Monetary Policy Transmission with Adjustable and Fixed-Rate Mortgages: The Role of Credit Supply[*]

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Abstract

While higher interest rates increase the payments for borrowers with adjustable-rate mortgages (ARMs), cutting their disposable income, higher rates also increase lenders' interest income, strengthening their balance sheets. We find, correspondingly, that—when monetary conditions tighten—banks with higher ARM shares see their stock prices outperform, supply more credit, and obtain higher interest income compared to banks with lower ARM shares. Therefore, more ARM credit outstanding may weaken monetary policy transmission. During a financial crisis, when interest income becomes critical for banks, reductions in interest rates may be challenging for those banks with very high ARM shares.

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1 Introduction

A widely held view in macroeconomics is that monetary policy transmission is stronger when the share of adjustable-rate mortgages (ARMs) in an economy increases (Mishkin (2007); Garriga, Kydland and Šustek (2017)). The logic is straightforward: when monetary policy tightens, interest rates on ARMs reset upward because they are tied to a reference rate that moves with the policy rate. The resulting increase in mortgage payments reduces borrowers' disposable income, potentially curtailing consumption and thereby strengthening monetary policy transmission. For borrowers with fixed-rate mortgages (FRMs), however, payments remain unchanged.

In this paper, we argue that this view, by focusing solely on the borrower, is incomplete. An increase in mortgage payments represents a transfer of income from borrowers to lenders. As banks face a more favorable interest income outlook, those with a higher share of ARMs should outperform those with a lower share and possess a greater capacity to extend credit. Based on this mechanism, we hypothesize that a higher prevalence of ARMs may actually weaken monetary policy transmission through the bank lending channel. While this mechanism may attenuate the impact of monetary policy, it could simultaneously enhance bank stability, potentially warranting adjustments in macroprudential policy.

We present three sets of results that support our hypothesis. First, we show that the interest income of banks with higher ARM exposure increases more persistently over time following a monetary tightening. Second, the stock prices of these banks react more positively to surprise tightening shocks. Third, using bank-level, bank–county-level, and syndicated loan-level data, we show that banks with higher ARM shares maintain a relatively stronger credit supply than banks with lower ARM shares when monetary conditions tighten.

We agree with the established view that heterogeneity in banks' responses to monetary policy operates through differences in interest-rate exposure, often summarized by maturity or income gaps (English, Van den Heuvel and Zakrajšek (2018) and Gomez et al. (2021)). Our focus on ARMs should be understood as isolating a specific, contract-defined component of this broader repricing heterogeneity: the household-mortgage share of banks' rate-sensitive assets. While ARM exposure is naturally related to standard gap measures, it need not be fully captured by them, and it has a direct policy interpretation because it is tied to mortgage contract design and household balance sheets.

There are three reasons why studying ARMs is informative even conditional on standard gap measures. First, U.S. ARMs feature institutional frictions—hybrid fixed-rate periods and periodic/lifetime adjustment caps—that mechanically delay and smooth the pass-through from monetary policy rates to mortgage cash flows. This implies a distinct dynamic profile: the relative interest-income benefit of higher ARM exposure materializes gradually over several years rather than immediately, consistent with our local-projection evidence in Section 3. Second, broad income-gap and maturity-gap measures can reflect active asset–liability management and hedging decisions, whereas ARM exposure is more tightly linked to local mortgage demand and a bank's long-run geographic footprint; we exploit this feature in our shift-share (Bartik) design in Section 5.4. Third, we test redundancy directly: in both the stock-price and lending regressions, the interaction of monetary policy with the ARM share remains economically and statistically significant when we horse-race it against the income gap (Gomez et al. (2021)), the maturity gap (English, Van den Heuvel and Zakrajšek (2018)), and interest income/expense betas (Drechsler, Savov and Schnabl (2021)).

We begin our analysis by testing the underlying mechanism. Our hypothesis predicts that monetary tightening leads to a relatively larger increase in interest income for banks with higher ARM shares. Since ARMs are long-term contracts and rate adjustments occur with a lag, we expect this higher income to materialize gradually. We test this using the local projection framework developed by Jordà (2005), examining the dynamic response of various interest income measures to surprise monetary policy shocks (identified from high-frequency changes in short-term bond yields around policy announcements). To isolate the role of ARMs, we control for an extensive set of bank balance sheet characteristics, including liability structures and other repricing assets and liabilities, interacting these controls with the monetary policy shocks. We also include bank and time fixed effects. Our results confirm the hypothesis: banks with higher ARM shares experience a persistent increase in mortgage interest income and, eventually, higher net interest income.

Second, we analyze the role of ARM shares in determining bank stock price responses to monetary policy surprises identified from high-frequency changes in short-term bond yields around policy announcements. Consistent with our interest income analysis, we control for a wide range of bank characteristics and their interactions with the shocks, as well as lagged equity price dynamics, bank fixed effects, and time fixed effects. The results confirm that equity prices of banks with higher ARM shares perform relatively better when monetary policy tightens.

Third, we analyze whether ARM shares affect the transmission of monetary policy to bank lending. We expect the credit supply of banks with higher ARM shares to remain relatively stronger during a tightening cycle. We estimate an extended version of the model used by Gomez et al. (2021). Following Gomez et al. (2021), we primarily use changes in the Federal Funds Rate (FFR) as our measure of monetary policy stance, as high-frequency shocks, while cleaner for identification, are typically very small.[1] To mitigate the endogeneity of the FFR, we include key macroeconomic variables (inflation, GDP growth, housing price growth, and mortgage demand) and their interactions with bank characteristics. Our bank-level results show a positive and statistically significant coefficient, indicating that banks with higher ARM shares curtail credit less than banks with lower ARM shares when interest rates rise. The economic magnitudes are significant.

To rigorously identify the credit supply channel, we utilize U.S. Community Reinvestment Act (CRA) and syndicated-loan-level DealScan data. These data allow us to employ borrower×time fixed effects, effectively controlling for unobserved loan demand by comparing loans made to the same county (using the CRA data) and firms (using the DealScan data) by different banks at the same time. The results confirm our bank-level findings: the credit supply of banks with higher ARM shares remains stronger when the FFR increases.

A remaining concern is the potential endogeneity of a bank's ARM share. Banks may strategically select their mortgage portfolio composition based on expectations of future monetary policy. To address this, we implement an instrumental variable (IV) strategy using a Bartik-style instrument applied to the DealScan data. We construct an instrument for a bank's ARM exposure by interacting the bank's predetermined geographic deposit footprint (the "share") with time-varying local ARM prevalence (the "shift"). This approach exploits arguably exogenous variation in ARM exposure driven by historical presence rather than contemporaneous strategic choices. The two-stage least squares (2SLS) estimation reinforces our OLS findings.

The ARM share we study captures a nuanced dimension of bank interest rate exposure. While banks face significant interest rate risk when holding long-term fixed-rate assets, ARMs mitigate this exposure by contractually transferring rate changes to the borrower. Conceptually, this links the ARM share to standard interest rate risk metrics, such as the income gap (Gomez et al. (2021)), the maturity gap (English, Van den Heuvel and Zakrajšek (2018)), and interest income/expense betas (Drechsler, Savov and Schnabl (2021)). To distinguish the role of the ARM share, we construct the income gap, maturity gap, and estimate bank-level interest income and expense betas, and horse-race them with the ARM share, for both stock prices and bank lending analysis. The role of the ARM share in these settings is robust to these additional controls.

We recognize that this income transfer mechanism does not operate in isolation. A natural countervailing force is the credit risk channel: higher interest rates raise payments for ARM borrowers, which could, in principle, lead to higher delinquencies that offset banks' interest

[1] We also provide results with surprise monetary policy shocks, where we show that our most salient results remain similar.

income gains. We explicitly test this trade-off. Using the same local-projection framework as in our interest income analysis, we examine the dynamic response of mortgage non-performing loan (NPL) ratios and loan loss provisions to monetary policy tightening. We find that the credit risk channel is economically small and does not negate the income channel. Mortgage NPL ratios (for real estate loans) are statistically indistinguishable from zero across horizons and peak at economically modest levels. Quantitatively, even at its peak, the (statistically insignificant) increase in mortgage delinquencies is negligible relative to the sustained increase in net interest income at longer horizons. We also find no spillovers to other loan portfolios, such as commercial and industrial lending. Crucially, loan loss provisions—a forward-looking measure of bank risk—decline significantly for high-ARM banks at longer horizons, indicating that banks view the medium-term risk implications of ARM payment resets as limited. Thus, over the range of monetary policy variation in our sample, the positive income transfer from borrowers to lenders dominates the credit risk channel, leaving high-ARM banks with stronger cash flows and (as we show in the lending analysis) a greater capacity to supply credit.

The availability of refinancing options makes FRMs and ARMs similar when interest rates decline, although refinancing costs and inaction limit the degree of substitution.[2] This implies an asymmetry in monetary policy transmission: we expect the ARM channel to be significant during tightening episodes but small or absent during loosening episodes. We test this prediction by estimating separate coefficients for tightening and loosening events, and our results for both stock prices and lending confirm this asymmetry.

We perform a battery of robustness tests. For example, we show that our results are not driven by post-2008 developments or by banks with extreme shares of real estate loans. For the lending analysis, we show that using alternative macroeconomic variables or high-frequency monetary policy shocks does not change our main conclusions.

The overall impact of ARMs on monetary policy transmission ultimately depends on the tension between the banking channel and the borrower channel, hinging on whether lenders or borrowers are the marginal agents at a given time. During a banking crisis, such as 2008, when banks are weakly capitalized, they become the marginal agents. In such scenarios, a reduction in policy rates might be counterproductive if ARM shares are high, as the resulting decline in interest income could threaten bank solvency. Conversely, during the recent episode of rising interest rates, highly indebted households with ARMs might sharply cut demand, potentially dominating the bank credit channel. Relatedly, while households with FRMs are insulated from rate increases, the sharp decline in the balance

[2]Even in well-designed mortgage systems, households often exhibit significant inaction in refinancing decisions, driven by factors such as psychological costs and information-gathering burdens (Andersen et al. (2020)).

sheet valuation of FRMs due to high nominal rates might curtail credit or even challenge financial stability (as exemplified by several bank failures in 2023), thereby strengthening monetary policy transmission.[3]

Related Literature: We build on several strands of the literature. The first strand examines the borrower channel of monetary policy transmission through mortgage contracts. Most closely related is Di Maggio et al. (2017), who show that ARM holders experienced significant reductions in mortgage payments (up to 50 percent) as the Federal Reserve lowered its policy rate during the 2008 crisis, leading to a substantial increase in car purchases (up to 35 percent). They also find that regions with a higher proportion of ARMs experienced relative decreases in defaults and increases in house prices, car purchases, and employment in response to lower interest rates.[4] In contrast to their focus on the borrower response during a loosening cycle, we focus on the lender side and demonstrate that changes in interest rates create opposing effects on lenders with high ARM shares by altering their interest income.

Our paper relates to work on banks' interest-rate exposure and the transmission of monetary policy, including English, Van den Heuvel and Zakrajšek (2018) and Gomez et al. (2021).[5] These studies show that banks with larger maturity or income gaps tend to experience more favorable profit and valuation responses to unexpected increases in rates and contract lending less. We build on this framework and interpret ARM exposure as one important component of repricing heterogeneity.

Our contribution is to show that focusing on ARMs—a contract-defined, household-facing asset class—is empirically and economically informative beyond standard gap proxies. Because ARMs reprice with institutional lags and caps, they generate a delayed yet persistent interest-income profile that differs from the immediate repricing of many other short-horizon rate-sensitive assets. Consistent with this distinction, the ARM share retains explanatory power for stock-price and lending responses even when we control for the income gap, maturity gap, and interest income/expense betas in horse-race specifications.

Recent work by Uppal (2025) and Bouis, Mirza and Nier (2025) further decomposes bank

[3]See Arslan, Guler and Kuruscu (2020) for a general equilibrium model with FRMs where a rise in interest rates lowers bank equity and credit supply, and strongly amplifies a bust.

[4]While we focus on mortgage lending, similar channels are at work with other forms of lending as well. For example, Ippolito, Ozdagli and Perez-Orive (2018) argue that most bank loans to firms have floating rates mechanically tied to monetary policy rates. Hence, a loosening in monetary policy can directly improve the liquidity and balance sheet strength of firms, a mechanism akin to the findings in Di Maggio et al. (2017). Another related mechanism exists with GDP-indexed bonds (see for example Önder (2023)). However, in Önder (2023) and others, international investors, which corresponds to banks in our paper, are typically risk neutral and the cost of such bonds is not modeled explicitly beyond its effect on the default probability.

[5]Relatedly, Paul (2023) shows that stock prices of banks with larger maturity mismatches respond more positively to a rise in term premia.

profitability during tightening cycles. They highlight a trade-off in floating-rate lending: higher rates increase net interest income but also raise borrower debt-servicing burdens and, hence, loan loss provisions. Uppal (2025) finds that for U.S. banks the loan-loss channel can dominate the income effect, leading to lower profits and higher leverage. Similarly, Bouis, Mirza and Nier (2025) show in cross-country data that higher rates increase provisions for banks with more flexible-rate lending, although macroprudential policy can mitigate these effects. Our analysis complements this work by jointly evaluating these two forces. In our sample, the positive income effect dominates the credit-risk channel, allowing high-ARM banks to sustain relatively stronger credit supply. Adelino, Ferreira and Zhao (2025) further show that the pass-through of monetary policy to ARM mortgage rates is imperfect because of adjustment caps and hybrid structures. This evidence is consistent with the gradual income response we estimate in our local projections.

Our results are also distinct from broader bank net-worth channels of monetary policy, such as the recapitalization channel emphasized by Orame, Ramcharan and Robatto (2025). The key difference is that ARM exposure affects banks through a persistent income-flow mechanism rather than a one-time valuation effect, naturally giving rise to an asymmetry between tightening and loosening, and is directly shaped by mortgage-market institutions and regulation.

Our contribution to this set of papers is our specific focus on the ARM share. Conceptually, the ARM share is related to the maturity mismatch and the income gap. As the ARM share increases, the duration of assets shortens, generally reducing the maturity mismatch. Simultaneously, a higher share of ARMs increases the volume of repricing assets, which tends to increase the income gap (the difference between rate-sensitive assets and liabilities). First, the ARM share is a specific asset class, often driven by household preferences (Albertazzi, Fringuellotti and Ongena (2024)). Second, the counterparty for ARMs is households, who may be less sophisticated in managing interest rate risk. Third, mortgages have long maturities; while banks might hedge short-term risks, long-term hedging may be prohibitively costly or unavailable. Finally, methodologically, we combine and expand upon the econometric frameworks used in these studies. To compare the relative importance of these measures, we construct maturity and income gaps and horse-race them with the ARM share. In all specifications, the ARM share remains statistically and economically significant.

Our paper further contributes to the broader literature on the significance of bank interest rate risk.[6] Drechsler, Savov and Schnabl (2021) present findings suggesting that banks' net interest margins and net worth are highly stable and relatively insensitive to changes in

[6] Di Tella and Kurlat (2021) propose a model where banks optimally choose to bear interest rate risk.

interest rates, implying limited vulnerability to monetary policy shocks.[7] However, Hoffmann et al. (2019), utilizing European data, argue that while aggregate exposure is small, significant heterogeneity exists across banks due to variations in mortgage rate fixation conventions across countries. We offer additional evidence emphasizing the importance of mortgage composition in generating interest income risk. We estimate interest income and expense betas following Drechsler, Savov and Schnabl (2021) and use them as controls in our regressions, showing that the ARM share remains significant. The key distinction is that while these betas measure short-term interest rate risk matching, ARMs influence interest income over the medium to long term, which are likely to be harder to hedge.

Our work also relates to Haddad and Sraer (2020), which shows that changes in banks' interest rate exposure (i.e., the "income gap") predict one-period bond excess returns, suggesting banks play a significant role as investors in fixed-income markets. Our paper, conversely, focuses on the effects of ARMs on bank lending behavior.

Our findings have implications for the general equilibrium literature arguing that higher ARM prevalence enhances monetary policy effectiveness. Garriga, Kydland and Šustek (2017) construct a quantitative model with long-term mortgages showing stronger transmission under ARMs. Calza, Monacelli and Stracca (2013) provide empirical evidence and a DSGE model suggesting that monetary policy impacts on residential investment and house prices are stronger in countries with variable-rate mortgages. However, these papers typically abstract from explicit modeling of bank credit and balance sheets.

Finally, our analysis complements the general equilibrium analysis by Arslan, Guler and Kuruscu (2020). They study a framework where households use FRMs financed by banks that hold these mortgages on their balance sheets. They show that a rise in interest rates lowers bank net worth due to valuation effects, reducing bank credit and slowing the economy. Therefore, FRMs in their framework amplify interest rate increases via bank balance sheets. Our empirical results provide support for this tension, as we find a higher ARM (FRM) share in bank balance sheets weakens (strengthens) the bank's role in monetary policy transmission.

We organize our paper as follows. In Section 2 we give institutional details and describe the data. Section 3 presents the results on interest income and expenses. We present the results on bank stock prices in Section 4. Section 5 reports the results on lending (bank-, bank-county- and syndicated-loan-level). Section 6 concludes.

[7] Begenau, Piazzesi and Schneider (2015) show that banks' balance sheets in the U.S. are exposed to interest rate risks and that hedging is very limited.

2 Institutional Details, Data, and Methodology

2.1 The Mortgage Market in the U.S.

The U.S. mortgage market has several characteristics that relate to our paper. First, FRMs account for over 75 percent of residential mortgages. Second, mortgages are extensively securitized and traded among investors. Fannie Mae and Freddie Mac, two prominent Government-Sponsored Enterprises (GSEs), purchase mortgages that meet specific criteria from issuers, subsequently packaging and selling them to investors. Nevertheless, banks continue to hold a substantial portion of mortgages on their balance sheets. This retention may be driven by several factors. Mortgages that do not meet the conforming loan limits (jumbo loans) or other specific criteria of the GSEs are typically held in portfolio. Furthermore, banks may strategically choose to retain certain mortgages if the risk-adjusted return is deemed advantageous, or to maintain customer relationships.

Several features of ARMs are important for our research. One feature is the two-fold composition of an ARM contract, which governs the interest rate: the index and the margin. The index follows overall interest rate trends in the economy. Different lenders utilize various indexes for their ARMs. Commonly used indexes include the U.S. prime rate and the Constant Maturity Treasury rate. The margin is an additional percentage that the lender adds to the index. The specific margin applied depends on the borrower's creditworthiness.

In the U.S., a typical ARM has an initial fixed-rate period ranging from 3 to 5 years, after which an adjustable period starts. Within the adjustable period, there are caps that limit interest rate adjustment. The "initial adjustment cap" restricts the extent to which the interest rate can increase during the initial adjustment after the fixed-rate period. The "subsequent adjustment cap" limits the maximum increase in the interest rate for subsequent adjustment periods. Typically set at 2 percent, this cap ensures that the new rate cannot exceed 2 percentage points above the previous rate. Additionally, the "lifetime adjustment cap" puts a ceiling on the overall interest rate increase over the entire duration of the loan.[8]

[8] An ARM with caps of 2/2/5 means: 2 = The rate will not increase or decrease by more than 2 percent for the first adjustment after the fixed period ends. 2 = The rate will not increase or decrease by more than 2 percent for any subsequent rate adjustments. 5 = The rate will never increase by more than 5 percent above the initial starting rate.

2.2 Data

We combine several data sets for our analysis.

2.2.1 Bank Balance Sheets, Interest Income, and Interest Expense

We use an extensive set of bank balance sheet information in all our analysis. Here we describe the sources of data, and how we construct our dependent variables and alternative measures of bank interest-rate risk.

Bank Balance Sheet and Income Information—U.S. Call Reports: The bank balance sheet data come from the Call Reports, which are submitted by banks subject to regulation by the Federal Reserve System, Federal Deposit Insurance Corporation, and the Comptroller of the Currency. We obtain the data from Drechsler, Savov and Schnabl (2017) and complement it with additional data from Wharton Research Data Services (WRDS).

The main variable we construct from the Call Reports is the share of ARMs within bank balance sheets. Specifically, we use "Adjustable rate closed-end loans secured by first liens on 1-4 family residential properties in domestic offices" (RCON5370) as our measure of the ARMs. To ensure comparability across banks, we normalize this variable by dividing it by the respective bank's total assets. As a robustness exercise, we also use the ARM as a share of real-estate loans, and show that our results keep holding.

We construct a set of additional control variables. Consistent with existing literature on bank lending behavior, we include the bank equity and liquidity ratios (normalized by bank assets) and bank size (the logarithm of bank assets). Additionally, to account for the influence of bank balance sheet structure on bank lending, and to minimize potential omitted variable bias, we introduce controls for the share of balances due from the Fed (BdF), and the share of core deposits in liabilities, all normalized by assets. Furthermore, to capture the impact of other bank assets that have similar characteristics to ARMs, we include controls for bank assets with a maturity of less than one year (AMY). We also control for several bank liability variables. Specifically, we control for bank deposit market power in all specifications. In more saturated regressions, we include additional variables to control for the interest rate sensitivity of liabilities (savings deposits, time-sensitive deposits, Fed funds repo liabilities, and/or the full maturity information of assets and liabilities).

For each bank, we construct multiple dependent variables: (1) quarterly change in the logarithm of commercial and industrial loans, (2) quarterly change in net interest income normalized by lagged total assets, (3) quarterly change in interest income on residential real estate loans normalized by lagged residential real estate loans, (4) interest expense on loans and deposits normalized by lagged total assets and by lagged total deposits, (5) change in the ratio of non-mortgage interest income to lagged non-mortgage loans, (6) change in the

NPL for real estate loans divided by the lagged real estate loans.

Our data set spans the period from 1997 to 2013 (similar to Drechsler, Savov and Schnabl (2017) and Gomez et al. (2021)). This period is particularly suitable for our analysis as it encompasses significant variation in monetary policy stances, including both tightening and loosening cycles before the extended zero lower bound period. We exclude the crisis years of 2007 and 2008 from our baseline analysis, since these years were characterized by unprecedented government and central bank interventions (e.g., TARP and extraordinary liquidity facilities) that directly influenced bank balance sheets, confounding the identification of the bank lending channel. Furthermore, the realization of credit risk during this time—driven by falling house prices and concentrated heavily in ARM portfolios—makes it difficult to disentangle the hypothesized interest income channel from systemic crisis dynamics. Nevertheless, we show that our results are robust when we study the pre-2007 period.

We report summary statistics in Table IV. The average bank size is 15.8 billion USD, while the median is 1.78 billion USD and the minimum is 457 million USD in 2010 prices.[9] The average ARM share is 6 percent (0.06), with a median of 3 percent (0.03) and a standard deviation of 0.075, highlighting significant dispersion in ARM prevalence across banks. (Figure 1). The average quarterly growth rate of commercial and industrial loans is 2.8 percent.

Distinguishing ARM exposure from aggregate gap measures: Standard measures of bank interest-rate exposure—such as the income gap and the maturity gap—summarize the mismatch between rate-sensitive assets and liabilities within repricing windows (Gomez et al. (2021) and English, Van den Heuvel and Zakrajšek (2018)). The ARM share is a determinant of these gaps because ARMs are rate-sensitive assets. However, the ARM share captures distinct variation for two reasons.

First, *timing*. Mortgage cash flows are governed by contract features that are not captured by window-based gap summaries. In U.S. data, many ARMs are hybrids with an initial fixed period (typically three to five years) and contractual caps on subsequent rate adjustments (e.g., annual caps and lifetime caps). These features imply that changes in policy rates translate into mortgage rates and bank interest income with delay and smoothing, which motivates our dynamic analysis of interest income in Section 3.

Second, *source of variation*. While gap measures may reflect endogenous balance-sheet and hedging choices, ARM exposure is more tightly linked to household mortgage demand

[9]We follow Gomez et al. (2021) and drop small banks from our sample and keep the top 2 deciles. Gomez et al. (2021) focus on banks that are larger than 1 billion USD. Our sample includes also relatively smaller banks given that the minimum bank size is 457 million USD. We show that our results are robust to this selection.

and predetermined geographic footprints. We exploit this feature in Section 5.4 using a shift-share (Bartik) instrument based on banks' deposit footprints and county-level ARM prevalence.

Income and Maturity Gaps: We construct interest income (Gomez et al. (2021)) and maturity gap (English, Van den Heuvel and Zakrajšek (2018)) measures using the Call Reports data. For the interest income gap, on the income side, we add securities and loans maturing/repricing in less than a year. On the interest expense side we use time deposits, federal home loans, and other borrowing maturing/repricing in less than a year. We construct the "interest income gap" as the difference between these two measures following Gomez et al. (2021).[10] For the maturity gap, we follow English, Van den Heuvel and Zakrajšek (2018) and use the available comprehensive information on the maturity and repricing time of assets and liabilities that became available on the Call Reports starting in 1997:Q2.

The interest income gap and maturity gap measures that we construct have very similar values to the ones constructed by Gomez et al. (2021) and English, Van den Heuvel and Zakrajšek (2018), respectively. For example, the income gap in our bank-level lending analysis that covers more banks (Table IV) has an average of 0.118 and a standard deviation of 0.169. The corresponding numbers in Gomez et al. (2021) are 0.125 and 0.182. The maturity gap has an average of 3.916 in the same sample, while it is 3.70 in English, Van den Heuvel and Zakrajšek (2018).

Interest Income and Expense Betas: Finally, we construct interest income and expense betas for each bank following Drechsler, Savov and Schnabl (2021). In particular, we estimate the following regressions for 30-quarter rolling windows:

$$\Delta InterestExp_{i,t} = \alpha_i + \eta_t + \sum_{k=0}^{k=3} \beta_{i,k,t}^{Exp} \Delta FFR_{t-k} + \epsilon_{i,t} \tag{1}$$

where $\Delta InterestExp_{i,t}$ is the change in bank i's interest expense, ΔFFR_{t-k} is the change in the Fed funds rate from t to $t-k$, α_i are bank fixed effects, and η_t are time fixed effects. We follow Drechsler, Savov and Schnabl (2021) and define the interest expense rate as the total quarterly interest expense (total interest expense on deposits, wholesale funding, and other liabilities) divided by quarterly average assets and then annualized (multiplied by four). Our estimate of bank i's overall expense beta at time t is the sum of the coefficients $\sum_{k=0}^{k=3} \beta_{i,k,t}^{Exp}$ in equation 1. We estimate the income (total interest income divided by quarterly average assets) betas similarly. We winsorize betas at the 1 percent level to minimize the impact of

[10]While Gomez et al. (2021) use bank holding company-level data, we use bank-level Call Reports data.

outliers.[11] In our analysis, we use interest income and expense betas as separate controls to provide more flexibility in the interest income-expense matching mechanism.

Our estimates of interest income and expense betas are very close to the ones found in Drechsler, Savov and Schnabl (2021) and imply a similar level of interest income-expense matching (the ratio of income beta to expense beta is close to one). In Drechsler, Savov and Schnabl (2021), the mean of interest expense beta is 0.345, while the mean of interest income beta is 0.351. Our estimates change slightly from sample to sample but they are close to the estimates in Drechsler, Savov and Schnabl (2021). For example, in our Call Reports sample which covers more banks (Table IV) the mean of interest expense beta is 0.395, while the mean of interest income beta is 0.381.

2.2.2 Stock Market Analysis:

We use daily bank-level stock prices from the Center for Research in Security Prices (CRSP) at the University of Chicago. We calculate the daily changes in stock prices for each bank around monetary policy events. We exclude observations from the sample where negative values for stock prices are reported. To link the U.S. Consolidated Reports of Condition and Income filings (Call Reports) data with CRSP data, we use the link file maintained by the Federal Reserve Bank of New York. We restrict our analysis to the period where we have high-frequency monetary policy shocks.

In Table I, we present our summary statistics. It is important to note that the CRSP data covers publicly listed banks, resulting in a larger mean bank size than the Call Reports data set. The average bank size is 28.9 billion USD and the median bank size is 1.85 billion USD in 2010 prices. Additionally, the mean share of ARMs (relative to total assets) is 5 percent, with the maximum share reaching 31.4 percent, as we show in Figure 1.

2.2.3 Identifying the Credit-Supply Channel

To identify the credit supply channel we use two data sources that help us to control loan demand with borrower×time fixed effects.

Community Reinvestment Act (CRA) Data: The Community Reinvestment Act (CRA) mandates that banks annually report small business lending data at the county level. This helps us to study the bank credit supply for relatively small firms (the DealScan data covers big firms) while controlling for loan demand by using county×time fixed effects. We merge the data with bank balance sheet information from Call Reports data. Table VIII reports the summary statistics for the variables that we use in our lending analysis. Overall, our data covers 3238 counties and 1317 banks. The average (median) amount of new small business lending in a given county is 288,000 (218,000) USD.

[11] We use 30-quarter windows to control for changing bank policies.

DealScan Data: We use syndicated-loan-level data from DealScan to control for loan demand.[12] Crucially, it also includes borrower and lender information enabling us to use borrower$\times$time fixed effects to control for loan demand. We merge the data with bank balance sheet information from Call Reports to control for lender characteristics that may affect loan outcomes.

In our analysis, we consider the loan amount between a firm and its lender as our dependent variable. It is important to note that the DealScan data provides flow data, meaning it captures information on loans solely at their origination stage. Consequently, we are unable to directly observe the outstanding loan amount between a firm and its lender within each year of our analysis.

We report the descriptive statistics of our sample from the DealScan data in Table XI. Notably, the banks included in this data are significantly larger compared to those in the CRSP and Call Reports samples. Specifically, the mean bank size in our DealScan sample is 424.3 billion USD in 2010 prices. Regarding the share of ARMs, it is comparable to the other samples, with a mean of 3.9 percent and a standard deviation of 3.6 percent.

2.2.4 BARTIK Instrument—FDIC Summary of Deposits and CoreLogic Data

To address the concern regarding the potential endogeneity of a bank's ARM share, we construct our instrumental variable for banks' ARM exposure. For this, we utilize two additional datasets: the FDIC Summary of Deposits (SOD) and CoreLogic. The SOD database provides annual data on the branch-level deposits for all FDIC-insured institutions. We use the 1998 SOD data to measure banks' predetermined geographic footprint. Specifically, we calculate each bank's deposit share within every county where it operates. Using this historical snapshot mitigates concerns that banks strategically adjust their geographic presence in response to contemporaneous local mortgage market conditions or anticipated monetary policy.

CoreLogic provides detailed loan-level data on mortgage originations. We aggregate this data to calculate the share of adjustable-rate mortgages (ARMs) originated in each county over time (see data in Figure 2 for the geographic distribution). This provides the time-series variation in local mortgage contract structures. We merge these datasets to construct a Bartik-style instrument, which we detail in Section 5.4.

2.2.5 Monetary Policy and Macroeconomic Variables

Macroeconomic Variables: In our lending analysis, we use the changes in FFR as the main policy variable (Figure 1 right panel). To control for endogeneity, we include inflation, GDP growth, housing price index, and mortgage demand in our regressions. Mortgage demand

[12] For a comprehensive description of this data set, we refer to Chava and Roberts (2008).

data comes from the "Senior Loan Officer Opinion Survey on Bank Lending Practices" survey. The rest of the macro variables come from FRED. In the robustness analysis, we use a measure of "ARM demand" along with inflation and GDP growth. We measure ARM demand following Koijen, Van Hemert and Van Nieuwerburgh (2009), who propose a "household decision rule" that powerfully predicts household mortgage choice in the United States. We construct this measure as the difference between the 5-year Treasury rate and the 12-quarter average of the 1-year Treasury rate.[13]

High-Frequency Monetary Policy Shocks: Our data come from the Bank for International Settlements (Figure 1 middle panel). It covers monetary policy decisions, releases of minutes of policy meetings, and press releases. The largest category is monetary policy decisions. These statements are released immediately following the policy decision at the FOMC meeting. Minutes of the policy meeting are published with a delay. Press conferences are a relatively new development and were introduced in April 2011.

High-frequency monetary policy shocks are obtained by measuring the changes in 1-month Treasury yield in a short window (15 minutes before to 15 minutes after) around these monetary policy events. Table I, the rows under "Shock Variables" give the descriptive statistics for the high-frequency shocks. These shocks, as is well known, are typically small. The minimum is -5 bp while the maximum is +3.3 bp (the mean is close to zero).

2.3 Hypothesis and Methodology: a Road Map

Our hypothesis is that banks with higher shares of ARMs experience relatively stronger performance when the Federal Reserve tightens its monetary policy stance. The underlying reason is that these banks are likely to benefit from increased interest income resulting from higher interest rates. To test our hypothesis, we present three sets of evidence.

First, we employ local projection methods using Call Reports data to show that banks with larger shares of ARM do indeed experience higher interest income in response to a tightening in monetary policy (measured by high-frequency surprises) compared to banks with lower ARM shares.

Second, we analyze bank stock prices. According to our hypothesis, when interest rates rise, the stock prices of banks with larger ARM shares should outperform their counterparts. To

[13] Koijen, Van Hemert and Van Nieuwerburgh (2009) frame this rule as a behavioral proxy for the bond risk premium, capturing households' adaptive expectations. In a subsequent study, Badarinza, Campbell and Ramadorai (2018) test this measure in a nine-country panel and find that it does not generalize outside the U.S. They conclude that a model combining the current FRM-ARM spread with short-term rational expectations is a better fit internationally. Given our paper's focus on the U.S. banking system where the Koijen, Van Hemert and Van Nieuwerburgh (2009) rule has been shown to be exceptionally strong, we use it as a robust control for demand-side factors.

examine this, we analyze how the daily responses of banks' stock prices to monetary policy surprises derived from high-frequency data differ depending on their ARM shares.

The third implication of our hypothesis is that banks with larger shares of ARM would curtail their lending less compared to banks with lower ARM shares in response to rising interest rates, on the back of higher anticipated interest income. To verify the hypothesis, we examine how the reaction of bank lending to changes in the FFR differs depending on the banks' ARM share. For this, we utilize bank-level data from Call Reports, bank-county-level CRA data, and syndicated-loan-level data from DealScan. We also report our results with high-frequency surprises, which mostly confirm the findings with the FFR.

3 The Mechanism

In this section, we provide empirical evidence that shows the direct impact of changes in the monetary policy rate on the banks' interest income and expenses, which varies depending on their ARM shares. Given that ARM contracts are long-term and that the adjustments on mortgage payments take time, the effects of monetary policy rate changes on interest income are expected to materialize over the medium to long term. To analyze this dynamic relationship, we adopt the local projection methodology proposed by Jordà (2005). In particular, we estimate the following model:

$$\Delta Y_{i,t+d} = \sum_{k=0}^{k=4} \alpha_{k,d} * ARM_{i,t-1} * MPshock_{t-k} + \tag{2}$$

$$\sum_{k=0}^{k=4} \gamma_{k,d} * \text{BANK CONTROLS}_{i,t-1} * MPshock_{t-k} + \sum_{k=0}^{k=4} \lambda_{k,d} * Y_{i,t-k} + \nu_t + \theta_i + \epsilon_{i,t+d}.$$

where the dependent variable $\Delta Y_{i,t+d}$ is several measures of interest income and interest expenses (relative to lagged assets) d quarters after time t, $ARM_{i,t-1}$ is the share of ARM loans relative to assets, $MPshock_t$ is the sum of surprise changes in short term (1 month) yields around monetary policy events in a quarter, BANK CONTROLS$_{i,t-1}$ are bank balance sheet variables, and $Y_{i,t-k}$ are lagged dependent variables. We denote time and bank fixed effects as ν_t and θ_i. Our hypothesis implies a positive value for the interaction term $\sum_{k=0}^{k=4} \alpha_{k,d}$. We calculate the significance level for the linear combination of interaction terms for the periods from $t = 0$ to $t - 4$.

We use monetary policy shock series obtained from high-frequency data. The idea is that high-frequency changes in short-term bond yields around monetary policy announcements correspond to unexpected changes in monetary policy stance, rather than other macro developments. However, a potential concern in our specification is the presence of omitted variable bias, which arises from the potential correlation between banks' ARM share and other bank characteristics that could independently influence the response of banks' interest income or lending to monetary policy shocks.[14] To alleviate this concern, we include an extensive set of control variables in Equation 2. These include variables such as bank size (e.g., Kashyap and Stein (1995)), leverage (e.g., Kishan and Opiela (2000)), local deposit concentration (e.g. Drechsler, Savov and Schnabl (2017)), and the share of liquid assets on banks' balance sheets (Kashyap and Stein (2000)). Additionally, we control for other bank assets with a maturity of less than a year, excluding ARMs.

We also account for the structure of bank liabilities, as this may be crucial if banks with high ARM shares adjust their liabilities based on their ARM holdings, potentially introducing bias into our results. To address this, we gradually introduce control variables for both saving deposits and time-sensitive liabilities, thus capturing the liability structure. We include these bank control variables directly and their interactions with current and four lags of interest rate changes ($\text{BANK CONTROLS}_{i,t-1} * MPshock_t$ in Equation 2). Furthermore, we include time fixed effects to control for economy-wide developments and bank fixed effects to control time-invariant bank characteristics.

We cluster standard errors at the bank holding company level to account for serial correlation within banking organizations over time. A potential secondary concern is cross-sectional dependence arising from common macroeconomic shocks. However, our empirical design explicitly mitigates this issue through the inclusion of time fixed effects (ν_t), which absorb all aggregate time-series variation. When time fixed effects are included, the need for clustering by time is significantly reduced (Cameron and Miller (2015)). Furthermore, our identification relies on the *interaction* between the aggregate shock and bank characteristics. Given this framework, we maintain clustering at the BHC level as the most salient dimension of dependence.

Results: Figure 3 reports local-projection estimates of the cumulative interaction effect, $\sum_{k=0}^{4} \alpha_{k,d}$, which measures how a monetary tightening differentially affects outcomes at horizon d for banks with higher ARM exposure relative to banks with lower ARM exposure. Consistent with the paper's mechanism, the results show that a tightening generates a gradual, persistent increase in mortgage-related interest income for high-ARM banks—an income transfer from ARM borrowers to lenders that improves cash flows—while any countervailing increase in credit risk is limited.

Interest Income and Funding Costs (The Revenue Channel): The first two rows of Figure 3 provide direct evidence of the income-transfer mechanism. Following a tightening, high-

[14] Albertazzi, Fringuellotti and Ongena (2024) find that a lower ARM share in a country is driven by higher inflation volatility (past) and a higher correlation between short-term interest rates and unemployment.

ARM banks earn persistently higher interest income, an effect concentrated in mortgage-related revenue.[15]

The clearest evidence comes from interest income on real estate loans (first row, right panel), the component most directly linked to ARM repricing. The differential response becomes statistically significant at the 10 percent level by quarter 3 and reaches 1 percent level significance by quarter 6, remaining highly significant through quarter 18.

Total interest income (first row, middle panel) displays a similar gradual build-up. The response becomes consistently significant at the 5 percent level from quarter 14 onward, peaking at 0.318 around quarter 17. This acceleration after approximately 10–14 quarters is consistent with the contract structure of U.S. hybrid ARMs (detailed in Section 2.1), where initial fixed-rate periods and adjustment caps delay the pass-through of policy rates.

On the liability side, interest expense (third row, left panel) rises early, with a significant coefficient of 0.080 by quarter 2. This reflects the relatively fast repricing of short-term funding costs during tightening. However, this effect dissipates at longer horizons as mortgage-side income gains accelerate. Consequently, net interest income (first row, left panel) remains flat for the first 12 quarters but turns positive and significant as the ARM repricing effect dominates funding costs. By quarter 18, the coefficient reaches 0.235 (significant at the 10 percent level).

To verify that these income gains are specific to mortgage contracts rather than a general feature of high-ARM banks, we examine interest income on non-mortgage loans (second row, left panel). The data support our identification: the response is statistically insignificant or slightly negative (quarters 7–8). This placebo confirms that the income effects operate specifically through the mortgage repricing channel.

Profitability and Strategic Expansion: How does this surge in net interest income flow through to the bottom line? While net interest income rises significantly, the response of net income (second row, right panel) is statistically more muted. After a transitional dip in the medium run, estimates recover to positive territory (0.252 by quarter 18) but remain statistically insignificant at conventional levels ($p = 0.12$).

A decomposition of bank expenses resolves this: the "missing" net income is not lost to credit risk, but is instead reinvested into operational expansion. If high-ARM banks were merely passive beneficiaries of rate hikes, we would expect net income to track net interest income perfectly, especially given that loan loss provisions actually decline at longer horizons (bottom row, left panel).

[15] All income and expense measures are normalized by lagged assets.

Instead, the data indicate that banks actively utilize their interest rate windfall to scale operations. This is most visible in employment growth (third row, middle panel). Following the realization of interest income gains, high-ARM banks engage in aggressive hiring; by quarter 18, the coefficient reaches approximately 13, implying a cumulative employment growth differential of roughly 1.7 percentage points (after scaling) relative to peers.

Consequently, the muted net income result reflects a strategic trade-off: the income windfall is being absorbed by the higher non-interest expenses (salaries) associated with a larger workforce. This finding aligns with our subsequent lending results: banks are building the organizational capacity—hiring loan officers and back-office staff—required to sustain the expansion in credit supply documented in Section 5. Dividends (third row, right panel) show no systematic adjustment, further suggesting that management prioritizes internal reinvestment over payouts.

Economic Magnitude: To gauge the scale of this income transfer, we scale the estimates to a one standard deviation positive monetary policy shock (1.8 bp) and compare a bank at the 75th percentile of ARM share (0.083) to a bank at the 25th percentile (0.009). For net interest income, the average differential over the 18-quarter horizon is approximately 1.22 bp (as a share of assets), peaking at 3.45 bp around quarter 15. For interest income on real estate loans, the differential reaches 3.6 bp by quarter 18. These magnitudes confirm that borrower-side payment increases translate into substantial improvements in internal cash generation for lenders.

Non-performing Loans (NPLs) and Provisions: A natural countervailing mechanism is credit risk: higher rates raise ARM payments and could increase delinquencies, potentially offsetting income gains. We test this using the same local projection framework (Equation 2).

The results indicate that the credit-risk channel is economically small relative to the income channel (bottom row of Figure 3). Mortgage NPLs (real-estate NPL ratio; bottom row, right panel) are statistically indistinguishable from zero at all horizons, peaking at a negligible 0.041 percentage points. This suggests that ARM payment resets do not translate into materially higher delinquencies for the banks in our sample. Similarly, we find no evidence of deterioration in C&I loan performance.

Crucially, loan-loss provisions (bottom row, left panel)—a forward-looking measure of bank risk—decline significantly at longer horizons. By quarter 18, provisions relative to assets are lower by 0.228 percentage points for high-ARM banks (significant at the 5 percent level). This declining provision path confirms that bank managers view the medium-term balance sheet position of high-ARM banks as improving, reinforcing the view that the strategic expansion in the workforce is driven by strength rather than a reaction to distress.

4 Bank Stock Price Response to Surprise Monetary Policy Shocks

Next, we examine how the responses of banks' stock prices to changes in monetary policy vary depending on the share of ARMs in their balance sheets. The analysis benefits from the ability to measure the impact within a relatively short time frame (daily), which helps to minimize the influence of confounding factors on identification. Moreover, the data quality is also very high, therefore, even the effects of small changes in monetary policy can be identified.

To test our hypothesis, we regress the daily changes in bank stock prices (comparing the day before and the day after monetary policy events) on the interaction between banks' ARM shares and monetary policy shocks. The estimated equation is as follows:

$$\begin{gathered}\Delta Y_{i,t} = \alpha * ARM_{i,t} * MP_{shock,t} + \\ \gamma * \text{BANK CONTROLS}_{i,t} * MP_{shock,t} + \beta * Y_{i,t-1} + \nu_t + \theta_i + \epsilon_{i,t}.\end{gathered} \tag{3}$$

where the dependent variable $\Delta Y_{i,t}$ is the percent change in stock prices of bank i between day $t+1$ and $t-1$ where t is the time of monetary policy shock, $ARM_{i,t}$ is the share of ARM loans relative to assets, $MPshock_t$ is the surprise change in short term (1-month) yields around monetary policy events, BANK CONTROLS$_{i,t}$ are bank balance sheet variables, $Y_{i,t-1}$ is the lagged dependent variable.[16] For the variables that we include interaction terms, the model incorporates each variable individually as well. We use lagged dependent variables, specifically the past bank equity price dynamics, to account for bank-specific pre-shock price dynamics. To control for time-invariant bank characteristics, we include bank fixed effects θ_i, and to account for aggregate developments common to all banks, we include time fixed effects ν_t. Our hypothesis suggests a positive value for the interaction term α.

As above, we use monetary policy shock series obtained from high-frequency data. Therefore, the endogeneity of monetary policy is less concerning. However, omitted variable bias might be a more important concern. To mitigate this concern, we include variables such as bank size, leverage, local deposit concentration, and the share of liquid assets on banks' balance sheets. Additionally, we control for other bank assets with a maturity of less than a

[16]For $ARM_{i,t}$ and BANK CONTROLS$_t$ we use balance sheet values corresponding to the quarter from the Call Reports data.

year, excluding ARMs. We also account for the structure of bank liabilities, by controlling variables for saving deposits, time-sensitive liabilities, and Fed funds repo liabilities into our model. We also include the full maturity structure of assets and liabilities available in the data. Notably, all these controls are not only directly included but also interacted with the monetary policy shocks (BANK CONTROLS$_{i,t} * MPshock_t$ in Equation 3).

Finally, we construct a maturity gap measure similar to English, Van den Heuvel and Zakrajšek (2018), interest income gap measure similar to Gomez et al. (2021), and estimate interest income and expense betas for each bank similar to Drechsler, Savov and Schnabl (2021). We horse-race these measures with the ARM share to explore whether the ARM share has some unique effects not captured in these earlier measures.

Baseline Results: Table II presents our findings. We begin with a specification that solely considers the asset side of bank balance sheets, without interacting the monetary policy shocks with other bank variables (other than the ARM share) and without incorporating time fixed effects (Column 1). Moving to Column 2, we introduce the interaction between monetary policy shocks and other bank balance sheet controls. In Column 3, we include year and month fixed effects. Starting from Column 4, we incorporate time fixed effects. We control for bank liabilities in Columns 5 and 6. In Columns 7 and 8 we control for the repricing maturities of bank assets and liabilities. Finally, in columns 9 to 11, we horse-race the income gap measure from Gomez et al. (2021), the maturity gap from English, Van den Heuvel and Zakrajšek (2018), and interest income and expense betas from Drechsler, Savov and Schnabl (2021), respectively, with the ARM share.[17] We find that the coefficient on the ARM share stays positive and significant in all these specifications.

Our results confirm our hypothesis that banks with higher ARM shares experience a relatively greater increase in stock prices in response to a positive monetary policy surprise shock. The results are economically significant within the context of the identified shocks.

[17]Here and in the subsequent analysis, we experimented with alternative ways of measuring interest rate risk matching. For example, the results are robust if we estimate the income and expense betas using the full sample, or if we winsorize at 5-percent level. Our results remain similar if we also use $\sum_{k=0}^{k=3} \beta^{Inc}_{i,k,t} / \sum_{k=0}^{k=3} \beta^{Exp}_{i,k,t}$ as the degree of bank's interest income and expense matching.

Alternatively, similar to Drechsler, Savov and Schnabl (2021), we also constructed a bank-level interest income-expense matching measure by regressing interest income on interest expense betas that were estimated using 30-quarter rolling windows at the bank level. Unlike Drechsler, Savov and Schnabl (2021), our interest income-expense matching is conducted at the bank level, while their measure is applied to the entire banking industry. The model we use is as follows:

$$\beta^{Inc}_{i,t} = \alpha_i + \gamma(i)\beta^{Exp}_{i,t} + \epsilon_{i,t}$$

where $\gamma(i)$ represents the interest income-expense matching measure for each bank. Our results are robust to using $\gamma(i)$ as our interest rate risk matching measure.

Comparing banks with 75th and 25th percentiles of ARM shares (0.071 vs 0.014), a one standard deviation positive monetary policy shock (0.94 bp) would raise equity prices by 0.043-0.082 percentage points more for the former bank.

It is crucial to interpret these magnitudes with caution. These coefficients represent *local* estimates identified using small, high-frequency surprises within the observed distribution of ARM shares in the U.S. (where the mean is 5 percent). Extrapolating these results linearly to large macroeconomic shifts (e.g., a 100 basis point tightening) or to extreme, counterfactual balance sheets (e.g., a bank with 100 percent ARMs) is likely inappropriate. The market response may be non-linear; a large tightening cycle could trigger broader concerns about borrower default risk or macroeconomic slowdowns that might offset the interest income benefits. Therefore, our findings identify the marginal impact of ARM exposure on bank valuations in response to small surprises, rather than a structural estimate applicable for large counterfactuals.

Asymmetry: The Role of Refinancing The refinancing option in FRM contracts makes them somewhat comparable to ARM contracts when interest rates decrease. However, refinancing comes with costs, which distinguishes FRMs from ARMs. Consequently, not all mortgage borrowers refinance. Nonetheless, we anticipate that the impact of ARM share would be diminished (or become insignificant) in the presence of a negative monetary policy shock.

We examine this hypothesis by estimating separate coefficients for positive and negative monetary policy shocks. We report our results in Table III. Our empirical results confirm our prediction. Specifically, for positive monetary policy surprises, the effects of ARM shares are statistically significant, and they exceed the magnitudes observed in our benchmark results reported in Table II. However, the coefficients for negative monetary policy shocks are statistically insignificant.

Robustness: Banks could have hedged their exposure to monetary policy surprises. In that case, we would have found insignificant results. Therefore, our positive and significant results suggest that banks do not hedge their interest rate risk exposures. In this part of the analysis, we add several controls for hedging. In particular, we include fixed-rate swaps, total swaps, net hedging, and gross hedging information available in the Call Reports data. Admittedly, available data is not perfect. For most of the hedging variables, it is not possible to identify which side of the contract the banks are on. For this exercise, we use a highly saturated specification where we include time fixed effects and the interaction of the monetary policy shock with bank controls.

Controlling for hedging does not alter our results (Table A.1, in the online Appendix). The impact of ARM shares remains significant, and the magnitude remains consistent with our benchmark values. The effect of hedging remains similar across different instruments. Surprisingly, the coefficient on fixed-rate swap contracts is also insignificant. This finding is unexpected because fixed-rate swaps are typically considered a potent hedging tool against interest rate risk.

One concern with our baseline results might be that the 2008 crisis might have affected the ARMs more than the FRMs. In particular, ARMs, which were more prevalent in high house price regions, may have been more affected by the crisis due to larger declines in house prices. Consequently, the supportive monetary policy (and other policies) implemented after 2008 could potentially bias our findings. To mitigate this issue, we narrow our sample to data before 2007. The results of our analysis during the pre-crisis period, as presented in the online Appendix in Table A.2 (left three panels), show that our findings remain robust. The coefficients continue to be statistically significant and even larger than our benchmark estimates.

We also explore whether our results are driven by banks with extremely low or high shares of mortgages. To examine this, we repeat the regressions after trimming the sample to exclude observations below the 1st and above the 9th deciles of real estate loan shares relative to assets. The results, as shown in Table A.2 (right three panels), reveal that all coefficients on the interaction term remain significant and positive. This suggests that our results are not driven by extreme real estate loan shares.

It might be possible that the level of FFR might influence our results. In particular, after the 2008 crisis, since the level of FFR declined very close to 0, the likelihood of ARM payments declining further became small. To control for these mechanisms we add the level of FFR to our regression. Our results show that our findings remain intact (Table A.3).

We have so far used the ARM as a share of bank assets in a given quarter as our key variable. We perform 2 robustness tests to show that our results are immune to different definitions of ARM shares. First, we use the 2-year average of ARM share. With this, we aim to mitigate the endogeneity concern, since the past 2-year average is more likely to be given to the banks and changes in monetary policy are unlikely to shift it. Second, we use the ARM as a share of real-estate loans. Our results hold with these alternative ARM measures (Tables A.4 and A.5).

5 Lending Analysis

We perform the lending analysis in several steps. First, we conduct a bank-level analysis. Second, to better control for loan demand, we study lending at the bank-county level. Third, we use DealScan syndicated loan data to control for firm-level loan demand.

Before turning to the lending results, it is useful to relate them to the local-projection evidence in Section 3. Aggregate net interest income for high-ARM banks turns significantly positive only after approximately 12–14 quarters, whereas the lending specifications allow credit supply to respond within the first year of a tightening. This pattern suggests that lending responds not only to realized cash flows, but also to the expected present value of future ARM-related income.

Three observations help reconcile this timing. First, bank equity prices react immediately to monetary policy surprises, consistent with markets capitalizing the future ARM income stream on impact (Table II).[18] Second, mortgage-specific interest income rises earlier than aggregate net interest income: the differential in interest income on real estate loans becomes statistically significant by quarter 3 (Figure 3), well within the horizon of the lending regressions, whereas aggregate net interest income is initially dampened by the faster repricing of funding costs. Third, a back-of-the-envelope calibration indicates that the magnitude of the stock-price response is broadly consistent with the observed lending response.[19] Taken together, these results suggest that the stock-price and lending evidence are consistent with the same mechanism operating over different horizons.

5.1 Bank-level Commercial and Industrial Loans

In this section, we provide additional support from bank lending behavior. This is important because if the ARM shares influence bank lending behavior in response to changes in monetary policy stance, then it has potentially important real economic consequences.

While the utilization of monetary policy shocks derived from high-frequency analysis helps address identification challenges in our daily bank stock price analysis by cleanly isolating policy surprises from other macroeconomic news, it is important to acknowledge the limitations associated with this approach when analyzing quarterly bank lending. Firstly, as markets often closely anticipate changes in monetary policy, the resulting high-frequency shocks are typically very small—often just a few basis points. These magnitudes may be insufficient to trigger economically significant adjustments in quarterly lending volumes or to be reliably detected within the noise of quarterly data. Secondly, bank lending decisions are likely influenced by the overall stance and persistence of monetary policy throughout the

[18] A one-standard-deviation high-frequency surprise (0.94 bp) produces a stock-price differential of 0.043–0.082 percentage points between banks at the 75th and 25th percentiles of the ARM-share distribution.

[19] The stock-price differential (0.064 percentage points in the median specification), multiplied by the average leverage ratio ($1/0.096 \approx 10.4$), implies a lending-capacity expansion of approximately 0.667 percentage points. The actual C&I lending differential using the same high-frequency shocks is 0.535 percentage points (Table VII), implying a ratio of 0.80.

quarter, rather than just the surprise component of specific announcements. To overcome these limitations, we adopt changes in the FFR as our main monetary policy variable for the subsequent sections of the paper, as these changes are larger in magnitude and better capture the prevailing monetary conditions relevant for lending. At the same time, we provide results with high-frequency monetary policy shocks, which mostly confirm our results with the changes in the FFR.

For bank lending analysis we estimate the model in Equation 4:

$$\Delta CILOANS_{it} = \sum_{k=0}^{k=4} \alpha_k * ARM_{i,t-1} * \Delta FFR_{t-k} + \tag{4}$$
$$+ \sum_{k=0}^{k=4} \gamma_k * \text{BANK CONTROLS}_{i,t-1} * \Delta FFR_{t-k} + \sum_{k=0}^{k=4} \lambda_k * \Delta CILOANS_{i,t-k}$$
$$+ \sum_{k=0}^{k=4} \varrho_k * ARM_{i,t-1} * \Delta\text{MACRO CONTROLS}_{t-k} + \nu_t + \theta_i + \epsilon_{i,t}.$$

where the dependent variable $\Delta CILOANS_{it}$ is the quarterly percent change in quarterly average of commercial and industrial loans of a bank. The advantage of specifically examining commercial and industrial loans is that this category excludes mortgages. If we were to estimate a regression model using total bank loans as the dependent variable, it would include ARMs and introduce potential ambiguity in interpreting the bank lending results. In the model, $ARM_{i,t-1}$ is the share of ARM loans relative to assets, ΔFFR_{t-k} is the quarterly change in the FFR, BANK CONTROLS$_{i,t-1}$ represent the bank balance sheet variables, $\Delta CILOANS_{i,t-k}$ lagged dependent variable, and ΔMACRO CONTROLS$_{t-k}$ are macroeconomic variables that might influence the monetary policy decision. Whenever we have an interaction of two variables, we also include the variables individually as long as it is feasible (not written explicitly in Equation 4).[20] Furthermore, we include time fixed effects (ν_t) to capture economy-wide developments and bank fixed effects (θ_i) to account for time-invariant bank characteristics. The coefficient of interest is the interaction term $\sum_{k=0}^{k=4} \alpha_k$. We account for serial correlation by clustering standard errors at the bank holding company level.[21] Our specification extends the one used by Gomez et al. (2021).[22]

[20]Sometimes it is not feasible. For example, when we use time fixed effects, individual macroeconomic variables drop.

[21]Clustering at the bank holding company and time levels (when we use quarterly fixed effects similar to Gomez et al. (2021)) yields qualitatively similar estimates. We also note that Abadie et al. (2023) show that employing the entire population of clusters and all observations within clusters obviates the need for correcting for clustering and may even be harmful unless the treatment assignment process itself is clustered.

[22]The specification is also similar to the ones used in Kashyap and Stein (1995), Kashyap and Stein (2000), and Campello (2002).

We need to address several identification concerns. One important concern is the potential endogeneity of changes in the FFR. The decision of the Federal Reserve to adjust the policy rate is typically driven mainly by inflation, macroeconomic conditions, and financial developments. It is plausible that these factors, rather than the FFR itself, could be influencing our results. To mitigate this concern, we incorporate major aggregate dynamics (inflation, GDP growth, changes in housing prices, and mortgage demand) and their interactions with ARM share (represented by $ARM_{i,t-1} * \Delta\text{MACRO CONTROLS}_{t-k}$). This allows us to control for the influence of these alternative drivers on our findings.

The other concern (the same concern that we discussed in more detail in Section 4) is that several other bank balance sheet variables are found to be important for monetary policy transmission. If we exclude them, our coefficient of interest may be biased. To alleviate this concern, in the regressions, we control for commonly used bank balance sheet variables in the literature (see Section 4 for a longer discussion). We also add controls where we interact these bank variables with monetary policy shocks.

Baseline Results: We present our results in Table V. We begin with a baseline specification that includes both time and bank fixed effects while controlling solely for the asset side of the bank balance sheets (Column 1). In Column 2, we introduce the interaction between macroeconomic variables and the bank controls related to the asset side. We include the interaction of the changes in FFR and bank controls in Column 3. In Columns 4 and 5, we extend our analysis by incorporating control variables for bank liabilities, specifically savings deposits, time-sensitive deposits, and Fed funds repo liabilities. In Column 6, we add the controls for the maturity structure of assets and liabilities, i.e., "repricing controls". In Columns 7, 8, and 9 we horse-race the income gap measure from Gomez et al. (2021) and the maturity gap from English, Van den Heuvel and Zakrajšek (2018), and interest income and expense betas from Drechsler, Savov and Schnabl (2021), respectively, with the ARM share.

The coefficients associated with the interaction term consistently show a positive relationship across all specifications, in line with our hypothesis. These findings indicate that banks with higher proportions of ARM loans in their balance sheets curtail commercial and industrial lending less than banks with lower ARM shares when the FFR rises. Moreover, the results suggest economically significant effects. For instance, banks with an ARM share at the 75th percentile (0.083) experience a commercial and industrial lending decline that is 0.38-0.50 percentage points smaller compared to banks with an ARM share at the 25th percentile (0.009) when there is a one standard deviation rise in the FFR (0.39 percentage points). This magnitude is sizable considering that the average growth in commercial and industrial loans in the data set is 2.8 percent.

Asymmetry: Next, we investigate the asymmetric effects of ARM shares during tightening and loosening episodes of monetary policy (similar to our analysis in Section 4). We expect that banks with higher ARM shares would respond positively to tightening episodes by increasing their lending compared to banks with lower ARM shares. However, during loosening episodes, the difference in lending behavior between banks with high and low ARM shares would be diminished or become insignificant.

To examine these predictions, we estimate separate coefficients for tightening and loosening episodes in our regression analysis. The results, as presented in Table VI, support our hypothesis. Specifically, the coefficient on the interaction term is positive and mostly statistically significant for the tightening episodes, indicating that banks with higher ARM shares indeed curtail lending less (compared to banks with lower ARMs) during these periods. On the other hand, the coefficient of the interaction term is insignificant for the loosening episodes, suggesting that the difference in lending behavior between banks with high and low ARM shares is not observed during periods of monetary policy loosening.

Bank-level Lending Response to High Frequency Monetary Policy Shocks: We repeat our analysis with monetary policy shocks identified from high-frequency methods. Specifically, we estimate the following equation:

$$\Delta CILOANS_{it} = \sum_{k=0}^{k=4} \alpha_k * ARM_{i,t-1} * MPshock_{t-k} + \tag{5}$$

$$\sum_{k=0}^{k=4} \gamma_k * \text{BANK CONTROLS}_{i,t-1} * MPshock_{,t-k} + \sum_{k=0}^{k=4} \lambda_k * \Delta CILOANS_{i,t-k} + \nu_t + \theta_i + \epsilon_{i,t}.$$

where $ARM_{i,t-1}$ is the share of ARM loans relative to assets, $MPshock_{t-k}$ is the sum of surprise changes in 1-month yields around monetary policy events in a quarter. The bank balance sheet control variables are BANK CONTROLS$_{i,t-k}$, and $\Delta CILOANS_{i,t-k}$ are lagged dependent variables. ν_t and θ_i are time and bank fixed effects. Our hypothesis implies a positive value for the interaction term $\sum_{k=0}^{k=4} \alpha_k$.

Since our dependent variables are quarterly, we aggregate the monetary policy surprises to quarterly by simply adding the surprises that happened in that quarter. Table VII reports the results for bank commercial and industrial loan lending. We find that the coefficient on the interaction term is positive and significant, implying that the banks with higher ARM shares curtail lending less relative to banks with lower ARM shares when interest rates increase, confirming our findings using the changes in FFR.

Robustness: We conduct a series of additional tests, akin to the ones presented in Section 4 and report the results in the Online Appendix. One potential concern is the possibility that our results are driven by post-2008 developments, such as the financial crisis. To address this concern, we limit our sample to the period before 2007 and re-estimate our regressions. The results of these analyses are presented in the first three columns of Table B.1. Our results remain consistent during the pre-crisis period, reaffirming the robustness of our findings.

Additionally, we perform regressions using a trimmed sample, where we exclude observations falling below the 1st decile and above the 9th decile of real estate loans relative to assets. This allows us to investigate whether extreme values of real estate loan shares disproportionately impact our results. The results, presented in the right three columns of Table B.1, indicate that the coefficients associated with the interaction term remain significant and positive.

Next, we explore the impact of alternative macroeconomic variables on the relationship between ARM shares and bank lending behavior. Traditionally, the Fed has targeted GDP growth (full employment more precisely) and inflation. To this end, we conduct additional regression analyses using GDP growth and inflation as the main macroeconomic variables. The results of these alternative specifications are presented in the first three columns of Table B.2 and they indicate that our findings remain robust.

In the right three columns of Table B.2 we also control for ARM demand. We measure the ARM demand following Koijen, Van Hemert and Van Nieuwerburgh (2009) where we construct and use the difference between 5-year Treasury yields and 12 quarter average of 1-year Treasury yield. This is important since changes in monetary policy might affect the ARM demand, and, hence, might affect the lending results. Our results suggest that this is not the case, the coefficients stay positive and significant.

We conduct three more robustness tests that we did in the bank stock price analysis. First, we control for the level of the FFR (Table B.3). Second, we use the past 2-year average of the ARM share instead of the previous quarter's ARM share (Table B.4). Third, we use the ARM share relative to real estate loans (Table B.5). Our findings are robust to all three of these robustness tests.

Our benchmark specification excludes banks below the eighth decile, aligning closely with the sample selection criteria employed by Gomez et al. (2021).[23] To delve deeper into the potential heterogeneity across bank sizes, we divide our sample into two subgroups: "small banks" and "big banks". For the "small banks" sample, we exclude only the banks in the first decile based on their assets, while for the "big banks" sample, we exclude banks below the ninth decile. We present the results in Table B.6, where Columns 1-3 correspond to the

[23] Gomez et al. (2021) choose a sample where they drop the banks with assets lower than one billion USD.

"small banks" sample, and Columns 4-6 represent the "big banks" sample. The coefficients of the interaction term in both samples are positive, aligning with our initial findings. However, the magnitudes of the coefficients are comparatively larger for the "big banks".

5.2 Controlling for Loan Demand with Bank-County-Level Credit Data

From our lending estimations, it is not clear whether the results are driven by changes in credit demand or supply. This becomes particularly relevant if banks with higher ARM shares give more loans to firms that are more sensitive to monetary policy. To address this concern, we use the CRA data which covers bank lending to small firms. We can control for loan demand with county×time fixed effects, which enables us to compare the loans provided by different banks to the same county within a given period while adequately accounting for variations in demand. We estimate the following model:

$$log(L_{c,i,t}) = \sum_{k=0}^{k=2} \alpha_k * ARM_{i,t-1} * \Delta FFR_{t-k} + \sum_{k=0}^{k=2} \gamma_k * \text{BANK CONTROLS} * \Delta FFR_{t-k} \quad (6)$$
$$+ \sum_{k=0}^{k=2} \varrho_k * ARM_{i,t-1} * \Delta \text{MACRO CONTROLS}_{t-k} + \delta_{c,t} + \delta_{c,b} + \theta_i + \epsilon_{i,t}$$

where the dependent variable $Log(L_{c,i,t})$ is the natural logarithm of new commercial loans at county c from bank i at time t, and $\delta_{c,t}$ is county×time fixed effects, $\delta_{c,b}$ is county×bank fixed effects. The rest of the specification is very similar to the one we used in the bank-level analysis. A difference is that since the CRA data is annual, we use two lags, instead of four that we used previously. $ARM_{i,t-1}$ is the share of ARM loans relative to assets, ΔFFR_{t-k} is the quarterly change in the FFR, BANK CONTROLS$_{i,t-1}$ are bank balance sheet variables, and MACRO CONTROLS$_{t-k}$ are macroeconomic variables such as inflation, GDP growth, housing price index, and mortgage demand. Finally, θ_i are bank fixed effects. Whenever we have an interaction of two variables, we also include the variables individually as long as it is feasible.[24] Our hypothesis implies a positive coefficient ($\sum_{k=0}^{k=2} \alpha_k$) on the interaction between the ARM share and the changes in FFR.

Results: We present our findings in Table IX. In the first column, we control for county×time and bank fixed effects, while controlling for bank balance sheets, and the interaction of macroeconomic variables with the ARM share to horse-race with the interaction of changes in FFR and ARM share. In Column 2 we add county×bank fixed effects to control for endogenous matching of counties and banks. In Columns 3 (without county×bank fixed

[24]We do not repeat the endogeneity concerns and how we address them here. See Section 5.1 for a detailed discussion.

effects) and 4 (with county×bank fixed effects), we control for the liability structure of the banks. In Columns 5 (without county×bank fixed effects) and 6 (with county×bank fixed effects), we control for the liabilities to the Fed. In Columns 7, 8, and 9 we include income and maturity gaps, and bank interest income and expense betas, respectively. We find that, for a given county (i.e., loan demand is controlled for), banks with higher ARM shares maintain a relatively stronger loan supply compared to banks with lower ARM shares when the FFR increases.[25]

The results imply economically large effects: for instance, a bank at the 75th percentile in terms of ARM share (0.054) maintains a loan supply that is 5.6-7.8 percent higher compared to a bank positioned at the 25th percentile in terms of ARM share (0.013) in response to a one standard deviation increase in the FFR (0.39 percent).

Bank Lending Response to High Frequency Monetary Policy Shocks: We repeat the CRA analysis with monetary policy shocks identified from high-frequency methods. We estimate a model very similar to the one displayed in equation 5. The only differences are that the dependent variable is now $log(L_{ict})$ from the CRA data and we use 2 lags. Table X reports the lending results. The results confirm the results with the changes in FFR.

5.3 Controlling for Loan Demand with Syndicated-Loan-Level Data

To provide more granular evidence for credit-supply, we utilize the syndicated-loan-level DealScan data to account for firm loan demand. We follow the methodology proposed by Khwaja and Mian (2008) and examine firms that maintain credit relationships with multiple banks. Specifically, we incorporate firm×time fixed effects, which effectively control for firm loan demand. By utilizing these fixed effects, we compare the loans provided by different banks to the same firm within a given time period while adequately accounting for variations in demand. Therefore, we can isolate the impact of banks' ARM shares on lending behavior while holding constant the firm-specific factors that drive loan demand. We estimate the following model:

$$\begin{aligned} log(L_{f,i,t}) = & \sum_{k=0}^{k=4} \alpha_k * ARM_{i,t-1} * \Delta FFR_{t-k} + \sum_{k=0}^{k=4} \gamma_k * \text{BANK CONTROLS}_{i,t-1} * \Delta FFR_{t-k} \\ & + \sum_{k=0}^{k=4} \varrho_k * ARM_{i,t-1} * \Delta\text{MACRO CONTROLS}_{t-k} + \delta_{f,t} + \theta_i + \epsilon_{i,t} \end{aligned} \tag{7}$$

where the dependent variable $Log(L_{f,i,t})$ is the natural logarithm of new loans of firm f

[25]The coefficient on the interest income beta is negative and the expense beta is positive, and significant. In our analysis with the DealScan data (in the next section), while not significant, the interest income beta has a positive, and the expense beta has a negative coefficient. These suggest that banks might be allocating loans to bigger firms (DealScan sample) when interest rates increase.

from bank i at time t, and $\delta_{f,t}$ is firm×time fixed effects. The rest of the specification is very similar to the one we used in the bank-level analysis. $ARM_{i,t-1}$ is the share of ARM loans relative to assets, ΔFFR_{t-k} is the quarterly change in the FFR, BANK CONTROLS$_{i,t-1}$ are bank balance sheet variables, and MACRO CONTROLS$_{t-k}$ are macroeconomic variables such as inflation, GDP growth, housing price index, and mortgage demand. θ_i are bank fixed effects. Whenever we have an interaction of two variables, we also include the variables individually as long as it is feasible.[26]

Baseline Results: We present our findings in Table XII. We start with a baseline specification that incorporates firm×time and bank fixed effects while controlling solely for the asset side of bank balance sheets (Column 1). In Column 2, we introduce the interaction of macroeconomic control variables with the ARM share to horse-race with the interaction of changes in FFR and ARM share. In Column 3, we further augment the model by including the interaction of the changes in FFR with the bank controls on the asset side. Columns 4 and 5 additionally control for bank liabilities along with their interactions with the changes in FFR. In Column 6, we control for the maturity structure of the bank assets and liabilities. Finally, we horse-race the income gap (Gomez et al. (2021)), the maturity gap (English, Van den Heuvel and Zakrajšek (2018)), and interest income and expense betas from (Drechsler, Savov and Schnabl (2021)) with the ARM share in columns 7, 8, and 9.

Our results consistently show that all coefficients on the interaction term are positive and significant. This implies that, for a given firm (i.e., loan demand is controlled for), banks with higher ARM shares maintain a relatively stronger credit supply compared to banks with lower ARM shares when the FFR increases.

Our estimates imply economically significant implications as well. For instance, a bank positioned at the 75th percentile in terms of ARM share (0.054) maintains a loan supply that is 1.39-2.55 percent higher compared to a bank positioned at the 25th percentile in terms of ARM share (0.013) in response to a one standard deviation increase in the FFR (0.39 percent).

Asymmetry: As we did earlier, we estimate separate coefficients for monetary policy tightenings and loosenings and test whether there is an asymmetry. Table XIII presents our findings, which provide further confirmation of our hypothesis and earlier findings. Specifically, we find that banks with higher ARM shares, in comparison to banks with low ARM shares, curtail credit supply less during monetary policy tightenings. However, their responses to monetary policy loosenings are not significantly different.

[26] We do not repeat the endogeneity concerns and how we address them here. See Section 5.1 for a detailed discussion.

Bank Lending Response to High Frequency Monetary Policy Shocks: We repeat our analysis with monetary policy shocks identified from high-frequency methods. Estimating the model in Equation 5 with syndicated lending data ($\log(L_{f,i,t})$), the coefficients are statistically insignificant (Table XIV).

We attribute the insignificance in the syndicated loan market to two factors: strategic shielding and signal magnitude. First, syndicated borrowers (DealScan) represent a bank's most valuable and sticky relationships. These firms typically have diverse funding sources (e.g., bond markets) and significant bargaining power. The literature suggests that banks often provide implicit insurance to these core clients, shielding them from high-frequency volatility to preserve long-term relationship value (Bolton et al. (2016)). While a high-frequency shock of a few basis points is sufficient for equity markets to mathematically reprice the bank's future cash flows (Table II), it is often below the threshold required to disrupt a major corporate credit line.

Second, this interpretation is reinforced by contrasting Table XIV (Big Firms) with Table X (Small Firms). In Table X, we do find a significant response to high-frequency shocks. This implies that high-ARM banks are actively managing their credit exposure in response to these shocks, but they adjust supply primarily through smaller, bank-dependent firms while maintaining stable terms for their largest corporate clients.

Therefore, the null result in Table XIV does not contradict the income mechanism; rather, it confirms that high-ARM banks use their income windfall to absorb volatility for strategic clients, adjusting large-scale credit supply only when the monetary stance shifts materially and persistently (as captured by our significant FFR results in Table XII).

Robustness: We conduct a series of robustness tests and report the results in the online Appendix.[27] First, we restrict our sample to the period before 2007 to examine whether our results were influenced by post-2008 developments. Second, we drop the extreme values of ARM shares (Table C.1). Third, we re-estimate our specification with GDP growth, inflation, and/or a measure of ARM demand (Table C.2).[28] Fourth, we control for the level of FFR since the decline in ARM costs might be limited because of the zero lower bound (Table C.3). Fifth, we use the past 2-year average of ARM shares to mitigate the endogeneity of the quarterly ARM shares (Table C.4). Finally, we estimate our model where we use the ARM as a share of the bank's real-estate loans instead of the bank's assets (Table C.5). We consistently find that the coefficient on the interaction term between ARM shares and

[27]We closely follow our earlier robustness tests that we did for bank stock price and bank-level lending analysis. See those parts for more descriptions.

[28]In our benchmark, we use inflation, GDP growth, the change in the housing price index, and the change in the mortgage demand index as macroeconomic variables.

changes in the FFR remains significant and positive.

5.4 Instrumental Variable Approach: Geographic ARM Exposure

While our analysis using DealScan data effectively controls for loan demand through firm×time fixed effects, a potential endogeneity concern remains regarding the banks' ARM shares. Banks may strategically select their mortgage portfolio composition based on expectations of future monetary policy or unobserved local economic conditions that also affect their lending behavior. For instance, a bank anticipating interest rate hikes might actively seek to increase its ARM share. If these factors are unobserved, our baseline OLS estimates might be biased.

To address this potential endogeneity and identify the causal effect of ARM exposure on bank lending responses to monetary policy, we employ an instrumental variable (IV) strategy using a Bartik-style instrument (a shift-share IV). We focus this IV approach specifically on the DealScan dataset, since the DealScan data provides the finest identification of the credit supply channel in our analysis, as it allows us to control for loan demand at the firm×time level.

The validity of this identification strategy rests on the exclusion restriction: the instrument must affect the lending response to monetary policy only through its impact on the bank's ARM share, conditional on controls. We acknowledge recent critiques of shift-share instruments (e.g., Goldsmith-Pinkham, Sorkin and Swift (2020) and Borusyak, Hull and Jaravel (2022)). We mitigate concerns about endogenous shares by using the 1998 footprint, which predates the significant shifts in mortgage market structure during the 2000s. Furthermore, the inclusion of bank fixed effects (α_i) in the first stage addresses a key identification challenge by ensuring that identification relies on the time-series variation in local ARM prevalence (the shifts) rather than potentially endogenous cross-sectional differences in historical bank footprints (the shares).

Instrument Construction and Identification: The Bartik instrument exploits exogenous variation in banks' exposure to local ARM prevalence based on their predetermined geographic footprints. We construct the geographic ARM exposure instrument ($ARM\_Exposure^{IV}_{i,t}$) for bank i at time t as follows:

$$ARM\_Exposure^{IV}_{i,t} = \sum_{c} \omega^{1998}_{i,c} \times ARM\_Share_{c,t} \tag{8}$$

where $\omega^{1998}_{i,c}$ represents bank i's share of total deposits in county c in 1998, calculated using the FDIC Summary of Deposits data. This "share" captures the bank's historical presence in a given market. $ARM\_Share_{c,t}$ is the fraction of mortgages that are adjustable-rate in county c at time t, derived from CoreLogic data (the "shift").

The identification assumption is that banks historically present in counties that later experienced increases in ARM usage (for reasons unrelated to the banks' individual contemporaneous lending strategies) will have higher ARM exposure.

Estimation and First Stage Results: We implement a two-stage least squares (2SLS) estimation. In the first stage, we regress the bank's actual ARM share ($ARM_{i,t}$) on the instrument, controlling for bank fixed effects:

$$ARM_{i,t} = \gamma_0 + \gamma_1 * ARM\_Exposure^{IV}_{i,t} + \alpha_i + \nu_{i,t} \tag{9}$$

This specification absorbs time-invariant bank characteristics (α_i) and utilizes both cross-sectional differences in geographic footprints and time-series variation in aggregate ARM prevalence for identification. The first-stage results confirm the relevance of the instrument. The coefficient γ_1 is positive and statistically significant, indicating that banks with higher exogenous geographic exposure indeed hold more ARMs. The F-statistic for the excluded instrument is 13.59, exceeding the conventional threshold of 10, suggesting the instrument is sufficiently strong.

Second Stage Results: In the second stage, we use the predicted ARM share ($\widehat{ARM}_{i,t}$) from the first stage to re-estimate the syndicated lending model (Equation 7). We replace the potentially endogenous $ARM_{i,t-1}$ with $\widehat{ARM}_{i,t-1}$ in the interaction term with ΔFFR_{t-k} and in the interaction with macroeconomic controls:

$$\begin{aligned} log(L_{f,i,t}) = & \sum_{k=0}^{k=4} \alpha_k * \widehat{ARM}_{i,t-1} * \Delta FFR_{t-k} + \sum_{k=0}^{k=4} \gamma_k * \text{BANK CONTROLS} * \Delta FFR_{t-k} \\ & + \sum_{k=0}^{k=4} \varrho_k * \widehat{ARM}_{i,t-1} * \Delta \text{MACRO CONTROLS}_{t-k} + \delta_{f,t} + \theta_i + \epsilon_{i,t} \end{aligned} \tag{10}$$

The results of the 2SLS estimation are presented in Table XV. The findings strongly support our baseline OLS results. The coefficient of interest, $\sum \alpha_k$, which captures the interaction between the instrumented ARM share and changes in the FFR, is positive across all specifications and statistically significant in the majority of them (Columns 1-4).

This reinforces the evidence that banks with exogenously higher ARM exposure reduce their credit supply less (or increase it more) compared to other banks when monetary policy tightens. The economic magnitude implied by the IV estimates is significant and generally larger than the OLS estimates. For instance, based on the specification in Column 2, a one standard deviation increase in the FFR leads to a 3.87 percent relative increase in lending for a bank at the 75th percentile of ARM exposure compared to a bank at the 25th percentile.

Overall, the instrumental variable analysis strengthens the causal interpretation of our main finding: the composition of bank mortgage portfolios significantly influences the transmission of monetary policy through the bank lending channel.

6 Conclusion

Is monetary policy more effective when ARMs are more common in the economy? Previous research has focused primarily on borrowers. When borrowers hold ARMs, changes in monetary policy directly influence their mortgage payments, leading to significant adjustments in disposable income, and potentially influencing consumer spending. This mechanism is absent for FRMs, which do not experience immediate payment changes. From this view, a higher prevalence of ARMs might strengthen the effectiveness of monetary policy transmission.

Our research challenges this view by examining the role of lenders. We show that banks with a higher share of ARMs mitigate monetary policy transmission. For instance, when monetary policy tightens, the banks with a higher proportion of ARMs have a relatively better stock price performance and reduce lending less compared to their counterparts with lower ARM shares. Our analysis reveals that these outcomes can be attributed to changes in expected mortgage interest income for these banks.

Therefore, the overall impact of ARMs on monetary policy transmission depends on whether the lenders or borrowers are the marginal agents at a given time. Consequently, during periods of banking crises, such as the one witnessed in 2008, a higher prevalence of ARMs may even impede economic activity and amplify risks to financial stability when monetary policy is loosened. This is because lower mortgage payments due to lower interest rates may push banks with low equity toward closure. Hence, this mechanism suggests that the role of ARMs in monetary policy transmission is likely to be time-varying and contingent on the relative strengths of borrowers' and lenders' balance sheets.

The structure of the U.S. mortgage market might influence some of our results. In particular, extensive securitization in the U.S. mortgage market, and the existence of Fannie Mae and Freddie Mac (two government-sponsored enterprises) lower the size of the mortgages in bank balance sheets. And the investors that hold these mortgage securities might have balance sheets different from banks. As a result, the total effect of ARMs on monetary policy transmission is likely to be different from the ones implied by our estimates. However, our point that the investors who hold ARMs will suffer from lower rates remains valid.

Although our estimates are identified from within-U.S. variation in banks' ARM exposure, they may also be informative for economies where ARM prevalence is substantially higher. The large cross-country dispersion in mortgage-rate fixation documented by Albertazzi, Fringuellotti and Ongena (2024) and Badarinza, Campbell and Ramadorai (2018) suggests that the lender-side channel we identify may matter quantitatively for monetary transmission in high-ARM economies.

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FIGURE 1 – **ARM Shares and Monetary Policy Shocks**

This figure plots three main variables that we use in the paper. The upper-left panel plots the distribution of bank ARM shares relative to real estate loans. The upper-right panel plots the mean ARM-share in bank balance sheets over time. The lower-left panel plots the surprise monetary policy shocks obtained from high-frequency data. The lower-right panel plots the quarterly changes in the federal funds rate (FFR).

FIGURE 2 – **ARM Shares across U.S. Counties (1999)**

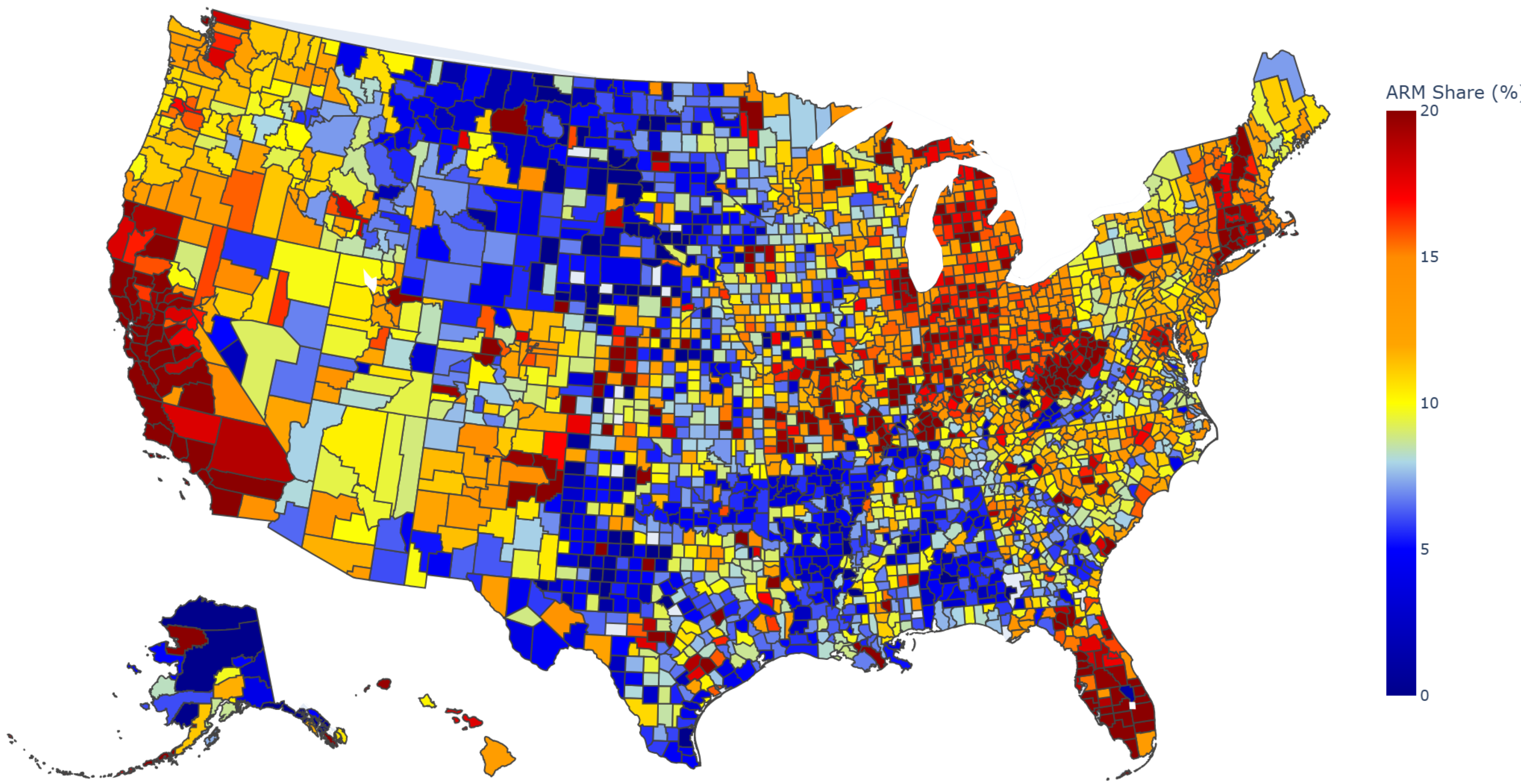

FIGURE 3 – **Bank Level—Local Projections of Bank Income—Monetary Shocks – High Frequency**

This figure plots the results from local projection regressions of Equation 2 where the dependent variables are changes in several measures of bank interest income and expense over different horizons. Specifically, we present the specification in Column 5 in Table II (the others look very similar). We plot the coefficient $\sum \alpha_{k,d}$ for different d quarters. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events, and its interaction with the share of ARMs in bank's assets. Blue dotted lines represent the point estimates, and shaded regions show 68, 90 and 95 percent confidence bands. RE Loans refers to Real Estate Loans. See the text for details.

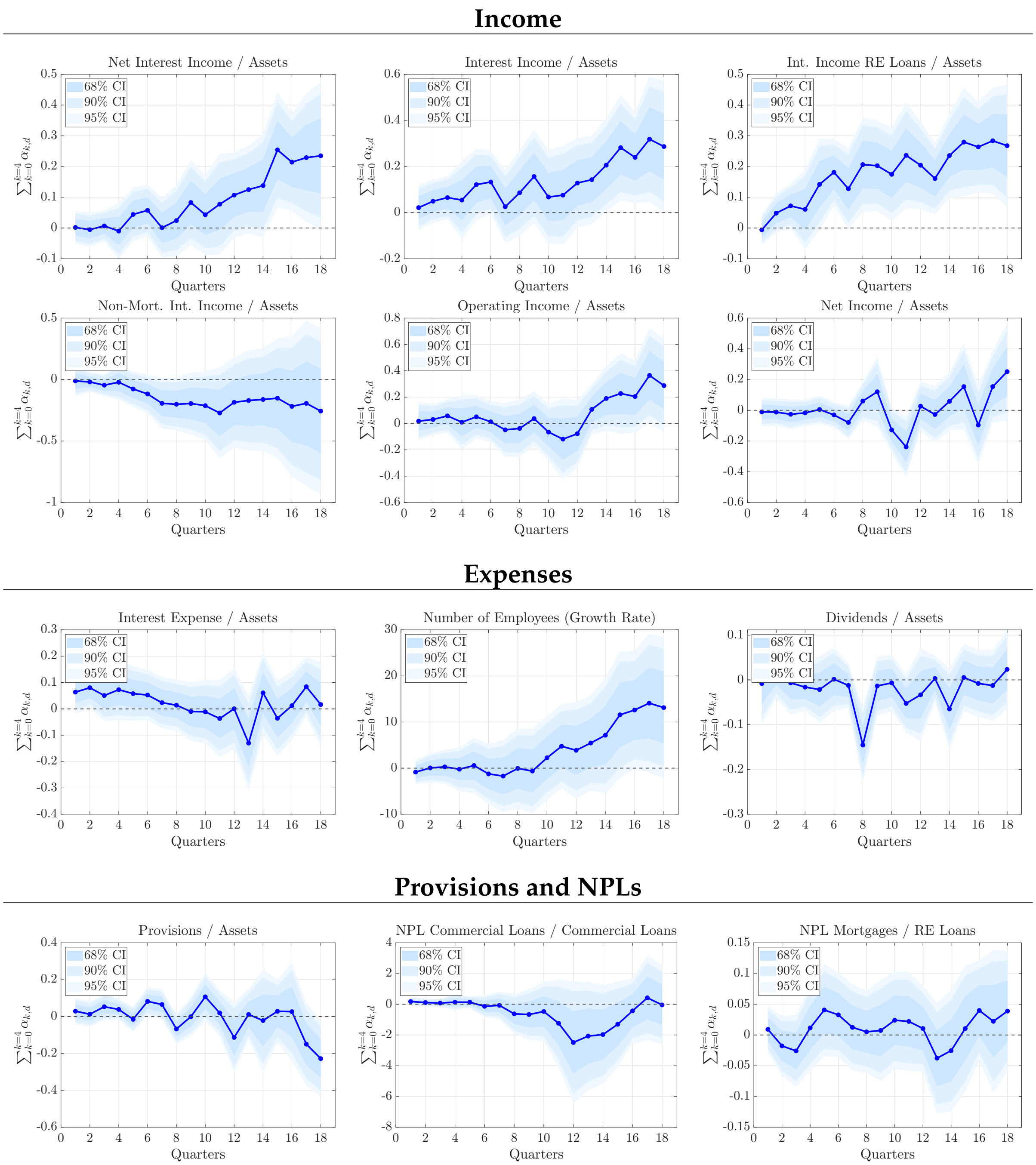

TABLE I – **Bank Level – Stock Prices – Descriptive Statistics**

Variables	Definition	# Obs.	Mean	Median	StD.	Min.	Max.
Dependent Variables							
% Change in Bank Stock Prices	Percent change in stock prices of bank i between day t+1 and t-1	44967	0.002	0.000	4.143	-36.845	35.667
Bank Controls							
ARM/Assets	The ratio of adjustable-rate mortgages (RCON5370) to total assets (RCFD2170)	44967	0.050	0.032	0.053	0.000	0.314
Real Estate Loans /Assets	The ratio of real estate loans (RCFD1410) to total assets	44967	0.498	0.514	0.157	0.000	0.863
Assets	Assets in billions (in 2010 USD.)	44967	28.898	1.845	182.255	0.050	2626.679
Equity/Assets	The ratio of equity (RCFD3210) to total assets	44967	0.102	0.098	0.027	0.013	0.335
Liquidity/Assets	The ratio of liquid assets (RCFD1773+RCFD1754) to total assets	44967	0.257	0.237	0.119	0.024	0.747
NPL/Assets	The ratio of nonperforming loans (RCFD1407+RCFD1403) to total assets	44967	0.023	0.012	0.029	0.000	0.233
BdF/Assets	The ratio of balances due from Fed (RCFD0090) to total assets	44967	0.012	0.001	0.028	0.000	0.262
HHI	Herfindahl-Hirschman Index at the county level for the deposit market	44967	0.187	0.175	0.083	0.000	0.871
Deposits/Assets	The ratio of deposits (RCON3485) to total assets	44967	0.767	0.789	0.102	0.273	0.945
AMY /Assets	The ratio of assets maturing in less than one year (RCFDA247) to total assets	44967	0.156	0.141	0.098	0.000	0.555
Saving Deposits/Assets	The ratio of saving deposits (RCON2389) to total assets	44967	0.364	0.362	0.145	0.020	0.747
Time Sensitive Deposits/Assets	The ratio of bank holding company sensitive deposits (RCONA579+ RCONA580+ RCONA584+ RCONA585+ RCFDF055+RCFDF060) to total assets	44967	0.221	0.206	0.108	0.005	0.684
Fed Funds Repo Liabilities /Assets	The ratio of Fed fund repo liabilities (RCFDB993+RCFDB995) to total assets	44967	0.036	0.021	0.045	0.000	0.335
Maturity Gap	See the text	44967	4.299	3.989	2.070	0.215	11.364
Income Gap	See the text	44967	0.102	0.097	0.148	-0.377	0.598
Income Beta	See the text	36137	0.338	0.333	0.117	0.040	0.726
Expense Beta	See the text	36137	0.330	0.324	0.086	0.073	0.600
Bank Hedging Controls (%)							
Fixed-rate Swaps/Assets	The ratio of fixed-rate swaps (RCONA589) to total assets	44967	0.303	0.000	1.232	0.000	15.158
Total Swaps/Assets	The ratio of total swaps (RCON3450) to total assets	44967	1.271	0.000	3.517	0.000	32.511
Net Hedging/Assets	The ratio of net hedging (RCONA589 -(RCON3450-RCONA589)) to total assets	44967	-0.577	0.000	2.479	-19.085	14.032
Gross Hedging/Assets	The ratio of gross hedging (RCON8725+RCON8729) to total assets	44967	1.915	0.000	4.752	0.000	48.332
Shock Variables (Basis Points)							
MPshock	Monetary policy shocks are obtained from changes in 1-month Treasury yields around monetary policy events.	44967	-0.037	0.000	0.940	-5.000	3.300
Positive *MPshock*	Positive high-frequency shocks, otherwise zero	44967	0.233	0.000	0.538	0.000	3.300
Negative *MPshock*	Negative high-frequency shocks, otherwise zero	44967	-0.269	0.000	0.685	-5.000	0.000

Notes: Summary statistics for bank and hedging controls are based on the quarterly U.S. Call Reports data between 1997 and 2013 restricted to U.S. banks. Daily bank stock prices are from the Center for Research in Security Prices (CRSP). Monetary policy shocks are from the Bank for International Settlements (BIS).

TABLE II – **Bank Level – Stock Prices – Monetary Shocks – High Frequency**

Dependent Variable: % Change in Bank Stock Prices

Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$\alpha * ARM_{i,t} * MPshock_t$	0.015***	0.008*	0.011**	0.011**	0.012***	0.012***	0.011*	0.008^{+}	0.011**	0.011**	0.014**
standard errors	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)	(0.006)
$\lambda * INCOMEGAP_{i,t} * MPshock_t$									-0.001		
standard errors									(0.002)		
$\pi * MATURITYGAP_{i,t} * MPshock_t$										0.0001	
standard errors										(0.0001)	
$\beta_I * INCOME\_BETA_{i,t} * MPshock_t$											0.025
standard errors											(0.295)
$\beta_E * EXPENSE\_BETA_{i,t} * MPshock_t$											-0.125
standard errors											(0.406)
TIME FIXED EFFECTS	N	N	N	Y	Y	Y	N	Y	Y	Y	Y
YEAR-MONTH FIXED EFFECTS	N	N	Y	-	-	-	Y	-	-	-	-
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t} * MPshock_t$	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	N	N	N	Y	Y	≈	≈	N	N	N
BANK LIABILITY CONTROLS$_{i,t} * MPshock_t$	N	N	N	N	Y	Y	≈	≈	N	N	N
BANK FED FUNDS LIABILITY$_{i,t}$	N	N	N	N	N	Y	≈	≈	N	N	N
BANK FED FUNDS LIABILITY$_{i,t} * MPshock_t$	N	N	N	N	N	Y	≈	≈	N	N	N
BANK REPRICING CONTROLS$_{i,t}$	N	N	N	N	N	N	Y	Y	N	N	N
BANK REPRICING CONTROLS$_{i,t} * MPshock_t$	N	N	N	N	N	N	Y	Y	N	N	N
Impact of 1 StD. increase in $MPshock_t$ on Low versus High ARM Banks (difference between 75th and 25th percentiles) in percentage points	0.082	0.043	0.060	0.0680	0.0685	0.065	0.060	0.043	0.060	0.060	0.076
Observations	25008	25008	25008	25008	25008	25008	25008	25008	25008	25008	20597
R-squared	0.159	0.161	0.314	0.367	0.367	0.367	0.316	0.368	0.367	0.367	0.392

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions. The dependent variable is the % change in bank stock prices between day $t+1$ and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. The coefficient of interest (α) is the interaction of *MPshock* with the ratio of adjustable-rate mortgages (ARM) to bank assets. It measures how ARM mortgage share changes the effect of the changes in *MPshock*. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls, Columns 5 and 6, include saving deposits and time sensitive deposits instead of deposits used in Columns 1-4. Column 6 includes Fed funds repo liabilities in addition to the bank variables used. In Columns 7 and 8, bank repricing controls include all repricing assets and liabilities in addition to the benchmark bank variables used in Column 4. Repricing assets are securities with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, between 3 years and 5 years, between 5 years and 15 years, and over 15 years, other mortgage backed securities (MBS) with maturities less than 3 years and over 3 years, other loans with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, between 3 years and 5 years, between 5 years and 15 years, and over 15 years, residential loans with maturities over 15 years. Repricing liabilities are time deposits with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, over 3 years, other liabilities from the Fed with maturities less than 1 year, between 1 year and 3 years, between 3 years and 5 years, and over 5 years. Columns 9-11 horse-race the ARM share with $INCOMEGAP$, $MATURITYGAP$, $INCOME\_BETA$ and $EXPENSE\_BETA$ (see the text for the definitions). The analysis covers the period of 2003:Q4 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "≈" indicates that the set of characteristics are almost fully controlled in the BANK REPRICING CONTROLS. *** Significant at 1%, ** Significant at 5%, * Significant at 10%, $^{+}$Significant at 15%.

TABLE III – **Bank Level – Stock Prices – Monetary Shocks – High Frequency – Asymmetry**

Dependent Variable: % Change in Bank Stock Prices						
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha^{+} * ARM_{i,t} * MPshock_t^{+}$	0.026***	0.019*	0.02**	0.02**	0.021**	0.021**
standard errors	(0.01)	(0.011)	(0.01)	(0.01)	(0.01)	(0.01)
$\alpha^{-} * ARM_{i,t} * MPshock_t^{-}$	-0.004	-0.013	-0.008	-0.008	-0.007	-0.007
standard errors	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
TIME FIXED EFFECTS	N	N	N	Y	Y	Y
YEAR-MONTH FIXED EFFECTS	N	N	Y	-	-	-
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t} * MPshock_t^{+,-}$	N	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	N	N	N	Y	Y
BANK LIABILITY CONTROLS$_{i,t} * MPshock_t^{+,-}$	N	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t}$	N	N	N	N	N	Y
BANK FED FUNDS LIABILITY$_{i,t} * MPshock_t^{+,-}$	N	N	N	N	N	Y
Observations	7906	7906	7906	7906	7906	7906
R-squared	0.257	0.27	0.399	0.399	0.399	0.399

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions where we estimate separate coefficients for positive and negative shocks. The dependent variable is the % change in bank stock prices between day $t+1$ and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. Positive $MPshock^{+}$, is defined as the positive shocks, obtained from high-frequency identification around monetary policy events, otherwise zero. Negative $MPshock^{-}$, is similarly defined as the negative shocks, otherwise zero. The coefficients of interest ($\alpha^{+,-}$) are the interactions of positive and negative $MPshock^{+,-}$ with the ratio of ARM to bank assets. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Column 4 offers full sets of fixed effects along with double interactions for those bank variables. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 5. Column 6 includes Fed funds repo liabilities. The analysis covers the period of 2003:Q4 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. We trim positive and negative $MPshock^{+,-}$, which are smaller than the absolute value of 0.4 bp. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE IV – **Bank Level – Lending – Descriptive Statistics**

Variables	Definition	# Obs.	Mean	Median	StD.	Min.	Max.
Dependent Variables							
% Change in Commercial Loans	Change in logarithm of commercial and industrial loans of bank i between quarter t and $t-1$	30519	0.028	0.018	0.143	-1.766	1.074
Δ Net Int. Inc. / L.Assets (%)	Change in net interest income relative to lagged total assets	30514	0.029	0.013	0.160	-0.503	3.926
Δ Int. Inc. / L.Assets (%)	Change in interest income relative to lagged total assets	30514	0.050	0.027	0.251	-0.762	6.412
Δ Int. Inc. Loans / L.Assets (%)	Change in interest income from loans relative to lagged total assets	30514	0.043	0.020	0.208	-0.567	5.552
Δ Int. Inc. RE Loans / L.RE Loans (%)	Change in interest income from real estate loans relative to lagged real estate loans	30139	0.074	0.034	0.442	-2.369	6.891
Δ Non-mortgage Int. Inc. / L.Assets (%)	Change in non-mortgage interest income relative to lagged total assets	30447	0.023	0.009	0.183	-1.435	2.905
Δ Int. Exp. Deposits / L.Deposits (%)	Change in interest expense on deposits relative to lagged deposits	30514	0.024	0.007	0.145	-0.400	1.937
Bank Controls							
ARM/Assets	The ratio of adjustable-rate mortgages to total assets	30519	0.060	0.030	0.075	0.000	0.428
Real Estate Loans /Assets	The ratio of real estate loans to total assets	30519	0.418	0.426	0.179	0.000	0.836
Assets	Assets in billions (in 2010 USD.)	30519	15.772	1.778	88.987	0.457	1873.869
Equity/Assets	The ratio of equity to total assets	30519	0.096	0.088	0.040	0.025	0.784
Liquidity/Assets	The ratio of liquid assets to total assets	30519	0.278	0.259	0.138	0.010	0.876
NPL/Assets	The ratio of nonperforming loans to total loans	30519	0.013	0.007	0.021	0.000	0.202
BdF/Assets	The ratio of balances due from Fed (RCFD0090) to total assets	30519	0.012	0.003	0.031	0.000	0.527
HHI	Herfindahl-Hirschman Index for the deposit market	30519	0.178	0.167	0.089	0.042	0.899
Deposits/Assets	The ratio of deposits to total assets	30519	0.739	0.778	0.150	0.001	0.945
AMY/Assets	The ratio of assets with a maturity of less than one year (AMY) to total assets	30519	0.157	0.141	0.108	0.000	0.610
Saving Deposits/Assets	The ratio of saving deposits to total assets	30519	0.308	0.300	0.144	0.000	0.945
Time Sensitive Deposits/Assets	The ratio of bank holding company sensitive deposits to total assets	30519	0.238	0.231	0.115	0.000	0.818
Fed Funds Repo Liabilities /Assets	The ratio of Fed fund repo liabilities (RCFDB993+RCFDB995) to total assets	30519	0.052	0.033	0.056	0.000	0.204
Maturity Gap	See the text	30445	3.916	3.521	2.168	-0.046	11.625
Income Gap	See the text	30519	0.118	0.110	0.169	-0.414	0.581
Income Beta	See the text	28289	0.381	0.372	0.133	-0.098	0.796
Expense Beta	See the text	28289	0.395	0.391	0.094	0.068	0.631
Macro Controls							
Changes in Fed Funds Rate (%)	Quarterly change in federal funds rate	30519	0.020	0.010	0.387	-1.370	0.590
Quarterly MPS (%)	Quarterly sum of daily high frequency shocks	11957	-0.008	-0.005	0.018	-0.057	0.047
Inflation (%)	Quarterly change in consumer price index	30519	0.568	0.638	0.379	-0.688	1.514
Change in GDP (% YOY)	Quarterly percent change in GDP	30519	3.044	3.600	2.862	-8.400	7.500
Change in Housing Prices (%)	Quarterly change in housing price index	30519	1.171	1.372	1.194	-2.751	3.824
Mortgage Demand Index	Quarterly Mortgage demand index	30519	-3.858	-5.800	33.880	-63.500	63.500

Notes: Summary statistics for bank controls are based on the quarterly U.S. Call Reports data between 1997 and 2013 restricted to U.S. banks. Mortgage demand index is from "Senior Loan Officer Opinion Survey on Bank Lending Practices". Other macro controls are from FRED.

TABLE V – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate**

Dependent Variable: % Change in Commercial Loans									
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	0.153***	0.134**	0.133**	0.136**	0.129**	0.175**	0.131**	0.135**	0.169**
standard errors	(0.052)	(0.069)	(0.067)	(0.067)	(0.067)	(0.075)	(0.067)	(0.068)	(0.073)
$\sum_{k=0}^{k=4} \lambda_k(INCOMEGAP_{i,t-1} * \Delta FFR_{t-k})$							0.039		
standard errors							(0.04)		
$\sum_{k=0}^{k=4} \pi_k(MATURITYGAP_{i,t-1} * \Delta FFR_{t-k})$								0.001	
standard errors								(0.003)	
$\sum_{k=0}^{k=4} \beta_{I,k}(INCOME\_BETA_{i,t-1} * \Delta FFR_{t-k})$									5.389
standard errors									(3.884)
$\sum_{k=0}^{k=4} \beta_{E,k}(EXPENSE\_BETA_{i,t-1} * \Delta FFR_{t-k})$									0.006
standard errors									(7.029)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	Y	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}*$MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y	≈	N	N	N
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	N	Y	Y	≈	N	N	N
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y	≈	N	N	N
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	N	N	Y	≈	N	N	N
BANK REPRICING CONTROLS$_{i,t-1}$	N	N	N	N	N	Y	N	N	N
$\sum_{k=0}^{k=4} \delta_k$(BANK REPRICING CONTROLS$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	N	N	N	Y	N	N	N
Impact of 1 StD. Increase in FFR on Low versus High ARM Banks (Difference Between 75th and 25th Percentiles) in percentage points	0.453	0.397	0.394	0.403	0.382	0.501	0.375	0.386	0.484
Observations	27825	27825	27825	27825	27825	27730	27730	27670	26141
R-squared	0.114	0.115	0.117	0.118	0.118	0.124	0.117	0.118	0.117

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (Columns 4 and 5) include saving deposits and time sensitive deposits which replace deposits used in Columns 1-3. Column 5 also includes Fed funds repo liabilities. In Column 6, Bank repricing controls include all repricing assets and liabilities in addition to the benchmark bank variables used in Columns 1-3. Repricing assets are securities with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, between 3 years and 5 years, between 5 years and 15 years, and over 15 years, other mortgage backed securities (MBS) with maturities less than 3 years and over 3 years, other loans with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, between 3 years and 5 years, between 5 years and 15 years, and over 15 years, residential loans with maturities over 15 years. Repricing liabilities are time deposits with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, over 3 years, other liabilities from the Fed with maturities less than 1 year, between 1 year and 3 years, between 3 years and 5 years, and over 5 years. Columns 7-9 horse-race the ARM share with $INCOMEGAP$, $MATURITYGAP$, $INCOME\_BETA$ and $EXPENSE\_BETA$ (see the text for the definitions). The analysis covers the period of 1997:Q2–2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "≈" indicates that the set of characteristics are almost fully controlled in the BANK REPRICING CONTROLS. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE VI – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Asymmetry**

Dependent Variable: % Change in Commercial Loans					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k^{+} (ARM_{i,t-1} * \Delta FFR_{t-k}^{+})$	0.161	0.386^{+}	0.386^{+}	0.396*	0.389^{+}
standard errors	(0.121)	(0.244)	(0.244)	(0.247)	(0.246)
$\sum_{k=0}^{k=4} \alpha_k^{-} (ARM_{i,t-1} * \Delta FFR_{t-k}^{-})$	0.116	-0.022	-0.022	-0.018	-0.021
standard errors	(0.075)	(0.097)	(0.097)	(0.097)	(0.097)
TIME FE, BANK FE	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k^{+,-}$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}^{+,-}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k^{+,-}$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k^{+,-} ARM_{i,t-1}*$MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k^{+,-}$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}^{+,-}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k^{+,-}$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}^{+,-}$)	N	N	N	N	Y
Observations	27825	27825	27825	27825	27825
R-squared	0.114	0.116	0.116	0.115	0.116

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. Positive ΔFFR^{+} is defined as the positive quarterly changes in FFR, otherwise zero. Negative ΔFFR^{-} is defined as the negative quarterly changes in FFR, otherwise zero. The coefficient of interest ($\sum \alpha_k^{+,-}$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2– 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. ***Significant at 1%, ** Significant at 5%, *Significant at 10%. +Significant at 11%.

TABLE VII – **Bank Level – Lending – Monetary Shocks – High Frequency**

Dependent Variable: % Change in Commercial Loans						
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * MPshock_{t-k})$	4.106*	4.188*	3.986*	3.966^{+}	4.016*	4.105^{+}
standard errors	(2.342)	(2.463)	(2.332)	(2.486)	(2.326)	(2.569)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,\,t\,-\,1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,\,t\,-\,1}$$*MPshock_{t-k}$)	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,\,t\,-\,1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,\,t\,-\,1}$$*MPshock_{t-k}$)	N	Y	N	Y	N	Y
BANK FED FUNDS LIABILITY$_{i,\,t\,-\,1}$	N	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,\,t\,-\,1}$$*MPshock_{t-k}$)	N	N	N	N	N	Y
Observations	10026	10026	10026	10026	10026	10026
R-squared	0.186	0.191	0.186	0.191	0.186	0.192

Notes: The table reports estimates Equation 5 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between quarters t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, *MPshock*, is obtained from high-frequency identification around monetary policy events. The coefficient of interest ($\sum \alpha_k$) is the interaction of *MPshock* with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in *MPshock*. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 3. Column 5 includes Fed funds repo liabilities. The analysis covers the period of 1997:Q2– 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%, $^{+}$Significant at 11%.

TABLE VIII – **Bank County Credit Level – Descriptive Statistics**

Variables	Definition	#Obs.	Mean	Median	StD.	Min.	Max.
Dependent Variables							
$Log(NewLoans)_{cit}$	The natural logarithm of new commercial loans at county *c* from bank *i* at bank holding company *t*	921408	12.336	12.240	2.200	6.909	17.949
Bank Controls							
ARM/Assets	The ratio of adjustable-rate mortgages to total assets	922086	0.035	0.016	0.049	0.000	0.426
Assets	Assets in billions (in 2010 USD.)	922086	115.026	11.788	289.214	0.192	1825.298
Equity/Assets	The ratio of equity to total assets	922086	23.348	23.190	2.226	19.071	28.233
Liquidity/Assets	The ratio of liquid assets to total assets	922086	0.120	0.097	0.076	0.025	0.682
NPL/Assets	The ratio of nonperforming loans to total loans	922086	0.199	0.197	0.127	0.014	0.882
BdF/Assets	The ratio of balances due from Fed (RCFD0090) to total assets	922086	0.018	0.013	0.017	0.000	0.196
HHI	Herfindahl-Hirschman Index for the deposit market	922086	0.011	0.002	0.029	0.000	0.510
Deposits/Assets	The ratio of deposits to total assets	922086	0.234	0.193	0.155	0.039	0.899
AMY/Assets	The ratio of assets with a maturity of less than one year (AMY) to total assets	922086	0.607	0.675	0.227	0.004	0.945
Saving Deposits/Assets	The ratio of saving deposits to total assets	922086	0.140	0.125	0.119	0.000	0.589
Time Sensitive Deposits/Assets	The ratio of time sensitive deposits to total assets	922086	0.269	0.278	0.188	0.000	0.895
Fed Funds Repo Liabilities /Assets	The ratio of Fed fund repo liabilities (RCFDB993+RCFDB995) to total assets	922086	0.192	0.170	0.135	0.000	0.791
Maturity Gap	See the text	896171	0.056	0.037	0.062	0.000	0.204
Income Gap	See the text	920976	0.217	0.220	0.169	-0.402	0.581
Income Beta	See the text	838794	0.356	0.351	0.136	-0.036	0.785
Expense Beta	See the text	838794	0.41	0.41	0.10	0.08	0.62
Macro Controls							
Change in Fed Funds Rate (%)	The change in effective federal funds rate (YOY)	922086	-0.076	-0.060	1.418	-3.860	1.990
MPshock (Basis Points)	High frequency identification around monetary policy events (Yearly sum of shocks)	492282	-3.685	-0.800	8.537	-23.500	9.100
Inflation (%)	Change in consumer price index (YOY)	922086	2.351	2.002	0.824	1.208	3.675
Change in GDP (%)	Percent change in GDP (YOY)	922086	2.610	2.800	1.446	0.100	4.900
Change in Housing Prices	Change in housing price index (YOY)	922086	4.609	6.700	4.773	-5.234	11.224
Mortgage Demand Index	Mortgage demand index	922086	-7.853	-11.200	28.955	-60.400	47.000

Notes: Summary statistics are based on annual data from the Community Reinvestment Act (CRA) data matched with the U.S. Call Reports data between 1997 and 2013.

TABLE IX – **Bank County Credit Level – Monetary Shocks – Federal Funds Rate**

Dependent Variable: Log (New Loans) at county c from bank i

Explanatory Variables	Total Loans (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	0.817***	1.001***	0.957***	1.087***	0.904***	1.119***	0.737***	0.28***	1.126***
standard errors	(0.084)	(0.083)	(0.084)	(0.084)	(0.084)	(0.084)	(0.087)	(0.094)	(0.089)
$\sum_{k=0}^{k=4} \lambda_k(INCOMEGAP_{i,t-1} * \Delta FFR_{t-k})$							0.200***		
standard errors							(0.025)		
$\sum_{k=0}^{k=4} \pi_k(MATURITYGAP_{i,t-1} * \Delta FFR_{t-k})$								-0.00002	
standard errors								(0.002)	
$\sum_{k=0}^{k=4} \beta_{I,k}(INCOME\_BETA_{i,t-1} * \Delta FFR_{t-k})$									-65.102***
standard errors									(3.138)
$\sum_{k=0}^{k=4} \beta_{E,k}(EXPENSE\_BETA_{i,t-1} * \Delta FFR_{t-k})$									130.605***
standard errors									(5.579)
COUNTY∗TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y	Y
COUNTY∗BANK FIXED EFFECTS	N	Y	N	Y	N	Y	N	N	N
BANK FIXED EFFECTS	Y	-	Y	-	Y	-	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS $_{i,t-1}$	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=1} \gamma_k$(BANK CONTROLS$_{i,t-1}$∗$\Delta FFR_{t-k}$)	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=1} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-	-	-	-
$\sum_{k=0}^{k=1} \mu_k ARM_{i,t-1}$∗MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	Y	Y	Y	Y	N	N	N
$\sum_{k=0}^{k=1} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}$∗$\Delta FFR_{t-k}$)	N	N	Y	Y	Y	Y	N	N	N
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y	Y	N	N	N
$\sum_{k=0}^{k=1} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}$∗ΔFFR_{t-k})	N	N	N	N	Y	Y	N	N	N
Impact of 1 StD. Increase in FFR on Low versus High ARM Banks (Difference Between 75th and 25th Percentiles)	5.683	6.963	6.657	7.561	6.288	7.784	5.127	1.948	7.833
Observations	644398	599195	644398	599195	644398	599195	598799	574364	589796
R-squared	0.782	0.866	0.783	0.866	0.783	0.866	0.867	0.867	0.789

Notes: The table reports estimates for the Equation 6 from ordinary least squares regressions. The dependent variable is the logarithm of new loans at county c from bank i at time t. Table VIII contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the sum of changes in the effective federal funds rate between time t and $t-1$ (t is a year). The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effect of the changes in ΔFFR. We control loan demand using COUNTY∗TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (Columns 3 and 4) include saving deposits and time sensitive deposits which replace deposits used in Columns 1-2. Columns 5-6 also includes Fed funds repo liabilities. Macro controls, year-on-year change in the quarterly averages, include inflation, GDP growth, change in the housing price index, and mortgage demand index. Columns 7-9 horse-race the ARM share with $INCOMEGAP$, $MATURITYGAP$, $INCOME\_BETA$ and $EXPENSE\_BETA$ (see the text for the definitions). The analysis covers the period of 1997– 2013 for the yearly data, however, we exclude 2007 and 2008, the housing crisis period. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE X – **Bank County Credit Level – Monetary Shocks – High Frequency**

Dependent Variable: Log (New Loans) at county c from bank i

	Total Loans					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=1} \alpha_k (ARM_{i,t-1} * MPshock_{t-k})$	0.081***	0.152***	0.033***	0.084***	0.024**	0.087***
standard errors	(0.012)	(0.011)	(0.012)	(0.01)	(0.012)	(0.011)
COUNTY∗TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
COUNTY∗BANK FIXED EFFECTS	N	Y	N	Y	N	Y
BANK FIXED EFFECTS	Y	-	Y	-	Y	-
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS $_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=1} \gamma_k$(BANK CONTROLS $_{i,t-1} * MPshock_{t-k}$)	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	Y	Y	Y	Y
$\sum_{k=0}^{k=1} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * MPshock_{t-k}$)	N	N	Y	Y	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y	Y
$\sum_{k=0}^{k=1} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * MPshock_{t-k}$)	N	N	N	N	Y	Y
Observations	367749	330215	367749	330215	367749	330215
R-squared	0.81	0.895	0.81	0.896	0.811	0.897

Notes: The table reports estimates a version of Equation 5 from ordinary least squares regressions. The dependent variable is the logarithm of new loans at county c from bank i at time t. Table VIII contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, $MPshock$, is the yearly sum of shocks obtained from high frequency identification around monetary policy events. The coefficient of interest ($\sum \alpha_k$) is the interaction of $MPshock$ with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effect of the changes in $MPshock$. We control loan demand using COUNTY∗TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (Columns 3 and 4) include saving deposits and time sensitive deposits which replace deposits used in Columns 1-2. Columns 5-6 also include Fed funds repo liabilities. The analysis covers the period of 2003 – 2013 for the yearly data, however, we exclude 2007 and 2008, the housing crisis period. Coefficients are listed in the first row, robust standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE XI – **Syndicated Loan Level – Descriptive Statistics**

Variables	Definition	#Obs.	Mean	Median	StD.	Min.	Max.
Dependent Variables							
$Log(NewLoans)_{f,i,t}$	The natural logarithm of new loans of firm f from bank i at time t	150177	16.946	16.884	1.252	5.145	23.153
Bank Controls							
ARM/Assets	The ratio of adjustable-rate mortgages to total assets	150177	0.039	0.029	0.036	0.000	0.335
Real Estate Loans /Assets	The ratio of real estate loans to total assets	150177	0.245	0.259	0.123	0.000	0.804
Assets	Assets in billions (in 2010 USD.)	150177	424.302	160.683	496.721	0.493	1873.869
Equity/Assets	The ratio of equity to total assets	150177	0.089	0.085	0.023	0.042	0.290
Liquidity/Assets	The ratio of liquid assets to total assets	150177	0.238	0.225	0.109	0.012	0.803
NPL/Assets	The ratio of nonperforming loans to total loans	150177	0.018	0.010	0.018	0.000	0.132
BdF/Assets	The ratio of balances due from Fed (RCFD0090) to total assets	150177	0.016	0.003	0.036	0.000	0.527
HHI	Herfindahl-Hirschman Index for the deposit market	150177	0.187	0.178	0.077	0.048	0.815
Deposits/Assets	The ratio of deposits to total assets	150177	0.531	0.545	0.172	0.070	0.932
AMY/Assets	The ratio of assets with a maturity of less than one year (AMY) to total assets	150177	0.167	0.158	0.084	0.000	0.608
Saving Deposits/Assets	The ratio of saving deposits to total assets	150177	0.310	0.293	0.143	0.000	0.911
Time Sensitive Deposits/Assets	The ratio of time sensitive deposits to total assets	150177	0.113	0.106	0.058	0.001	0.790
Fed Funds Repo Liabilities /Assets	The ratio of Fed fund repo liabilities (RCFDB993+RCFDB995) to total assets	150177	0.076	0.065	0.055	0.000	0.204
Maturity Gap	See the text	150177	4.421	4.045	2.103	0.236	10.786
Income Gap	See the text	150177	0.261	0.257	0.115	-0.350	0.581
Income Beta	See the text	148018	0.385	0.371	0.130	0.016	0.783
Expense Beta	See the text	148018	0.433	0.420	0.093	0.085	0.631
Macro Controls							
Change in Fed Funds Rate (%)	Quarterly change in federal funds rate	150177	0.015	0.000	0.390	-1.370	0.590
Inflation (%)	Quarterly change in consumer price index	150177	0.583	0.638	0.366	-0.688	1.514
Change in GDP (% YOY)	Quarterly percent change in GDP	150177	2.954	3.200	2.385	-8.400	7.500
Change in Housing Prices (%)	Quarterly change in housing price index	150177	1.244	1.395	1.190	-2.751	3.824
Mortgage Demand Index	Quarterly Mortgage demand index	150177	-0.930	-1.900	31.080	-63.500	63.500

Notes: Summary statistics are based on the sample from matched U.S. Call Reports data with syndicated-loan-level data from DealScan between 1997 and 2013. The mortgage demand index is from "Senior Loan Officer Opinion Survey on Bank Lending Practices". Other macro controls are from FRED.

TABLE XII – **Syndicated Loan Level – Monetary Shocks – Federal Funds Rate**

Dependent Variable: Log (New Loans) of borrower firm f from bank i									
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	0.868***	1.585**	1.275*	1.378*	1.184*	1.529***	1.205*	1.586**	1.110**
standard errors	(0.327)	(0.773)	(0.72)	(0.789)	(0.708)	(0.493)	(0.714)	(0.745)	(0.533)
$\sum_{k=0}^{k=4} \lambda_k(INCOMEGAP_{i,t-1} * \Delta FFR_{t-k})$							-0.074		
standard errors							(0.358)		
$\sum_{k=0}^{k=4} \pi_k(MATURITYGAP_{i,t-1} * \Delta FFR_{t-k})$								0.015	
standard errors								(0.017)	
$\sum_{k=0}^{k=4} \beta_{I,k}(INCOME\_BETA_{i,t-1} * \Delta FFR_{t-k})$									43.009
standard errors									(30.864)
$\sum_{k=0}^{k=4} \beta_{E,k}(EXPENSE\_BETA_{i,t-1} * \Delta FFR_{t-k})$									18.238
standard errors									(42.345)
FIRM$*$TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	Y	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1} *$MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y	$\approx$	N	N	N
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	Y	Y	$\approx$	N	N	N
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y	$\approx$	N	N	N
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	N	Y	$\approx$	N	N	N
BANK REPRICING CONTROLS$_{i,t-1}$	N	N	N	N	N	Y	N	N	N
$\sum_{k=0}^{k=4} \delta_k$(BANK REPRICING CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	N	N	Y	N	N	N
Impact of 1 StD. Increase in FFR on Low versus High ARM Banks (Difference Between 75th and 25th Percentiles)	1.40%	2.55%	2.05%	2.22%	1.90%	2.46%	1.94%	2.55%	1.78%
Observations	47877	47877	47877	47877	47877	47877	47877	47877	47078
R-squared	0.779	0.78	0.78	0.78	0.78	0.78	0.781	0.78	0.78

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of new loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We control loan demand using FIRM$*$TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (Columns 4 and 5) include saving deposits and time sensitive deposits which replace deposits used in Columns 1-3. Column 5 also includes Fed funds repo liabilities. In Column 6, bank repricing controls include all repricing assets and liabilities in addition to the benchmark bank variables used in Columns 1-3. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. Repricing assets are securities with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, between 3 years and 5 years, between 5 years and 15 years, and over 15 years, other mortgage backed securities (MBS) with maturities less than 3 years and over 3 years, other loans with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, between 3 years and 5 years, between 5 years and 15 years, and over 15 years, residential loans with maturities over 15 years. Repricing liabilities are time deposits with maturities less than 3 months, between 3 months and 1 year, between 1 year and 3 years, over 3 years, other liabilities from the Fed with maturities less than 1 year, between 1 year and 3 years, between 3 years and 5 years, and over 5 years. Columns 7-9 horse-race the ARM share with $INCOMEGAP$, $MATURITYGAP$, $INCOME\_BETA$ and $EXPENSE\_BETA$ (see the text for the definitions). The analysis covers the period of 1997:Q2– 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. "$\approx$" indicates that the set of characteristics are almost fully controlled in the BANK REPRICING CONTROLS. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE XIII – **Syndicated Loan Level – Monetary Shocks – Federal Funds Rate – Asymmetry**

Dependent Variable: Log (New Loans) of borrower firm f from bank i						
	Full Sample			Trimmed Sample		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k^{+}(ARM_{i,t-1} * \Delta FFR_{t-k}^{+})$	4.264**	5.01***	4.534***	4.197***	4.405***	4.875***
standard errors	(2.062)	(1.897)	(1.677)	(1.323)	(1.427)	(1.697)
$\sum_{k=0}^{k=4} \alpha_k^{-}(ARM_{i,t-1} * \Delta FFR_{t-k}^{-})$	-0.867	-0.897	-0.941	-0.811	-0.769	-1.058
standard errors	(1.154)	(1.067)	(1.134)	(1.26)	(1.175)	(1.264)
FIRM $*$TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k^{+,-}$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}^{+,-}$)	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k^{+,-}$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k^{+,-} ARM_{i,t-1}$*MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	Y	Y	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k^{+,-}$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}^{+,-}$)	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	Y	N	N	Y
$\sum_{k=0}^{k=4} \phi_k^{+,-}$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}^{+,-}$)	N	N	Y	N	N	Y
Observations	47877	47877	47877	27635	27635	27635
R-squared	0.781	0.781	0.781	0.822	0.822	0.822

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of new loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. Positive ΔFFR^{+} is defined as the positive quarterly changes in FFR, otherwise zero. Negative ΔFFR^{-} is defined as the negative quarterly changes in FFR, otherwise zero. The coefficient of interest ($\sum \alpha_k^{+,-}$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We control loan demand using FIRM$*$TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits instead of deposits. Fed funds repo liabilities in addition to the bank variables. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2– 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Columns 1-3 provide results for the full sample. Columns 4-6 represent results with the exclusion lower and upper deciles of ARM/A. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE XIV – **Syndicated Loan Level – Monetary Shocks – High Frequency**

Dependent Variable: Log (New Loans) of borrower firm f from bank i						
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * MPshock_{t-k})$	-1.328	3.072	-2.257	1.026	-1.806	-2.094
standard errors	(12.136)	(13.653)	(11.644)	(13.171)	(12.089)	(12.714)
FIRM*TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS $* MPshock_{t-k}$)	N	Y	N	Y	N	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * MPshock_{t-k}$)	N	N	N	Y	N	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * MPshock_{t-k}$)	N	N	N	N	N	Y
Observations	16927	16927	16927	16927	16927	16927
R-squared	0.814	0.815	0.814	0.815	0.814	0.815

Notes: The table reports estimates a version of Equation 5 from ordinary least squares regressions. The dependent variable is the logarithm of new loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. The coefficient of interest ($\sum \alpha_k$) is the interaction of *MPshock* with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in *MPshock*. We control loan demand using FIRM*TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. The analysis covers the period of 1997– 2013, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE XV – **Syndicated Loan Level – Geographic ARM Exposure Instrument**

Dependent Variable: Log (New Loans) of borrower firm f from bank i				
Explanatory Variables	(1)	(2)	(3)	(4)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.827**	2.408**	1.652*	2.105*
standard errors	(0.379)	(1.013)	(0.968)	(1.172)
FIRM∗TIME FIXED EFFECTS	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$∗MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	N	Y
Impact of 1 StD. Increase in FFR on Low versus High ARM Banks (Difference Between 75th and 25th Percentiles)	1.33%	3.87%	2.66%	3.38%
Observations	31978	31978	31978	31978
R-squared	0.761	0.761	0.762	0.762

Notes: The table reports estimates from Two-Stage Least Squares (2SLS) regressions corresponding to Equation 10. The dependent variable is the logarithm of new loans of borrower f from bank i at quarter t. We instrument the bank's ARM share ($ARM_{i,t-1}$) using a Bartik-style instrument ($ARM\_Exposure^{IV}_{i,t}$). This instrument exploits predetermined variation in banks' geographic footprints (based on 1998 FDIC Summary of Deposits data) combined with time-varying local mortgage market characteristics (county-level ARM shares from CoreLogic). The first-stage regression (Equation 9) is estimated with bank fixed effects: $ARM_{i,t} = \gamma_0 + \gamma_1 ARM\_Exposure^{IV}_{i,t} + \alpha_i + \nu_{i,t}$. The F-statistic for the excluded instrument is 13.59, indicating instrument relevance. The monetary policy variable, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR (current and four lags) with the instrumented ARM share ($\widehat{ARM}_{i,t-1}$). It measures how exogenous exposure to ARMs affects the bank lending response to changes in the FFR.We control for loan demand using FIRM∗TIME fixed effects. Bank fixed effects are also included. Control variables are indicated at the bottom of each column. The instrumented ARM share and all relevant double interactions (e.g., interactions of $\widehat{ARM}_{i,t-1}$ with Macro Controls) are included in the model. Bank controls include equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (Columns 4 and 5) include saving deposits and time-sensitive deposits (replacing deposits used in Columns 1-3). Column 5 also includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and the mortgage demand index. The analysis covers the period 1997:Q2-2013:Q4, excluding the 2007-2008 crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, with standard errors reported in parentheses below. "Y" indicates the inclusion of the specified characteristics or fixed effects. "N" indicates exclusion. "-" indicates that the characteristics are subsumed by a wider set of included fixed effects. Table XI contains variable definitions and summary statistics. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

FOR ONLINE PUBLICATION

A Bank-level Stock Prices Robustness

TABLE A.1 – **Bank Level – Stock Prices – Monetary Shocks – High Frequency – Hedging**

Dependent Variable: % Change in Bank Stock Prices								
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\alpha * ARM_{i,t} * MP_{shock}$	0.011**	0.011**	0.011**	0.011**	0.011***	0.012***	0.012***	0.012***
standard errors	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$$*MPshock_t$	Y	Y	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	N	N	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$$*MPshock_t$	N	N	N	N	Y	Y	Y	Y
FIXED-RATE SWAPS$_{i,t}$$*MPshock_t$	Y	N	N	N	Y	N	N	N
TOTAL SWAPS$_{i,t}$$*MPshock_t$	N	Y	N	N	N	Y	N	N
NET HEDGING$_{i,t}$$*MPshock_t$	N	N	Y	N	N	N	Y	N
GROSS HEDGING$_{i,t}$$*MPshock_t$	N	N	N	Y	N	N	N	Y
Observations	25008	25008	25008	25008	25008	25008	25008	25008
R-squared	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions. The dependent variable the % change in bank stock prices between day $t+1$ and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. The coefficient of interest (α) is the interaction of *MPshock* with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effect of the changes in *MPshock*. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 5. Alternative hedging variables are included interchangeably in all columns along with their *MPshock* interactions. The analysis covers the period of 2003:Q4 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE A.2 – **Bank Level – Stock Prices – Monetary Shocks – High Frequency – Before 2007 and Filtering**

Dependent Variable: % Change in Bank Stock Prices						
	Before 2007			Trimmed Sample		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha * ARM_{i,t} * MPshock_t$	0.011**	0.011**	0.011**	0.017***	0.016**	0.017**
standard errors	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}*MPshock_t$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	Y	Y	N	Y	Y
BANK LIABILITY CONTROLS$_{i,t}*MPshock_t$	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t}$	N	N	Y	N	N	Y
BANK FED FUNDS LIABILITY$_{i,t}*MPshock_t$	N	N	Y	N	N	Y
Observations	7497	7497	7497	14920	14920	14920
R-squared	0.415	0.416	0.416	0.373	0.373	0.373

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions. The dependent variable is the % change in bank stock prices between day $t+1$ and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. The coefficient of interest (α) is the interaction of *MPshock* with the ratio of adjustable-rate mortgages (ARM) to bank assets. It measures how ARM mortgage share changes the effect of the changes in *MPshock*. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits instead of deposits. Fed funds repo liabilities in addition to the bank variables. Columns 1-3 provide results for the period of 2003:Q4 – 2006:Q4, excludes the period after 2007, the housing crises and low-interest rate period. Columns 4-6 represent results for the period of 2003:Q4 – 2013:Q4 with the exclusion of 2007 and 2008, the housing crisis period, and lower and upper deciles of ARM/A. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE A.3 – **Bank Level – Stock Prices – Monetary Shocks – High Frequency – Level Federal Funds Rate**

Dependent Variable: % Change in Bank Stock Prices						
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha * ARM_{i,t} * MPshock_t$	0.016***	0.008*	0.011**	0.011**	0.012***	0.012***
standard errors	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
TIME FIXED EFFECTS	N	N	N	Y	Y	Y
YEAR$*$MONTH FIXED EFFECTS	N	N	Y	-	-	-
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$$*MPshock_t$	N	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	N	N	N	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$$*MPshock_t$	N	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t}$	N	N	N	N	N	Y
BANK FED FUNDS LIABILITY$_{i,t}$$*MPshock_t$	N	N	N	N	N	Y
Observations	25008	25008	25008	25008	25008	25008
R-squared	0.159	0.161	0.317	0.367	0.367	0.367

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions. The dependent variable is the % change in bank stock prices between day $t+1$and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. The coefficient of interest (α) is the interaction of *MPshock* with the ratio of adjustable-rate mortgages (ARM) to bank assets. It measures how ARM mortgage share changes the effect of the changes in *MPshock*. We include the levels of federal funds rate along with all relevant interactions to effectively manage interest rates that can impact lending behavior and the ARM strategy of banks. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls, after Column 5, include saving deposits and time sensitive deposits instead of deposits used in Columns 1-3. Column 6 includes Fed funds repo liabilities in addition to the bank variables used. The analysis covers the period of 2003:Q4 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE A.4 – **Bank Level – Stock Prices – Monetary Shocks – High Frequency – Average ARM**

Dependent Variable: % Change in Bank Stock Prices						
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha * ARM_{i,t} * MPshock_t$	0.015***	0.007^{+}	0.011**	0.013***	0.013***	0.013***
standard errors	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
TIME FIXED EFFECTS	N	N	N	Y	Y	Y
YEAR$*$MONTH FIXED EFFECTS	N	N	Y	-	-	-
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}*MPshock_t$	N	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	N	N	N	Y	Y
BANK LIABILITY CONTROLS$_{i,t}*MPshock_t$	N	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t}$	N	N	N	N	N	Y
BANK FED FUNDS LIABILITY$_{i,t}*MPshock_t$	N	N	N	N	N	Y
Observations	24056	24056	24056	24056	24056	24056
R-squared	0.162	0.164	0.317	0.369	0.369	0.369

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions. The dependent variable is the % change in bank stock prices between day $t+1$ and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. ARM is the average of lagged eight quarter values. The coefficient of interest (α) is the interaction of *MPshock* with the ratio of adjustable-rate mortgages (ARM) to bank assets. It measures how ARM mortgage share changes the effect of the changes in *MPshock*. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls, after Column 5, include saving deposits and time sensitive deposits instead of deposits used in Columns 1-3. Column 6 includes Fed funds repo liabilities in addition to the bank variables used. The analysis covers the period of 2003:Q4 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE A.5 – **Bank Level – Stock Prices – Monetary Shocks – High Frequency – ARM/Real Estate Loans**

Dependent Variable: % Change in Bank Stock Prices						
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\alpha * ARM_{i,t} * MPshock_t$	0.007***	0.007***	0.007***	0.007***	0.007***	0.007***
standard errors	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
TIME FIXED EFFECTS	N	N	N	Y	Y	Y
YEAR$*$MONTH FIXED EFFECTS	N	N	Y	-	-	-
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t}$	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t} * MPshock_t$	N	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t}$	N	N	N	N	Y	Y
BANK LIABILITY CONTROLS$_{i,t} * MPshock_t$	N	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t}$	N	N	N	N	N	Y
BANK FED FUNDS LIABILITY$_{i,t} * MPshock_t$	N	N	N	N	N	Y
Observations	23935	23935	23935	23935	23935	23935
R-squared	0.162	0.164	0.312	0.365	0.365	0.365

Notes: The table reports estimates for the Equation 3 from ordinary least squares regressions. The dependent variable is the % change in bank stock prices between day $t+1$ and $t-1$ where monetary policy shock is realized at time t. Table I contains the definitions of all variables and the summary statistics for each included variable. The main independent variable is the monetary policy shock, *MPshock*, obtained from high-frequency identification around monetary policy events. The coefficient of interest (α) is the interaction of *MPshock* with the ratio of adjustable-rate mortgages (ARM) to bank real estate loans. It measures how ARM mortgage share changes the effect of the changes in *MPshock*. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls, after Column 5, include saving deposits and time sensitive deposits instead of deposits used in Columns 1-3. Column 6 includes Fed funds repo liabilities in addition to the bank variables used. The analysis covers the period of 2003:Q4 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

B Bank-level Lending

TABLE B.1 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Before 2007 and Filtering**

Dependent Variable: % Change in Commercial Loans						
	Sample Before 2007			Trimmed Sample		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	0.198**	0.197**	0.188**	0.149*	0.144*	0.132^{+}
standard errors	(0.082)	(0.081)	(0.081)	(0.09)	(0.089)	(0.09)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}$*$\Delta FFR_{t-k}$)	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	Y	Y	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}*\Delta FFR_{t-k}$)	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	Y	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	Y	N	N	Y
Observations	22634	22634	22634	22615	22615	22615
R-squared	0.117	0.117	0.118	0.134	0.135	0.135

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits instead of deposits. Fed funds repo liabilities in addition to the bank variables. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. Columns 1-3 provide results for the period of 1997:Q1 – 2006:Q4, excludes the period after 2007, the housing crises and low-interest rate period. Columns 4-6 present results for the period of 1997:Q2 – 2013:Q4 with the exclusion of 2007 and 2008, the housing crisis period, and lower and upper deciles of ARM/A. All analysis is done using quarterly data. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%,$^{+}$Significant at 13%.

TABLE B.2 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Alternative Macro Controls**

Dependent Variable: % Change in Commercial Loans						
	MACRO CONTROLS					
	GDP+Inflation			GDP+Inflation+ARM Demand		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.154**	0.157**	0.15**	0.323**	0.329**	0.321**
standard errors	(0.068)	(0.068)	(0.068)	(0.14)	(0.138)	(0.139)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	Y	Y	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	Y	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	Y	N	N	Y
Observations	27825	27825	27825	27825	27825	27825
R-squared	0.116	0.117	0.117	0.117	0.118	0.118

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. The first three columns include inflation and GDP growth as macro controls. Additionally, in the last three columns, we add arm demand along with those macro controls (see the text for details about the "arm demand" measure). Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls (columns 1 and 3) are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (columns 2 and 4) include saving deposits and time sensitive deposits which replace deposits used in the benchmark bank variables. Columns 3 and 6 include Fed funds repo liabilities. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE B.3 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Level Federal Funds Rate**

Dependent Variable: % Change in Commercial Loans					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.16***	0.124*	0.133*	0.134*	0.127*
standard errors	(0.049)	(0.073)	(0.074)	(0.073)	(0.073)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$*MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	N	Y
Observations	27825	27825	27825	27825	27825
R-squared	0.114	0.115	0.118	0.119	0.119

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We include the five quarter average of federal funds rate along with all relevant interactions to effectively manage interest rates that can impact lending behavior and the ARM strategy of banks. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE B.4 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Average ARM**

Dependent Variable: % Change in Commercial Loans					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.149***	0.131**	0.13**	0.136**	0.129**
standard errors	(0.05)	(0.069)	(0.066)	(0.065)	(0.065)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1} *$MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	N	N	Y
Observations	27763	27763	27763	27763	27763
R-squared	0.115	0.116	0.118	0.119	0.119

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. ARM is the average of lagged eight quarter values. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE B.5 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – ARM/Real Estate Loans**

Dependent Variable: % Change in Commercial Loans					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.087***	0.089***	0.078**	0.075**	0.071**
standard errors	(0.026)	(0.033)	(0.032)	(0.032)	(0.032)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$*MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	N	N	Y
Observations	25626	25626	25626	25626	25626
R-squared	0.122	0.123	0.125	0.125	0.126

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank real estate loans. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE B.6 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Small and Large Banks**

Dependent Variable: % Change in Commercial Loans						
	Small Banks			Large Banks		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	0.081*	0.084**	0.081*	0.181*	0.194**	0.188**
standard errors	(0.044)	(0.044)	(0.044)	(0.1)	(0.097)	(0.097)
TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}*$MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	Y	Y	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	Y	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	Y	N	N	Y
Observations	59433	59433	59433	19252	19252	19252
R-squared	0.106	0.106	0.107	0.123	0.124	0.124

Notes: The table reports estimates for the Equation 4 from ordinary least squares regressions. The dependent variable is the % change in commercial loans of banks between t and $t-1$. Table IV contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits instead of deposits. Fed funds repo liabilities in addition to the bank variables. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Columns 1-3 provide results for the banks excluding the first decile of banks. Columns 3-6 represent results for the banks excluding up to the ninth decile of banks. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

C Syndicated-Loan-Level

TABLE C.1 – **Bank Level – Lending – Monetary Shocks – Federal Funds Rate – Before 2007 and Filtering**

Dependent Variable: Log (New Loans) of borrower firm f from bank i						
	Sample Before 2007			Trimmed Sample, Whole Period		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	1.715**	1.773**	1.716**	1.232**	1.476**	1.429**
standard errors	(0.748)	(0.751)	(0.733)	(0.621)	(0.629)	(0.639)
FIRM∗TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$∗MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	Y	Y	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	Y	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}$$*\Delta FFR_{t-k}$)	N	N	Y	N	N	Y
Observations	38308	38308	38308	27635	27635	27635
R-squared	0.772	0.772	0.772	0.821	0.821	0.821

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of total loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We control loan demand using FIRM∗TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits instead of deposits. Fed funds repo liabilities in addition to the bank variables. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Columns 1-3 provide results for the period of 1997:Q1 – 2006:Q4, exclude the period after 2007, the housing crises and low-interest rate period. Columns 4-6 represent results for the period of 1997:Q2 – 2013:Q4 with the exclusions of 2007 and 2008, the housing crisis period, and lower and upper deciles of ARM/A. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE C.2 – **Syndicated Loan Level – Monetary Shocks – Federal Funds Rate – Alternative Macro Controls**

Dependent Variable: Log (New Loans) of borrower firm f from bank i						
	MACRO CONTROLS					
	GDP+Inflation			GDP+Inflation+ARM Demand		
Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	1.263*	1.405*	1.192*	1.665**	1.772**	1.575**
standard errors	(0.693)	(0.769)	(0.668)	(0.761)	(0.813)	(0.712)
FIRM∗TIME FIXED EFFECTS	Y	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	Y	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$∗MACRO CONTROLS$_{i,t-k}$	Y	Y	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	Y	Y	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1} * \Delta FFR_{t-k}$)	N	Y	Y	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	Y	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1} * \Delta FFR_{t-k}$)	N	N	Y	N	N	Y
Observations	47877	47877	47877	47877	47877	47877
R-squared	0.78	0.78	0.78	0.78	0.78	0.78

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of total loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We control loan demand using FIRM∗TIME fixed effects. The first three columns include inflation and GDP growth as macro controls. Additionally, in the last three columns, we add arm demand along with those macro controls (see the text for details about the "arm demand" measure). Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls (columns 1 and 3) are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls (columns 2 and 4) include saving deposits and time sensitive deposits which replace deposits used in the benchmark bank variables. Columns 3 and 6 include Fed funds repo liabilities. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

TABLE C.3 – **Syndicated Loan Level – Monetary Shocks – Federal Funds Rate – Level Federal Funds Rate**

Dependent Variable: Log (New Loans) of borrower firm f from bank i					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.884***	1.493**	0.879*	0.934*	0.749^{+}
standard errors	(0.328)	(0.671)	(0.555)	(0.598)	(0.552)
FIRM∗TIME FIXED EFFECTS	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,\,t\,-\,1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,\,t\,-\,1}$∗$\Delta FFR_{t-k}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,\,t\,-\,k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}$∗MACRO CONTROLS$_{i,\,t\,-\,k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,\,t\,-\,1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,\,t\,-\,1}$∗$\Delta FFR_{t-k}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,\,t\,-\,1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,\,t\,-\,1}$∗ΔFFR_{t-k})	N	N	N	N	Y
Observations	47877	47877	47877	47877	47877
R-squared	0.779	0.78	0.781	0.781	0.781

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of total loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We include the five quarter average of federal funds rate along with all relevant interactions to effectively manage interest rates that can impact lending behavior and the ARM strategy of banks. We control loan demand using FIRM∗TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, *Significant at 10%,$^{+}$Significant at 12%.

TABLE C.4 – **Syndicated Loan Level – Monetary Shocks – Federal Funds Rate – Average ARM**

Dependent Variable: Log (New Loans) of borrower firm f from bank i					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k (ARM_{i,t-1} * \Delta FFR_{t-k})$	0.643*	1.548*	1.192^{+}	1.336^{+}	1.085^{+}
standard errors	(0.371)	(0.958)	(0.856)	(0.925)	(0.817)
FIRM∗TIME FIXED EFFECTS	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,\,t-1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,\,t-1}$$*\Delta FFR_{t-k}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,\,t-k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}*$MACRO CONTROLS$_{i,\,t-k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,\,t-1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,\,t-1}$$*\Delta FFR_{t-k}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,\,t-1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,\,t-1}$$*\Delta FFR_{t-k}$)	N	N	N	N	Y
Observations	47721	47721	47721	47721	47721
R-squared	0.779	0.78	0.78	0.78	0.78

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of total loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. ARM is the average of lagged eight quarter values. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank assets. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We control loan demand using FIRM*TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%,$^{+}$Significant at 18%.

TABLE C.5 – **Syndicated Loan Level – Monetary Shocks – Federal Funds Rate – ARM/Real Estate Loans**

Dependent Variable: Log (New Loans) of borrower firm f from bank i					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
$\sum_{k=0}^{k=4} \alpha_k(ARM_{i,t-1} * \Delta FFR_{t-k})$	0.284*	0.369**	0.555***	0.686***	0.637***
standard errors	(0.161)	(0.175)	(0.204)	(0.232)	(0.229)
FIRM$*$TIME FIXED EFFECTS	Y	Y	Y	Y	Y
BANK FIXED EFFECTS	Y	Y	Y	Y	Y
DEPENDENT VARIABLE LAGS	Y	Y	Y	Y	Y
BANK CONTROLS$_{i,t-1}$	Y	Y	Y	Y	Y
$\sum_{k=0}^{k=4} \gamma_k$(BANK CONTROLS$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	Y	Y	Y
$\sum_{k=0}^{k=4} \varrho_k$MACRO CONTROLS$_{i,t-k}$	-	-	-	-	-
$\sum_{k=0}^{k=4} \mu_k ARM_{i,t-1}*$MACRO CONTROLS$_{i,t-k}$	N	Y	Y	Y	Y
BANK LIABILITY CONTROLS$_{i,t-1}$	N	N	N	Y	Y
$\sum_{k=0}^{k=4} \theta_k$(BANK LIABILITY CONTROLS$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	N	Y	Y
BANK FED FUNDS LIABILITY$_{i,t-1}$	N	N	N	N	Y
$\sum_{k=0}^{k=4} \phi_k$(BANK FED FUNDS LIABILITY$_{i,t-1}*\Delta FFR_{t-k}$)	N	N	N	N	Y
Observations	29387	29387	29387	29387	29387
R-squared	0.814	0.814	0.815	0.815	0.815

Notes: The table reports estimates for the Equation 7 from ordinary least squares regressions. The dependent variable is the logarithm of total loans of borrower f from bank i at quarter t. Table XI contains the definitions of all variables and the summary statistics for each included variable. The monetary policy shock, ΔFFR, is the quarterly change in the effective federal funds rate. The coefficient of interest ($\sum \alpha_k$) is the interaction of ΔFFR with the ratio of ARM to bank real estate loans. It measures how ARM mortgage share changes the effects of the current and past changes in ΔFFR. We control loan demand using FIRM*TIME fixed effects. Control variables and fixed effects are indicated at the bottom of each column. Level of ARM as well as all relevant double interactions are included in the model. Bank controls are equity, liquidity, nonperforming loans ratio, BdF, deposit market HHI, deposits, and AMY. Bank liability controls include saving deposits and time sensitive deposits which replace deposits after Column 4. Column 5 includes Fed funds repo liabilities. Macro controls include inflation, GDP growth, change in the housing price index, and mortgage demand index. The analysis covers the period of 1997:Q2 – 2013:Q4, however, we exclude 2007 and 2008, the housing crisis period. Standard errors are clustered at the bank holding company level. Coefficients are listed in the first row, standard errors are reported in the row below, and the corresponding significance levels are placed adjacently. "Y" indicates set of characteristics or fixed effects. "N" indicates set of characteristics or fixed effects is not included. "-" indicates that the set of characteristics or fixed effects are comprised in the wider included set of fixed effects. *** Significant at 1%, ** Significant at 5%, * Significant at 10%,$^+$Significant at 12%.