Variable	Observations	Mean	SD	5th	95th
$\Delta$ Mortgages	1,536	-15.08	415.86	-1012.67	999.88
$\Delta$ Consumerloans	1,536	-31.12	396.71	-851.74	829.43
Consumption(nondurable)	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
Ln(Noncore)	14,615	11.26	2.10	8.01	14.61
Ln(Interbank)	14,615	11.18	2.04	8.00	14.51
ROA	13,524	0.04	2.48	0.00	0.42
ROE	13,524	1.89	16.99	0.00	6.64
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
Noncore	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 for the German bank and household data set. The first block of variables are the outcome variables in the different stages of the analysis at either the household or bank level. The second one contains the household-level controls and the third block contains the bank controls, both of which are fixed in the year 2014. Household data come from the Panel on Household Finances (PHF) survey and span three periods: 2010–2011, 2014, and 2017. Data definitions and sources are provided in the appendix Table A1.

Sources: PHF, GuV, and BISTA (See the appendix for details).

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 Locational Banking Statistics (BIS-LBS). This measure is computed as the foreign-exchange 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.<sup>10</sup>

Table 2 presents the summary statistics for the European sample. The two credit variables (in logs) have mean values of 2.3 and 3.3, with mortgages showing greater standard deviation than consumer loans. Heterogeneity across households is more pronounced in net wealth than in income. The average age of household heads in the sample is 57 years, about 10% of households are foreign citizens, and one-fifth are renters. Finally, the ratio of net bank inflows over GDP has an average value of 0.6%, ranging from -1.4 to 7.0% between the 5th and 95th percentile. Table A3 provides separate summary statistics for more and less-exposed countries.

**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 for 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 7, column (1). Data definitions and sources are provided in Section 2.2.

Source: HFCS (See the appendix for details).

### 3 CROSS-BORDER BANK FLOW DYNAMICS

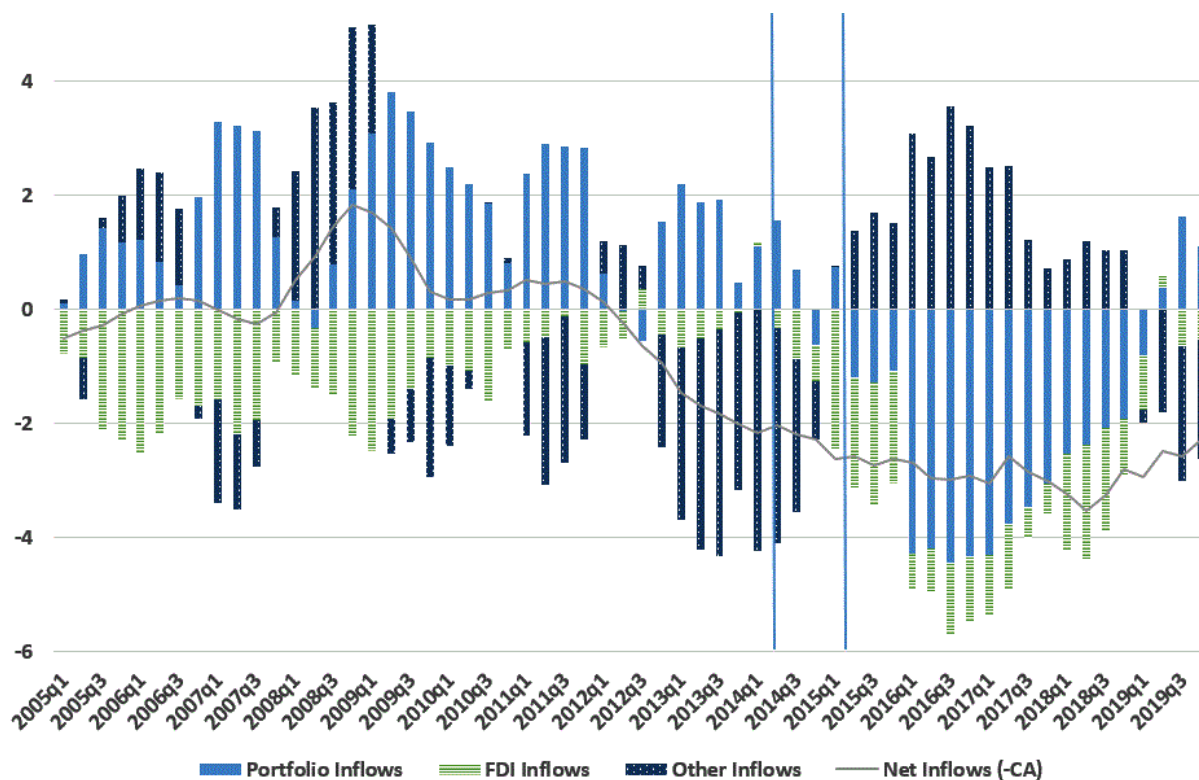
Figure 1 illustrates the dynamics of euro area net cross-border capital flows, measured as the negative of the current account, and disaggregated into net FDI, net portfolio

<sup>10</sup> Break-adjusted means that the BIS corrects cross-border flows for breaks in the reporting population and/or reporting methodology.

investment, and net other investment inflows. The net other investment flows category primarily consists of 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 interest rate policy in the second quarter of 2014 and its quantitative easing program in the first quarter of 2015, 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, Fidora, and Schmitz 2020; Kojen et al. 2021), the revenues from those asset sales provided new funds to euro area banks.

Figure 2, panel A shows that breaking down the financial account using BIS-LBS data and focusing on net cross-border bank inflows produces a similar pattern of higher inflows to euro-area banks. When we split net bank inflows into gross inflows and outflows, panel B indicates 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 banks within the euro area. Panel C demonstrates that countries in the core euro area received growing inflows in 2015–2017. This suggests that foreign investors mainly provided cross-border funds to banks in the northern euro area, which were seen as safer at the time. In Germany, bank inflows rose from -6% in 2013 to +4% 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. For external validation, we use euro area data to leverage cross-country variation in bank inflows as documented in panel C.

**Figure 1 The Euro Area Financial Account**

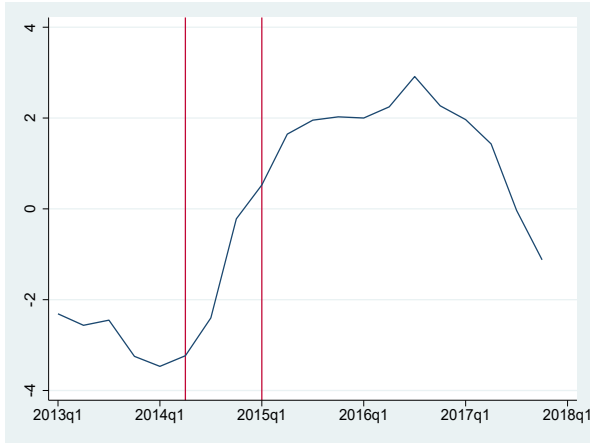


Note: This figure shows the euro area financial account, with the solid line depicting total net capital inflows (the negative of the current account), and the bars representing portfolio investment, foreign direct investment, and other investment inflows, all in net terms and as a percentage of euro 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 European Central Bank's Quantitative Easing program in 2015:Q1.

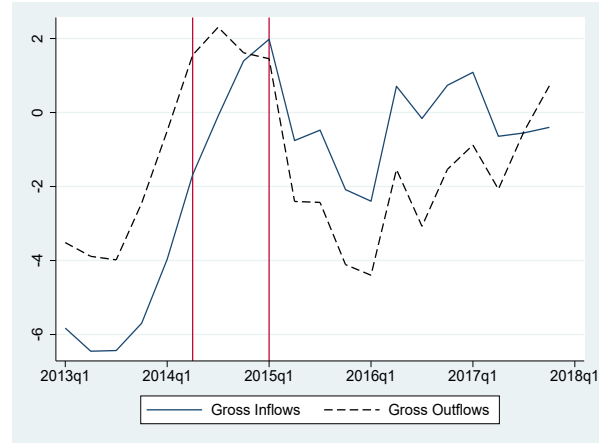
Sources: BIS, ECB, and FRED (See the appendix for details).

**Figure 2 Bank Flows in the Euro Area**

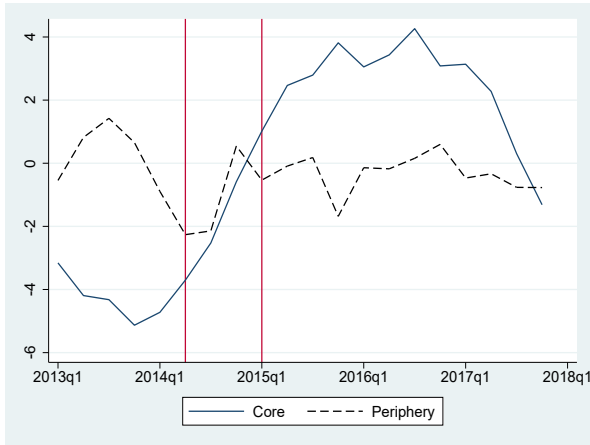
**Panel A: Net Bank Inflows—Entire Euro Area**



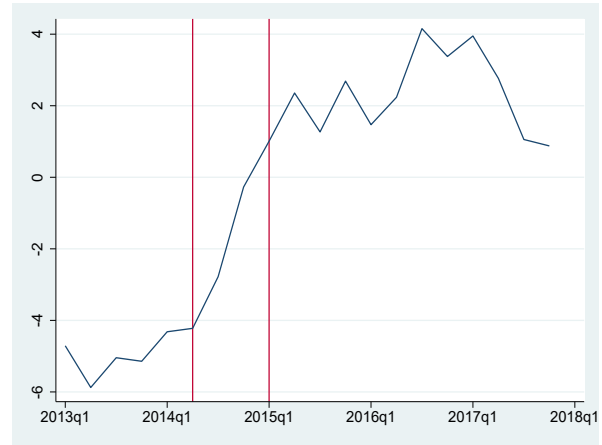
**Panel B: Gross Bank Flows—Entire Euro Area**



**Panel C: Bank Inflows—Core vs Periphery**



**Panel D: Bank Inflows—Germany**



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 European Central Bank's Quantitative Easing program in 2015:Q1.

Sources: Fred and BIS-LBS (See the appendix for details).

## 4 EMPIRICAL SPECIFICATION

### 4.1 German Benchmark Specification

In our benchmark specification, we use German survey data to identify the effect of cross-border bank flows on banks' lending to households. This is achieved 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 quantitative easing programs in 2014 and 2015. Our regressions are specified as follows:

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

where  $Y$  represents the logarithm of either total mortgage or total consumer loans of household  $h$  borrowing from bank  $b$ . The key variable of interest is the interaction between the post-dummy, which equals one for the survey wave following 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 toward low-income, riskier households. Additional household characteristics are included as controls, interacted with the post-dummy, to capture their potential effects on lending. Equation 1 also contains household and time fixed effects, denoted by  $\alpha_h$  and  $\alpha_t$ , 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 noncore funding ratio. The expanded equation takes the following form:

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

This will be our preferred specification because it enables exploration of whether cross-border bank flows induce *more exposed* banks to heighten risk appetite in their lending practices toward households, where exposure is measured by banks' noncore funding ratio. This follows Baskaya et al. (2017), who show for Türkiye that banks with larger ratios are more affected by cross-border flows than those reliant on customer deposits. We therefore hypothesize that the coefficient  $\omega$  will be negative—i.e., banks that are expected to benefit more from the upswing in cross-border bank flows will increase their lending to lower-income (risky) households relative to other banks.

In our most saturated model specification, we include not only household and time fixed effects, but also fixed effects for bank group, location, income, and time. Here, “bank group” refers to whether a household's main relationship bank is a savings or cooperative bank, “location” represents one of the 401 administrative German regions, “time” corresponds to the survey wave, and “income” denotes the decile of the household income distribution. These fixed effects align with 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 to Khwaja-Mian's firm-time fixed effects (Khwaja and Mian 2008). Similarly, our bank group, location, income, and time fixed effects intend to absorb any heterogeneity specific to a cluster of households in a certain region, with a certain bank group preference, of a specific income, at a particular 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.



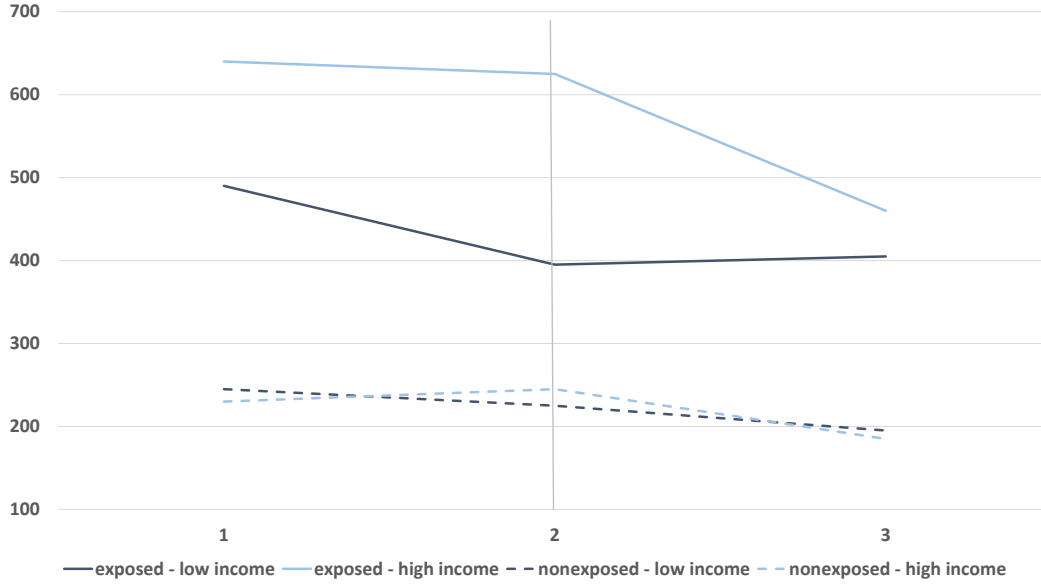
The central assumption underlying the difference-in-differences regressions is that, absent cross-border bank flows, banks with a higher noncore dependence would have exhibited the same trend in lending behavior as banks with a lower dependence. To validate this assumption, as a first step, Figure 3 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, prior to the increase in bank inflows starting in 2015, more exposed banks, i.e., those with a noncore funding ratio in the upper 67% of the distribution, and less exposed banks (below the 33rd percentile) followed the same trends in lending to low-income households. After the increase in bank inflows, more exposed banks increased their consumer lending to these households, while less exposed banks did not.

For high-income households, we see similar consumer credit dynamics independent of bank inflows and bank exposure. In Section 5.3, 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.

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' noncore ratios are correlated with other bank covariates, properly controlling for these covariates will satisfy the conditional mean zero assumption and ensure unbiased estimates (Roberts and Whited 2013). Therefore, we include a broad set bank covariates fixed at their pre-inflow wave 2 level interacted with the post-dummy and the household characteristics in matrix  $X$ .

We show later that inclusion of these interactions has a negligible impact on our baseline estimates, suggesting that nonrandom treatment allocation does not jeopardize our identification.

**Figure 3 Parallel Trends Before the Bank Inflow Shock**



Note: This figure shows the aggregate log of consumer credit volumes in a German final Panel on Household Finances (PHF) sample for four distinct bank-household combinations: (i) low-income households (lowest 50%) and exposed banks (top 67% of noncore 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 and BISTA (See the appendix for details).

## 4.2 External Validity: Euro Area Data

To establish external 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 limitation prevents us from conditioning the link between cross-border bank flows and household credit on banks' exposure to such flows, which weakens identification 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:

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

where  $\text{Log}(Y)$  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 first differences approach requires data from at least three survey waves and lead to the exclusion of 6,000 observations from Finland and France. The matrix  $X$ , which contains control variables, includes all variables of the German benchmark regressions, except for 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 exposures to capital inflows, a key difference in the euro area regressions is that changes in credit now depend on a *country's* net cross-border bank inflows as a share of GDP during 2016–2017. Consequently, the results from these regressions should be treated as complementary rather than causal evidence. At the country-household level, we expect that larger bank inflows will also be associated with a stronger shift in credit toward 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.

The cross-country, cross-household regressions are important because they help establish that our benchmark results for Germany are not driven solely by the adoption of negative rates or quantitative easing. Instead, the results highlight the role of 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 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 interact the post-dummy with household income alone, for now disregarding banks' differential exposures to cross-border bank flows. After the bank inflow shock, low-income households experience an increase in consumer credit, while their mortgage credit volumes remain unaffected. In columns (3)–(4), we account for bank heterogeneity by interacting the post-dummy not only with household income, but also with the main bank's pre-shock noncore funding ratio. Consistent with our expectations, the double interaction between bank exposure and the post-dummy is positive and statistically significant at the 1% level. Conversely, the triple interaction term has a negative and statistically significant coefficient at the 1% level, indicating that more exposed banks increase consumer lending disproportionately 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 combining the direct treatment effect with the income interaction term, we find that the marginal treatment effect on consumer credit supply becomes negative for annual income above 66,000 euros, slightly exceeding the sample mean. Once again, we find no significant effect for mortgage lending.

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta$ Mortgages	$\Delta$ ConsLoans	$\Delta$ Mortgages	$\Delta$ ConsLoans	$\Delta$ Mortgages	$\Delta$ ConsLoans	$\Delta$ Mortgages	$\Delta$ ConsLoans
Post $\times$ Noncore			-34.64 (68.83)	138.4*** (48.59)	-23.40 (89.88)	208.4*** (61.81)	-131.62 (152.41)	287.63*** (107.39)
Post $\times$ Income	-19.95 (21.81)	-40.75** (19.74)	-85.02 (97.65)	93.00 (62.62)	-98.48 (123.1)	153.2* (83.48)	-464.38 (346.0)	125.84 (931.8)
Post $\times$ Income $\times$ Noncore			3.735 (6.467)	-12.60*** (4.514)	2.520 (8.271)	-18.78*** (5.875)	11.62 (12.81)	-22.75** (9.27)
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	1,422	1,422
$R^2$	0.366	0.290	0.372	0.286	0.385	0.297	0.519	0.437

Note: Regressions are based on data from the Panel on Household Finances (PHF) survey. Bank exposure variables are from the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (GuV). Dependent variables are household-level changes in the logarithm of mortgage or consumer credit. Main regressors are interactions between a post-dummy equaling to one for the third wave of the PHF survey and 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 noncore funding ratios 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 the appendix Table A1. Regressions include time and household fixed effects; columns (7)–(8) add bank group, location, income, and time fixed effects. Heteroscedasticity-robust standard errors in parentheses. \*, \*\* and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels.

Sources: PHF, GuV, and BISTA (See the appendix for details).

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 because of space constraints. Our income triple interaction estimate remains significant and the coefficient estimate even increases somewhat. Without affecting the allocation along the income dimension, credit allocation varies along a few other household characteristics following the rise in foreign bank inflows, with younger households and those with lower-income expectations getting more (consumer) credit. This means that not only households with lower past income but also those with lower expectations for future income receive more credit, pointing to a reallocation of credit toward young households and those with structurally lower incomes. Combining the estimates of columns (2) and (6), our results imply that a low-income household in the 25th percentile of the income distribution, compared to one in the 75th percentile, experiences an average 51 percentage points higher consumer credit growth rate after the bank inflow shock. This growth rate increases to 83 percentage points when the low-income household’s main relationship is with a more exposed bank, defined as one in the 75th percentile of the noncore funding distribution.

In the most saturated specification, we add fixed effects for location, bank group, income, and time to better absorb changes in households’ loan demand, as described in Section 4. The data demands of this specification shrink the number of observations. Although our estimates become somewhat more uncertain as a result, columns (7)–(8) show the main results are qualitatively unaffected. The coefficient on the triple interaction term increases; however, its interpretation becomes less precise because the focus is a different sample, primarily comprising larger (urban) regions.

Overall, these results show that low-income households benefit most from a funding shock caused by cross-border bank inflows, particularly when their primary banking relationship is with a bank more dependent on noncore funding. The observed rise in lending is driven by a change in consumer credit, not by mortgages. Consequently, we

focus on consumer loans as the main outcome variable of interest for the rest of this paper. Results for mortgage credit are available upon request. The findings deepen our understanding of earlier work showing that banks increase risk-taking in response to significant cross-border capital inflows. We contribute to this literature by establishing that a similar mechanism exists for consumer credit borrowed from banks, complementing earlier work at the bank and bank-firm level. As we show in Appendix B, the documented credit reallocation toward lower-income households also correlates with a higher profitability of more exposed regional banks.

## **5.2 Robustness Checks**

### **Direct or Indirect Transmission**

We next present the results of several robustness checks. First, we investigate whether access to securities markets is crucial for transmitting shocks from capital inflows. Much of the earlier research on cross-border bank flows has, for reasons of data availability, focused on global or at least large international banks. We want to understand if the effects we identify hinge on smaller regional banks having similar access to securities markets, or whether these regional banks interact directly with large international financial institutions in the interbank market. To address this, we generate alternate measures of banks' exposure to cross-border flows: the gross *interbank* dependency ratio, defined as total interbank borrowing over total assets, and the net interbank dependency ratio. Table 4, column (1), shows the benchmark results are highly robust to excluding money market and debt securities funding from noncore funding. When capital inflows rise, as observed during 2015–2017, 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 also depends on banks' net exposure to cross-border interbank funding.

**Table 4 Robustness—Bank Exposure, Rural vs Urban, Bank Presence**

	(1) Gross Expos	(2) Net Expos	(3) Urban	(4) Rural	(5) Sav. Banks	(6) Single Bank	(7) Low Pres	(8) High Pres	(9) IHS Credit
Post × Income	105.2 (79.99)	-46.65 (39.74)	101.7 (130.8)	98.68 (108.0)	9.54 (81.64)	-10.20 (94.85)	-19.02 (102.9)	132.4 (83.94)	168.1* (90.47)
Post × Bank Exp.	197.4*** (64.02)	107.0** (46.22)	190.8 (118.2)	132.5* (78.45)	104.2* (60.16)	124.7 (80.32)	-20.08 (85.21)	179.9*** (64.74)	227.0*** (67.08)
Post × Income × Bank Exp.	-16.23*** (6.071)	-9.731** (4.549)	-15.08 (10.32)	-14.82** (7.276)	-9.41* (5.62)	-11.23 (7.62)	2.63 (8.16)	-16.85*** (6.02)	-20.49*** (6.361)
Other Household Controls Interacted	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,536	1,536	458	1,062	856	550	600	828	1,536
R <sup>2</sup>	0.454	0.545	0.333	0.295	0.285	0.272	0.251	0.303	0.295

Note: The dependent variable is the household-level change in the logarithm of consumer credit (columns 1-8) or the change in IHS transformed consumer credit (column 9). IHS is the inverse hyperbolic sine (“arcsinh”) transformation as in Bellemare and Wichman (2020). Our regressions are based on data from the Panel on Household Finances (PHF) survey. Bank exposure variables originate from the Bundesbank’s monthly balance sheet statistics (BISTA) and income statement statistics (GuV). The main regressors are the triple interactions between a post-dummy equal to one for the third wave of the Panel on Household Finances (PHF) survey and zero otherwise, bank-level exposure to cross-border flows measured in wave 2, and the following household 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 noncore funding ratio in columns (3)–(9), and the gross and net interbank liabilities in columns (1)–(2). To conserve space, most interaction estimates are not displayed. In columns (3) and (4), we split the sample into urban and rural regions. In column (5), we only consider households borrowing from savings banks and in column (6), we additionally drop regions where multiple savings banks operate. Column (7) and (8) focus on regions with below-median and above-median regional bank presence. Data details can be found in the appendix 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.

Sources: PHF, GuV, and BISTA (See the appendix for details).



## Rural vs Urban Areas

Our analysis leverages the unique regional role of savings and cooperative banks. Although suitable regional credit data for Germany are unavailable, the local market shares of savings and cooperative banks are typically larger in rural areas. Conversely, larger commercial banks maintain a stronger office presence in urban areas, likely implying a smaller market share for regional banks in these regions. If switching behavior matters and large banks respond differently to capital inflows than regional banks, we expect our findings to weaken in urban areas. To test this, columns (3) and (4) split the sample into banks located in urban areas (*Stadtkreise*) and rural areas (*Landkreise*). Consistent with expectations, the benchmark results are highly robust in rural areas. In urban areas, however, the results are less conclusive: while the triple interaction estimate remains negative and quantitatively similar to that in rural areas, it is not statistically significant. This is likely due to the substantially smaller sample size in this specification, reflecting that households in urban areas are more often served by large commercial banks excluded from our data set. Thus, the transmission in urban areas may well resemble that in rural areas, but our empirical setting does not allow this to be identified.

## Stricter Identification of Bank Relationship

Regions in our sample have an average of 1.2 *savings* banks, reflecting that the vast majority of regions have only one savings bank. In most cases, our matching procedure therefore exactly identifies the link between households and savings banks. However, regions have an average of 3.4 *cooperative* banks, making the bank-household pairing less precise for clients of cooperative banks.

In our benchmark analysis, we calculate bank characteristics for households reporting a cooperative bank relationship as a weighted average of all cooperative banks

in their administrative region.<sup>11</sup> In the following robustness check, we eliminate noise from imprecisely identified bank relations by restricting our sample to customers of savings banks. Table 4, column (5), shows that our benchmark results remain statistically significant. In column (6), we also exclude all regions with more than one savings bank. The coefficient on the triple interaction term *Post x Income x Bank* exposure remains negative and economically comparable to the earlier specifications, but loses some of its statistical significance, likely because the shrinking sample size. Together, columns (5)–(6) suggest that imprecision in the match between households and banks does not contaminate our analysis.

### **Competition and Alternative Credit Growth**

In columns (7)–(8), we assess if regional bank presence, which might be related to competition among regional banks, affects our results. To do so, we split the sample into two subsamples: one with regional bank presence below the median (computed as the sum of cooperative and savings banks active in the region) and one above it. The results are clearly driven by regions with a higher presence of regional banks, suggesting that cross-border inflows only raise low-income households' access to consumer credit in regions with stronger presence of regional banks.

To check the sensitivity of the findings to the particular definition of credit growth, we next employ an alternative transformation of the main outcome variable, the inverse hyperbolic sine, that allows for including zero values. Column (9) shows that doing so has no effect on the significance of our coefficient estimates.<sup>12</sup>

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<sup>11</sup> We do the same for the few regions with more than one savings bank.

<sup>12</sup> 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.

## **Switching Behavior**

As mentioned, we observe a household's main bank only 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 does not drive our findings. Generally, German households are very loyal to their banks; only 117 households, or 7%, change their main bank between the first and second wave. Thus, substantial switching behavior is not expected between the second and third waves. To mitigate residual concerns about an unobservable switching effect, we test if households with a greater tendency to switch in "normal" times are driving the main findings. In Table 5, we exclude 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.

## **Alternative Controls For Credit Demand**

In columns (2) and (3), we conduct two additional sensitivity tests of the benchmark findings and control in a more granular way 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 initially and may therefore be more inclined to experience a rise in credit if they, for example, gain employment during the period of increased foreign bank inflows. Including such households in the benchmark regressions might consequently tilt our coefficient estimate toward finding a significant effect on household credit. Table 5, column (2), shows that this concern is unwarranted as the coefficient estimate is more or less unchanged when unemployed households are excluded from the regression. Self-employed households, conversely, may experience a greater rise in credit during

the post-inflow period if the inflows boosted general economic activity and increased credit demand—effects not fully captured by our fixed effects.

### **Relationship Length**

This could also tilt our regressions toward finding a significant effect on lending to households. Column (3) confirms that when excluding self-employed households, the coefficient on the triple interaction term remains negative and significant at the 1% level. As already noted, our bank-level analysis assumes that households obtain their loans from their main relationship bank. This assumption is supported by Puri, Rocholl, and Steffen (2017), who find that German households have very strong ties with their savings banks. They show that over 80% of loan applicants have been customers for at least 5 years. Previous bank–depositor relationships also increase access to uncollateralized credit, such as consumer loans. To further support this notion, we restrict our sample and run separate regressions for relatively older households—i.e., those who are likely to have longer-standing bank relationships. Table 5, columns (4) and (5), confirms that when we restrict our sample to households aged 30 years or more, and then 40 years or more, the coefficient estimates are nearly the same as in the benchmark regressions.

**Table 5** Robustness and Heterogeneity—Bank Switching, Credit Demand, Relationship Length, Credit Type

	(1) No switchers	(2) No UI	(3) No self-employed	(4) Age $\geq 30$	(5) Age $\geq 40$	(6) No student loans	(7) Formal credit	(8) Triple bank interactions
Post $\times$ Income	102.1 (88.29)	61.39 (100.4)	188.8* (101.3)	160.0* (84.31)	88.31 (86.97)	97.10 (85.11)	99.37 (85.25)	921.4 (594.3)
Post $\times$ Noncore	172.1*** (64.04)	157.5** (71.87)	202.9*** (68.99)	178.7*** (61.97)	150.1** (68.23)	150.2** (64.52)	152.4** (64.65)	203.7*** (70.01)
Post $\times$ Income $\times$ Noncore	-11.56* (6.278)	-15.25** (7.244)	-20.06*** (6.673)	-18.65*** (5.884)	-14.56** (6.069)	-15.15** (5.921)	-15.27** (5.926)	-17.73** (6.986)
Other Household Controls Interacted	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Bank Interactions	No	No	No	No	No	No	No	Yes
Obs	1,302	1,264	1,090	1,488	1,380	1,536	1,534	1,534
$R^2$	0.311	0.306	0.308	0.295	0.308	0.313	0.313	0.328

Note: The dependent variable is the household-level change in the logarithm of consumer credit volumes. These regressions are based on data from the Panel on Household Finances (PHF) survey. Bank exposure variables originate from the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (GuV). The main regressors are the triple interactions between a post-dummy equal to one for the third wave of the PHF survey and zero otherwise, bank-level noncore funding ratios measured in wave 2, and the following household 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 for foreign citizenship, and income expectations. 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. In columns (4) and (5), we drop households aged below 30 and 40. Columns (6) and (7) use a tighter definition of consumer credit, excluding student loans and loans from friends. In column (8), 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. To conserve space, most interaction estimates are not displayed. Data details can be found in the appendix 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.

Sources: PHF, GuV, and BISTA (See the appendix for details).

## **Different Credit Types**

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 last two components are independent of bank loan supply, we redefine consumer credit more strictly 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 (6). In column (7), we remove households that report having obtained loans from their employer. Neither modification affects the estimated coefficient, although the smaller sample size slightly reduces the significance level.

## **Controlling for Non-Random Treatment**

A potential threat to our main regressions is that banks' exposure to cross-border flows may not be distributed randomly but correlates with other bank characteristics. As Table A2 shows, however, this is unlikely to be a major concern for our analysis as both more and less exposed banks share similar characteristics. Specifically, both types of bank types are comparable in size, profitability, and capitalization. Only liquidity ratios seem to be significantly smaller for more exposed banks.

Yet, as explained in Section 4.1, controlling for these bank covariates increases the likelihood that the conditional mean zero assumption is satisfied and that we hence obtain unbiased estimates (Roberts and Whited 2013). To this end, we run 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. Table 5, column (8), shows their inclusion changes neither the size nor the significance of our coefficient of interest. While we do not report the coefficients for the additional interaction terms in Table 5, most 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.

### **5.3 Placebo Test**

In Section 4.1 we performed an initial check of the parallel trends assumption. Figure 3 indicated that more and less exposed banks exhibited lending patterns up to 2014 and then diverged, particularly for lending to lower-income households, when bank flows into Germany began increasing. Ideally, our survey data would contain a long pre-treatment time series for each household to verify if the parallel trends assumption is satisfied. Given that the PHF data span only three waves, we instead address this limitation by conducting placebo regressions. The first one estimates Equation 2 on a pre-inflow sample. For this, we rerun our benchmark regression, restricting the data to the first (2010–2011) and second (2014) survey waves. With only two sample waves, we cannot compute the outcome variable in log-differences. Instead, we use the logarithm of consumer credit as the dependent variable. Table 6, column (1), confirms that our main results hold when we rerun the benchmark regression with this alternative transformation of the credit variable. We then estimate this regression specification on the pre-inflow sample. Column (2) shows that, in this placebo regression, the difference in lending patterns between more and less exposed banks disappears. This finding provides additional support for the parallel trends assumption, suggesting that affected and unaffected banks followed similar lending paths before the sudden rise in international bank inflows.

Next, we perform two other sets of placebo regressions to confirm that 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 the outcome variable but substitute the bank exposure variable with a placebo—the bank share of tangible fixed assets over total assets. Cross-border bank inflows provide additional

liquidity to banks dependent on noncore funding, regardless of their asset structure, and in particular independently of the share of a bank's tangible assets. We therefore expect this regression to produce insignificant treatment effects. Table 6, column (3), confirms that the consumer credit supply by "placebo-treated" and "untreated" banks evolves equally, further validating the parallel pre-trend assumption.

Second, instead of using a placebo treatment variable, we replace the dependent variable with household outcomes expected to be unrelated to cross-border bank flows. These include growth in income, growth of net worth, changes in the share of stocks in the asset portfolio, changes in the share of housing in total assets, and changes in housing tenure status. Columns (4)–(8) show that the triple interaction coefficient on *post x income x noncore funding ratio* is statistically insignificant for all these regressions. Households with relationships with more or less exposed banks exhibited no diverging dynamics in these placebo outcomes, providing further support for the parallel trend assumption.



Table 6 Placebo Tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Benchmark Ln(ConsLoans)	Placebo Ln(ConsLoans)	$\Delta$ Ln(ConsLoans)	$\Delta$ Ln(Income)	$\Delta$ Ln(NetWorth)	$\Delta$ Stocks	$\Delta$ Housing	$\Delta$ Tenure
Post $\times$ Income	0.0301 (0.386)	-0.0729 (0.500)	37.17 (26.28)	19.60** (8.014)	-21.92 (15.62)	-0.306 (0.37)	3.206 (3.1)	-0.0959*** (0.0366)
Post $\times$ Tangible			-162.3 (586.6)					
Post $\times$ Income $\times$ Tangible			32.72 (47.54)					
Post $\times$ Noncore	0.427 (0.283)	0.180 (0.307)		-1.698 (12.84)	-6.521 (17.18)	0.49 (0.85)	-0.0647 (4.993)	-0.0004 (0.0482)
Post $\times$ Income $\times$ Noncore	-0.0453* (0.0275)	0.0163 (0.0322)		0.5 (1.191)	2.443 (1.534)	-0.0769 (0.0731)	0.161 (0.471)	-0.0026 (0.0044)
Other Household Controls Interacted	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	2,910	1,958	1,536	1,494	1,468	1,536	1,536	1,536
$R^2$	0.702	0.694	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 the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (GuV). The dependent variable is the household-level change in the logarithm of consumer credit volumes (columns 1, 2, and 3), the log-change in income (column 4), the log-change in net worth (column 5), the change in the share of stocks over a household's total portfolio value (column 6), the change in the share of housing wealth over the total portfolio value (column 7) and the change in a household's housing tenure status (column 8). 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 and zero otherwise, bank noncore funding ratios (columns 1 and 2 and 4 to 8) or bank tangible fixed assets over total assets (column 3) measured in wave 2, and the following household 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. To conserve space, most interaction estimates are not displayed. Data details can be found in the appendix 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.

Sources: PHF, GuV, and BISTA (See the appendix for details).

## 5.4 External Validity: Euro Area Households

So far, this paper has established that German households benefited from increased 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. Therefore, we focus on the effect of cross-border bank inflows on credit volumes, without differentiating between more and less exposed banks. Instead, we measure households' exposure by means of country-level bank inflows over GDP (Figure 2).

Table 7 presents evidence that euro area countries besides Germany also 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 data set, excluding the foreign citizenship dummy 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 term: *Post x country-level bank inflows x household income*.

Our coefficient of interest remains consistent when German regression controls are replicated as closely as possible by including the foreign citizenship dummy (column 2) and country-time fixed effects (column 3). In column (4), isolation of log-income triple interactions and the omission of other household interactions still obtains a significant coefficient estimate. Similarly, the results hold in column (5), where we exclude the 5,546 German households included in columns (1)–(4), though in this case the triple interaction coefficient falls slightly below conventional significance levels. Finally, in column (6), we use the log of mortgage credit volumes as the outcome variable. Consistent with our German benchmark results, we do not see a shift in mortgage credit across households.

Together, the Table 7 results provide evidence that other euro area countries exhibited a similar increase in consumer credit toward low-income households in response to foreign bank funding inflows. The results also demonstrate that the findings

for German households were not driven by the ECB's nonconventional monetary policy, given that all euro area countries faced the same monetary policy mix. Only euro area countries with greater bank inflows experienced a shift in consumer credit toward low-income households.

## **6 MECHANISMS**

In this section, we identify the mechanisms underlying our results. The starting point is to examine whether the aggregate bank inflow shock implies higher bank noncore funding volumes for more relative to less exposed banks. We then study to what extent our results are driven by regional banks obtaining interbank liquidity directly from abroad, 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, with a particular focus on the role of bank agency problems.

**Table 7** Results for the European Household Sample

	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(ConsLoans)	Ln(ConsLoans)	Ln(ConsLoans)	Ln(ConsLoans)	Ln(ConsLoans)	Ln(Mortgages)
Post × Income	-0.197** (0.08)	-0.134** (0.05)	-0.122** (0.04)	-0.089* (0.04)	-0.170* (0.08)	-0.059 (0.01)
Post × Income × Flows	-0.034* (0.02)	-0.027* (0.01)	-0.035** (0.01)	-0.025*** (0.01)	-0.026 (0.02)	-0.019 (0.02)
Other Household Controls Interacted	Yes	Yes	Yes	Yes	Yes	Yes
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) and 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 additionally 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.

Source: HFCS (See the appendix for details).

## 6.1 More Exposed Banks Experience Greater Funding Inflows

Our main regression specification implicitly assumes that banks with higher initial noncore funding ratios are more exposed to aggregate bank inflow shocks. In this subsection, we verify this assumption by examining whether these banks indeed experience greater noncore funding inflows from abroad following the shock.

To investigate this, we regress the logarithm of each bank's total noncore funding volume as well as the interbank component individually on the interaction term *Post x noncore funding ratio*, using the same sample period as in the household regressions. We include bank and year fixed effects and cluster standard errors at the bank level. As Table 8 shows, banks with a higher noncore funding ratio prior to the cross-border bank inflow shock indeed experience higher noncore funding inflows, regardless of whether measured as total noncore funding (column 1) or as interbank liabilities (column 2). These effects are approximately twice as large when focusing exclusively on regional banks (columns 3-4), consistent with the household regression findings. Together, these results confirm that banks classified as more exposed are indeed the ones experiencing higher inflows of wholesale funds as a consequence of the cross-border inflow shock.

## 6.2 Direct vs Indirect Transmission

We have shown that regional banks dependent on noncore funding increase their consumer lending to low-income households. This could be driven either by direct access to foreign wholesale liquidity or by a trickledown effect, where larger banks attract cross-border bank inflows and pass on their liquidity “surplus” to smaller banks. To disentangle both effects we exploit the granularity of the supervisory data, which allows us to break down interbank deposits—the largest component of banks' noncore

**Table 8** Do Noncore Volumes Increase for More Exposed Banks?

	All Banks		Regional Banks	
	(1)	(2)	(3)	(4)
	Ln(Noncore)	Ln(Interbank)	Ln(Noncore)	Ln(Interbank)
Post × Noncore	0.003*** (0.001)	0.003*** (0.001)	0.006*** (0.002)	0.005** (0.002)
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Obs	14,212	14,212	11,735	11,735
$R^2$	0.96	0.95	0.98	0.97

Note: The dependent variable is the log-level of a bank's noncore or interbank funds. The data originate from the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (GuV) and cover 2010–2017. The main regressor is the double interaction between a post-dummy equal to one for the third wave of the PHF survey and zero otherwise, and bank-level noncore funding ratios measured in wave 2. In columns (1) and (2), we include all banks in the analysis. Columns (3) and (4) only include regional banks. Data details can be found in the appendix Table A1. Time and bank fixed effects are included. Heteroscedasticity-robust standard errors clustered at the bank level are shown in parentheses. \*, \*\* and \*\*\* indicate statistical significance at the 10%, 5%, and 1% levels.

Sources: GuV and BISTA (See the appendix for details).

funding—into its domestic, euro area, and non-euro area parts.<sup>13</sup> If our benchmark results are driven by a trickledown mechanism, we would expect the triple interaction with domestic interbank deposits to be significant, whereas for the foreign components it should not exhibit significance. In contrast, if a direct pass-through from foreign to regional banks is behind our results, the foreign interbank deposit interactions should be significant.

Table 9, columns (1)–(3) show that the coefficients for both domestic and non-euro area interbank deposits are statistically significant, but the coefficient for 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, with the normalized coefficient on non-euro area deposits being five times greater. This

<sup>13</sup> This breakdown is not available for the other variables used in the construction of noncore 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.

suggests that our results are primarily driven by direct deposits from non-euro area banks into regional German banks, with amplification through a trickling down of funds deposited at large, nationally active banks. Our analysis is limited to inflows and outflows at German banks due to data constraints preventing further investigation into the negligible role of euro area interbank deposits in the transmission mechanism. Euro area banks accounted for only about 7% of inflows into Germany during 2015–2017. In contrast, inflows from the United Kingdom into Germany were on average eight times larger than those from France and seven times larger than flows from the Netherlands. This disparity may reflect the strong ties between large global, non-euro area banks and the German banking system or regional portfolio preferences.

### **6.3 Intensive vs Extensive Margin**

Next, we investigate the extent to which our key result that more exposed banks raise consumer lending to low-income households is driven by changes in the intensive or extensive margin of lending. For this, 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 equal to 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 9, 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 in prior results, and is statistically significant at the 10% level. This estimate implies that treated banks are 4.4% more likely than non-treated banks to give credit to new borrowers in the 75th percentile of the income distribution than to those in the 25th percentile of the income distribution. We obtain similar results when applying a probit or logit model. The extensive margin thus plays an important role in the overall

**Table 9 Mechanisms: Funding Sources, Extensive Margin and Bank Capital**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta \ln(\text{ConsLoans})$	$\Delta \ln(\text{ConsLoans})$	$\Delta \ln(\text{ConsLoans})$	Prob(NewLoan)	Prob(MoreCred)	Low-Cap $\Delta \ln(\text{ConsLoans})$	High-Cap $\Delta \ln(\text{ConsLoans})$
Post $\times$ Income	-96.06** (40.56)	-94.01** (41.26)	-117.8*** (41.96)	3.01 (5.27)	-1.73 (5.13)	293.3*** (72.58)	-39.55 (155.7)
Post $\times$ Exp.				6.31* (3.82)	0.718 (3.55)	235.3*** (72.58)	143.4 (117.2)
Post $\times$ Income $\times$ DE Exp.	-90.06*** (34.78)						
Post $\times$ Income $\times$ EA exp.		-67.8 (62.75)					
Post $\times$ Income $\times$ Non-EA exp.			-521.4** (236.9)				
Post $\times$ Income $\times$ Exp.				-0.607* (0.362)	0.00 (0.364)	-26.29*** (6.907)	-6.630 (11.55)
Other Household Controls Interacted	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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 data from the Panel on Household Finances (PHF) survey. Bank exposure variables originate from the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (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 by 100 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 and zero otherwise, bank exposure measured in wave 2, and the following household 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. To conserve space, most interaction estimates are not displayed. 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 noncore funding ratio. In columns (6) and (7), we split the sample into low-capitalized banks (below median) and well-capitalized banks (above median). Data details are available in the appendix 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.

Sources: PHF, GuV, and BISTA (See the appendix for details).



credit increase, suggesting that households with initially limited access to credit saw these constraints loosen following the rise in bank inflows. In contrast, the intensive margin does not play a role, as indicated by the insignificant estimate in column (5).

#### **6.4 Bank Capitalization**

Why do more exposed banks raise their consumer lending to higher-risk rather than to lower-risk borrowers? The existing literature on the risk-taking channel of both monetary policy and capital flow transmission suggests that poorly capitalized banks tend to engage (more) in riskier lending (e.g., Jiménez et al. 2014; Altavilla, Laeven, and Peydró 2020; Dinger and Kaat 2020; Kaat 2021). The theoretical rationale behind this empirical result is that bank agency problems become more severe as bank capitalization falls, because banks fail to 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). To investigate whether our findings are driven by poorly capitalized banks, we re-estimate our benchmark regression on two subsamples: one of banks with a capital-to-asset ratio below the in-sample median and another that is composed of above-median banks.

Table 9, columns (6) and (7), shows 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 times to 2 times larger than the benchmark estimate in Table 3, implying a credit growth differential of 189 percentage points between low and high-income households borrowing from more exposed versus less exposed banks. In contrast, we do not find a shift in more exposed banks' consumer lending toward low-income households for the subsample of well-capitalized banks. Our analysis thus documents that the transmission of foreign capital inflow shocks to households through bank funding operates through a similar risk-taking channel reported by earlier research into monetary policy transmission and firm funding.

## 7 REAL EFFECTS OF LOCAL CREDIT BOOMS

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

**Table 10** Bank Flows, Credit and Consumption Effects

	(1) Nondurable	(2) Durable	(3) Food	(4) Restaurant
Post $\times$ Income	-0.0411 (0.0251)	-0.0151 (0.0677)	-0.0158 (0.0203)	-0.134 (0.0839)
Other Household Controls Interacted	Yes	Yes	Yes	Yes
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 data from the Panel on Household Finances (PHF) survey. Bank exposure variables originate from the Bundesbank's monthly balance sheet statistics (BISTA) and income statement statistics (GuV). The dependent variable is the household-level logarithm of durable, nondurable, food and restaurant consumption. The main regressors are double interactions between a post-dummy equaling one for wave 3 of the PHF survey and zero otherwise, and the following household 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. To conserve space, most interaction estimates are not displayed. Data details can be found in the appendix 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. Sources: PHF, GuV, and BISTA (See the appendix for details).

In Table 10, we look at a plain regression that highlights treatment effects by household income. Then, in Table 11 we split our sample into households borrowing from banks with low versus high noncore funding ratios to determine whether consumption changes

are consistent across the board or confined to households linked to banks that are more exposed to inflow shocks. All regressions include household and time fixed effects, as well as household controls interacted with the post-dummy.

Table 10 shows that low-income households indeed increase consumption expenditures following the bank inflow shock. However, the coefficient estimates are weakly identified and not statistically significant. This is consistent with our findings in Table 3, which showed that only low-income households borrowing from exposed banks experienced a rise in credit.

We proceed by splitting the sample into households borrowing from banks that are more exposed (with higher noncore ratios) and less exposed (lower noncore ratios). Table 11, columns (1)–(4), shows that households borrowing from less exposed banks do not increase consumption. Low-income households banking with more exposed credit providers do show an increase in their nondurable consumption, particularly food and beverages consumed outside the home, in columns (5)–(8), although the coefficients in columns (1)–(4) are not statistically different from those in columns (5)–(8). On the other hand, bank inflows do not affect durable consumption by low-income households. The effect on nondurable consumption is not only statistically, but also economically significant. After the shock, a low-income

**Table 11** Bank Flows and Consumption—Distinguishing by Bank Exposure

	Less Exposed Banks				More Exposed Banks			
	(1) Nondurable	(2) Durable	(3) Food	(4) Restaurant	(5) Nondurable	(6) Durable	(7) Food	(8) Restaurant
Post × Income	-0.0225 (0.0383)	-0.0320 (0.119)	0.00984 (0.0330)	-0.0500 (0.158)	-0.0553* (0.0322)	-0.00768 (0.0815)	-0.0316 (0.0254)	-0.177* (0.0992)
Other Household Controls Interacted	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
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, nondurable, 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 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. To conserve space, most interaction estimates are not displayed. Data details can be found in the appendix Table A1. In columns (1)–(4), we focus on households whose main relationship is with a less exposed bank (lowest 33% of noncore 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.

Sources: PHF, GuV, and BISTA (See the appendix for details).

household—i.e., one in the 25th percentile of the income distribution—consumes 28.7% more nondurables than its pre-inflow consumption, and more than a higher-income household (in the 75th percentile of the income distribution).

Overall, these findings provide valuable insights into the effects of international capital flows. While cross-border bank inflows have been shown to bring the potential of financial instability risks through sudden increases in lending, our analysis highlights their role in relaxing credit constraints for poorer households with previously unmet demand for credit. Improvement in their access to credit translates exclusively into a growth of shorter-term consumer credit, which these households use to raise nondurable consumption, a more transitory form of expenditure.

## **8 CONCLUSIONS**

We employ granular matched bank and household data and establish that cross-border bank inflows induce regional banks with a greater noncore funding dependency to increase their uncollateralized lending to riskier, lower-income households. However, we do not observe any increase in risk-taking in banks' mortgage lending.

Investigating the channels through which 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 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 poorly capitalized banks are responsible for the rise in credit, while better capitalized banks do not lend more to households. We further demonstrate that this credit expansion occurs through the extensive margin. Finally, as access to credit improves, lower-income households who are clients of more exposed banks increase their spending on consumption, especially on non-essential nondurables. We establish the external validity of our main results using cross-country household data from almost 18,000 households in the euro area.

While previous research has shown that cross-border capital inflows raise bank lending to risky *firms*, particularly in emerging economies, we provide new household-level evidence that a similar risk-taking effect exists in banks' *household* lending. Importantly, we also document that cross-border capital flows can generate large fluctuations in credit supply not only in emerging economies but also in an advanced economy such as Germany, and that this occurs through smaller regional banks rather than through the international network of large global banks, as several studies (Cetorelli and Goldberg 2012; Correa et al. 2021) have emphasized. Our analysis shows that smaller, regional banks without international activities also create a link to global capital markets through their reliance on noncore funding.

Prior research has demonstrated that credit expansions in the household sector can lead to boom-bust cycles, increase financial fragility, and predict financial crises. Our results imply that fluctuations in foreign funding flows can increase financial stability risks through regional, less capitalized banks. At the same time, however, greater access to credit allows lower-income households to increase consumption. This has the potential to reduce consumption inequality, at least in the short run. Over the longer term, however, the debt of poorer households will increase. Overall, our analysis hence highlights the trade-offs that policymakers face when foreign capital inflows in the interbank market lead to domestic fluctuations in credit availability. A complete assessment of the long-term effects of cross-border capital inflows on consumption inequality and a granular understanding of the mechanisms behind these effects requires further research.

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

This paper provides novel microlevel evidence that cross-border bank flows are an important means for households to access credit. Using granular data from Germany, we study how lending to households was impacted by the influx of cross-border bank funding following the European Central Bank's implementation of nonconventional monetary policy in 2014 and 2015. Regional banks that were highly exposed to fluctuations in foreign capital inflows increased consumer lending to riskier, lower-income households by 50% more than other banks.

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