Monetary transmission and economic conditions:
How does the strength of the bank credit channel depend on real economic activity?[1]

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Abstract: We use bank level data to study the relationship between the strength of the bank credit channel of monetary policy and the growth rate of real GDP in the United States, between 1986 and 2008. Our findings are threefold. First, we establish that the bank lending channel of monetary policy, which Kashyap and Stein (2000) identified in the total and C&I lending of smaller banks through the mid-1990s, continued to hold in the 2000s – and is also present in residential and consumer lending. Second, we show that the lending of these banks is also subject to the bank balance sheet channel of monetary policy (Bernanke and Gertler, 1995), and we find that this channel is stronger at times of lower economic growth. Third, we show that this bank balance sheet channel holds in estimations where we weight observations by each bank's market share, especially when economic growth is low. This latter finding has substantial policy relevance, as we show that the credit channel also affects banks with the largest market shares in lending.

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1. Introduction

As the Fed continues the removal of policy accommodation in the United States, and monetary policy returns to "conventional", a key question emerges: to what extent will the rise in interest rates impact the U.S. economy through affecting the lending of U.S. banks? Will this lending effect be stronger or weaker, in times of robust economic growth? What are the mechanisms through which U.S monetary policy is transmitted to lending flows? In this paper, we address these questions in detail, and find several policy-relevant results.

First, we find strong evidence that the credit channel (Bernanke and Gertler, 1995) of U.S. monetary policy is operational during the period from 1986 to 2008 – that is, a tightening in U.S. monetary reduces the lending of U.S. commercial banks. On the one hand, this is in part because the bank lending channel of monetary policy: a monetary tightening reduces the availability of funding to smaller banks (Kashyap and Stein, 2000). On the other hand, the monetary effects on lending act through the net worth of banks, the bank balance sheet channel (Bernanke and Gertler 1995) – i.e., because riskier, less capitalized banks, find it increasingly expensive to replenish their liabilities in a higher interest rate environment. These two mechanisms of the bank credit channel cause banks to reduce lending on the asset side of banks' balance sheets. Second, we find that both mechanisms of this bank credit channel are stronger at times of low economic growth – making monetary policy a particularly potent tool when economic conditions are weak.

The extensive literature on the bank credit channel dates back to Bernanke and Gertler (1995), who argued that changes in monetary policy impact the real economy in part by affecting banks' lending decisions. Kashyap and Stein (2000) established empirically the existence of the bank lending channel in the U.S. – the first mechanism through which the credit channel operates: a tightening in monetary policy raises the cost of non-reservable liabilities for banks, and hence

reduces their lending. Kashyap and Stein (2000) also showed that this bank lending channel is the strongest amongst those banks which have the most limited access to non-reservable liabilities: smaller banks, and among those, banks with low securities to assets ratios. Cetorelli and Goldberg (2012) extended the Kashyap and Stein (2000) analysis of the bank lending channel through the 2000s.

The second mechanism under the bank credit channel is the bank balance sheet channel: a tightening in monetary policy makes less capitalized (lower net worth) banks more likely to default, hence they face relatively higher funding costs in bank funding markets, which limits their lending. Temesvary, Ongena and Owen (2017) show some evidence of the existence of this bank balance sheet channel in the U.S. domestic context, and also show the existence of this channel in U.S. banks' cross-border lending, as do Correa et al, 2017.

A key challenge in identifying both mechanisms of the bank credit channel is to disentangle the effect of monetary policy of credit supply from its effects on credit demand (Bernanke and Blinder, 1992). Kashyap and Stein (2000) handle this issue by including controls for macroeconomic developments, while comparing the impact of monetary policy on the lending of smaller banks with lower vs. higher securities ratios. Temesvary, Ongena and Owen (2017) introduce the use of extensive sets of fixed effects in their analysis of the bank credit channel in U.S. banks' domestic and cross-border lending, to fully control for time-varying shocks to the demand for bank credit – while (as Kashyap and Stein, 2000) comparing the impact of monetary policy changes on the lending of more vs. less funding-constrained U.S. banks.

As described, there is strong evidence in the literature that changes in U.S. monetary policy has significant effects on banks' credit supply decisions. Then, a key question arises: to which extent does the strength of this monetary effect depend on external factors that are exogenous to

banks' day-to-day operations and decision-making? As discussed above, Kashyap and Stein (2000) examine the role of *bank size*, and find that the lending channel is the strongest in the lending of smaller U.S. banks, i.e., banks which are more limited in obtaining external funding, all else equal. Cetorelli and Goldberg (2012) study the role of "global reach", i.e., whether U.S. banks that maintain global activities respond differently to changes in U.S. monetary policy. They find that globalness insulates U.S. banks from the lending effects of domestic monetary policy, as they are able to draw on the liquidity of their foreign affiliates as a buffer.

In this paper, we investigate how *economic activity* affects the strength of the bank credit channel of monetary policy. To do so, we proceed in three steps. First, we extend the Kashyap and Stein (2000) analysis up to the global financial crisis and we show that the bank lending channel they identified, continues to hold in the lending of smaller U.S. banks.[4] While Cetorelli and Goldberg (2012) also extended the analysis through the early 2000s, we move beyond their focus in two ways. On the one hand, we contribute by also establishing the existence of the bank lending channel in smaller U.S. banks' *residential* and *consumer* lending, in addition to total and C&I lending, while documenting the absence of the channel in commercial residential lending. On the other hand, we show that the strength of the lending channel is significantly *weaker* when the growth rate of real GDP is higher.

In the second step of our analysis, we establish the presence of the *bank balance sheet channel* of monetary policy using the same sample (total, C&I, residential and consumer lending of smaller U.S. banks from 1986 to 2008). We find strong evidence that the lending of smaller U.S. banks with *lower equity capital ratios* is significantly *more* affected by changes in U.S.

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[4] We define as smaller U.S. banks those which are below the 95th percentile of the cross-sectional distribution of asset size in each period.

monetary policy than the lending of better capitalized U.S. banks. To our knowledge, we are the first to find solid evidence of this channel in the U.S. economy. We also show that the bank balance sheet channel is significantly stronger in times of low economic growth, all else equal.

In the third step of our analysis, we extend the study of the bank balance sheet channel documented in the second step to *all* U.S. banks, including those above the 95th percentile of the cross-sectional distribution of total assets. Weighing each observation by the given bank's market share in each lending segment, we find strong evidence that the bank balance sheet channel indeed affects the lending of all U.S. banks, even when we account for market share. This finding has policy relevance: it allows us to establish the presence of the bank credit channel in the lending of the most relevant banks, i.e., the banks which have the highest lending market shares. As before, these effects are strongest in times of low GDP growth, and are robust to the inclusion of extensive sets of controls and fixed effects to eliminate the confounding effects of changes in banking clients' demand for credit.

In recent years, several new papers have studied the bank credit channel. Interestingly, however, these papers either focused on the strength of domestic monetary transmission in a foreign country (Jimenez et al., 2012; Ioannidou et al., 2015) or examined the strength of the credit channel in an international context (Correa et al., 2015; Correa et al., 2017; Temesvary et al, 2017, among others). Our paper is among the few which have examined the strength of the credit channel in U.S. lending, extending the analyses of the bank lending channel by Kashyap and Stein (2000) and Cetorelli and Goldberg (2012). To our knowledge, we are the first to study the strength of the bank balance sheet channel in domestic lending up to the financial crisis. We also believe we are the first to study the effect of economic activity, i.e., GDP growth, on the strength of the bank credit channel.

The paper proceeds as follows. First, in Section 2 we describe our bank-level data and control variables. Next, we show our estimation methodology in Section 3. We discuss the empirical results in Section 4. We describe some additional specifications in Section 5, and summarize and conclude the analysis in Section 6.

2. Data description

2.1. Lending flows and balance sheet controls

We use bank-level data on U.S. commercial banks from the Federal Reserve's TINY database. This database is the merger-adjusted (confidential) version of the publicly available Call Reports (Reports of Conditions and Income). The dataset we compile from the TINY database contains detailed balance sheet information for all commercial banks in the United States, with quarterly frequency between 1986 and 2008. Detailed definitions of the variables, as well as summary statistics, are provided in Table 1.

Our dependent variables (that is, our measures of lending) are: total, C&I, residential and consumer lending flows. As is standard in the related literature, for each market segment we define lending flows as the quarterly change in the natural logarithm of each bank's stock of loans, multiplied by 100. Our main explanatory variables of interest are measures of the extent to which a bank is affected by changes in monetary policy. First, we use the securities to assets ratio (in accordance with the definition in Kashyap and Stein, 2000) to measure the bank lending channel. Second, we employ the equity capital ratio (as in Temesvary, Ongena and Owen, 2017) to measure the strength of the bank balance sheet channel. In order to control for the effects of changes in banks' balance sheet conditions on credit supply, which are unrelated to changes in monetary

policy, we also include a set of balance sheet controls that include real net income, return on assets, level and growth of real total assets, and the deposits to assets ratio.

2.2. Monetary policy and real economic activity measures

The main macroeconomic variables of interest are: our measure of changes in U.S. monetary policy, and a proxy for real economic activity. For the former, in line with the related literature (Kashyap and Stein, Correa et al, 2015, Temesvary et al, 2017, among others) we employ quarterly changes (expressed as percentage points) in the effective federal funds rate – a measure which was reflective of changes in the stance of U.S. monetary policy during our sample period. In order to proxy real economic activity in the United States, we use quarterly changes in the real U.S. gross domestic product.

2.3. Controls for changes in credit demand

An addition task is to control for macroeconomic changes which may impact banking clients' *demand* for credit in the United States. These effects, which are otherwise unobservable, may confound our identification of the relationship between changes in U.S. monetary policy and banks' credit *supply* decisions. We include several macro controls to minimize this concern: the unemployment rate, a recession dummy, quarterly inflation and real aggregate investment. In addition, we include weighted aggregated controls for credit demand and standards, derived from the Senior Loan Officer Opinion Surveys (SLOOS).

3. Estimation methodology

We employ a continuous diff-in-diff estimation method to identify the bank lending and bank balance sheet channels of monetary policy, which has become standard in the related literature

(see Kashyap and Stein, 2000, and Cetorelli and Goldberg, 2012, among others). We take an important step beyond the estimation methodology of these papers, however, by including extensive sets of fixed effects and measures of credit demand (as described in the previous section) to eliminate non-monetary policy related confounding effects on lending flows. In doing so, we follow the methodology of Temesvary, Ongena and Owen (2017).

Our main specification describes U.S. banks' quarterly lending flows as follows. Let $Y_{j,t}^n$ denote bank j's holdings of loans of type n (where n is one of total, C&I, residential and consumer) at time t. Then $\Delta \ln(Y)_{j,t}^n$ captures the quarterly change (from time t-1 to time t) of the natural logarithm of bank j's stock of loans of type n. Our specification is as follows:

(1) $\Delta \ln(Y)_{j,t}^n = \alpha + \sum_{k=1}^{4}\eta\Delta\ln(Y)_{j,t-k}^n + \sum_{k=1}^{4}\beta_k MP_{t-k}^{us} + \sum_{k=1}^{4}\gamma_k MP_{t-k}^{us}\times C_{j,t-k} + \sum_{k=1}^{4}\delta_k C_{j,t-k} +$

$\sum_{k=1}^{4}\zeta \begin{pmatrix} Bank \\ Controls \end{pmatrix}_{j,t-k} + \left(\sum_{k=1}^{4}\theta_k MP_{t-k}^{us} + \sum_{k=1}^{4}\lambda_k MP_{t-k}^{us}\times C_{j,t-k} + \sum_{k=1}^{4}\pi_k C_{j,t-k}\right)\times \Delta GDP_t +$

$\eta \begin{pmatrix} Demand \\ Controls \end{pmatrix}_{t-1}^n + \varepsilon_{j,t}^n$

In Equation (1), $\Delta \ln(Y)_{j,t}^n$ denotes the quarter-to-quarter lending flow at the bank level as described above. The monetary policy variable *MP* is the quarterly change in the Federal ("Fed") funds rate from time *t-1* to *t*. Furthermore, *C* denotes the bank's securities to assets ratio, later replaced by the equity capital to assets ratio.[5] As in Kashyap and Stein (2000) and Cetorelli and Goldberg (2012), we focus on the cumulative impact of monetary policy changes over the four

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[5] A potential concern is the possible feedback effect that may exist from domestic economic conditions to monetary policy changes. Given our identification strategy we are less concerned about potential domestic macroeconomic feedback effects into monetary policy (Acharya et al, 2016). Indeed, we identify monetary transmission from the *differential* response of funding-constrained versus funding-abundant banks to monetary shocks. Even if macro shocks simultaneously impact all banks' flows through monetary policy, the cross-bank *differences* in the strength of transmission should not be impacted.

preceding quarters.[6] Therefore, four lags of the monetary shock measure, the funding measure, and their interactions are included.[7] Furthermore, ΔGDP_t is the quarterly change (from *t-1* to *t)* in the U.S. real gross domestic product, as described above. The sets of *Bank Controls* and *Demand Controls* contains the control variables described in the previous section. In addition, these vectors also include various combinations of bank and time fixed effects to control for unobservable time-invariant bank-specific, and time-varying shocks, respectively, which may impact lending flows.

In Equation (1), we expect that the direct effect of the U.S. monetary policy shock on bank flows is negative: $\sum_{k=1}^{4}\beta_k < 0$. Our strategy for identifying the bank credit channel of U.S. monetary policy focuses on the sign of the cumulative coefficients on the interaction term of the bank's funding ratio and the U.S. monetary policy shock: $\sum_{k=1}^{4}\gamma_k$. If U.S. banks which are flush with securities or equity capital change their lending flows *less* in response to a U.S. monetary policy shock than banks that have lower securities or equity capital ratios, we expect to find $\sum_{k=1}^{4}\gamma_k > 0$. Lastly, expectations as to the sign of $\sum_{k=1}^{4}\delta_k$ are mixed. In the international context, Temesvary (2014) finds that funding-constrained banks maintain higher (foreign) lending flows, which would imply a negative cumulative coefficient. However, Basset and Berrospide (2017)'s results in the domestic context would suggest a positive cumulative effect.

An important focus of our paper is the role of real economic activity in the strength of the bank credit channel. The bank credit channel of monetary policy rests on frictions in banks' access

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[6] Our use of lagged values of the bank funding ratios ensures that these ratios may at most reflect *past* strategic choices of banks. The inclusion of four lags of the quarterly interest rate changes (which has become standard in the related literature) ensures that we capture the cumulative effect of monetary policy shocks throughout the previous year.

[7] Since a bank can choose its funding ratio strategically, the inclusion of lags of the funding ratio that are in time similar to those of the monetary policy shocks (in their levels and interactions) reduces concerns that the funding ratio may be endogenous to the interest rate changes.

to external funding – either due to inelastic supply of such funding (as in the bank lending channel) or due to agency costs (as in the bank balance sheet channel). We expect both these frictions to be more pronounced when economic (and thus, market funding) conditions are tight, due to subdued economic activity. Therefore, we expect that *the bank credit channel is stronger in times of low economic* growth: $\sum_{k=1}^{4} \theta_k > 0$ and $\sum_{k=1}^{4} \lambda_k < 0$. In other words, we expect that higher GDP growth has an attenuating effect on the strength of the bank credit channel of monetary policy – by reducing the market frictions that the strength of the bank credit channel rests on.

4. Estimation results

In Table 2, we repeat the specifications of Kasyhap and Stein (2000). That is, we examine the strength of the bank lending channel of monetary policy in smaller U.S. banks' lending flows. In these estimations, we move beyond the Kashyap and Stein (2000) analysis by interacting the bank lending channel strength measures with the U.S. real GDP growth rate.

We find strong evidence of the existence of the bank lending channel: In Table 2, the interaction of the securities to assets ratio with the cumulative quarterly changes in the fed funds rate is consistently significant at the 1 percent level, both in total and C&I lending flows. Furthermore, the results also strongly confirm that this monetary transmission effect is particularly potent in times of low economic growth: the coefficients on the double interaction terms are consistently negative and significant. These effects, which are robust to the inclusion of extensive sets of macroeconomic and credit demand controls (Columns 2, 3 6 and 7) as well as time fixed effects (Columns 4 and 8), are somewhat smaller in magnitude in total lending (Columns 1 through 4) than for C&I lending (Columns 5 through 8). Looking at total lending, for instance, as the calculations at the bottom of the table show, in Column 1 the interaction of the securities to assets

ratio with the cumulative monetary policy change is 0.05 when economic growth is low (at the 10th percentile of the distribution of real GDP growth over time, which corresponds to a quarterly growth rate of 0.6 percent) but is infinitesimal when growth is high (at the 90th percentile, or 1.85 percent per quarter). These results are also economically significant. For instance in Column 1, the calculations at the bottom of the table also reveal that in times of low economic growth, a funding constrained bank (at the 10th percentile of the securities to assets distribution, which in our sample is zero) would reduce its total lending flows by 1.94 percentage points *more* in response to a 100 bps tightening in U.S. monetary policy than would a funding abundant bank (at the 90th percentile, which corresponds to a near 28 percent share of securities in total assets). However, the relative magnitudes are much smaller, at 0.17 percentage points, during times of high economic growth. These findings, qualitatively consistent across the specifications, suggest that in total lending the bank lending channel does not operate when GDP growth is high.

Turning to C&I lending flows (Columns 5 through 8), we see that the coefficient estimates are larger. For instance, in Column 5 the interaction of cumulative monetary policy changes with the securities to assets ratio (the simple interaction term) is 0.06 in a low growth environment, but, just as in total lending, is only 0.03 when economic growth is high. Furthermore, the calculations at the bottom of the table also reveal that in response to a 100 bps tightening in the fed funds rate (over four quarters), the lending of a funding constraint bank would respond by 2.32 percentage points more than the lending of a funding abundant bank – when economic growth is low. In a high growth environment, this differential is only 1.18 percentage points.

Next, in Table 3 we repeat the Table 2 estimations, now for residential and consumer lending flows. Again, this is a contribution to the literature as earlier work (Kashyap and Stein, 2000, Cetorelli and Goldberg, 2012) only studied total and C&I lending flows. Importantly, we

find evidence of the bank lending channel of monetary policy both in residential (Columns 1 through 4) and consumer lending (Columns 5 through 8). Looking at residential flows first, the simple and double interaction terms are consistently positive and negative, respectively, and significant at the 1 percent level throughout. For instance, in Column 1 the value of the simple interaction term is 0.06 when evaluated at low economic growth, but is much smaller near zero, when evaluated in a high growth environment (as show in the calculations at the bottom of the table). Furthermore, this same column also reveals that a 100 bps tightening in the fed funds rate over four quarters would reduce the residential lending of a funding constrained bank by 2.43 percentage points more than the lending of a more funding abundant bank, in a low economic growth environment. However, this differential effect is substantially lower, at 0.06 percentage points, in a high growth environment (bottom of Table 3).

Turning to consumer ("other") lending in Columns 5 through 8, the magnitudes of the coefficients of interest are somewhat smaller, but the simple and double interaction coefficients are consistently and significantly positive and negative, respectively, as before. Looking at Column 5, for instance, the simple interaction term is 0.05 in a low growth environment, but infinitesimal in a high growth environment. Accordingly, the calculations at the bottom of the table also reveal that a 100 bps tightening in U.S. monetary policy over four quarters would reduce the consumer lending of a funding constrained U.S. bank by 1.73 percentage points more than the consumer lending flows of a funding abundant bank, in a low growth environment. This differential effect is smaller, at near 0.15 percentage points, in a high growth environment. The results (both in Tables 2 and 3) also reveal that banks with higher securities to assets ratios lend substantially more, all else equal, than their more funding-constrained counterparts.

In Tables 4 and 5, we now turn to studying the strength of the second mechanism of the bank credit channel: the bank balance sheet channel of monetary transmission. Specifically, in Table 4 we repeat the Table 2 specifications, now interacting changes in monetary policy with each bank's equity capital to assets ratio. Thus, this measure of funding constraint replaces the securities to assets ratio (our measure of funding constraint in Table 2).

Columns 1 through 4 in Table 4 confirms the existence of the bank balance sheet channel in U.S. banks' total lending flows – especially in low growth periods. As before, the coefficients on the (simple) interaction of the cumulative fed funds rate changes and the funding ratio (which, in this case, is the equity capital to assets ratio) is consistently positive and significant at the 1 percent level. In addition, the double interaction of this term with the GDP growth rate is negative and significant. For instance, calculations based on the Column 2 coefficients reveal that a 100 bps tightening in the fed funds rate would lower the total lending flows of a bank with median capital ratio by 0.47 percentage points during a period of low growth, but the comparable negative effect in a high growth environment would be a lower reduction by 0.34 percentage points.

As before, the simple interaction term is significantly higher (at 0.09) when evaluated during a period of low growth, than in a high growth period (near zero). The economic effects are significant as well: A 100 bps increase in the fed funds rate would lower the total lending of a low capitalized bank (at the 10th percentile of the equity capital ratio distribution, which corresponds to near 7.38 percent) by 0.51 percentage points more than the lending of a high capitalized bank (at the 90th percentile of the capital ratio distributions, which is near 13.27 percent), in a low growth environment. During times of a high economic growth, however, this differential impact would be significantly smaller, at 0.03 percentage points. Columns 5 through 8 show that these results prevail in C&I lending as well: low capitalized banks respond substantially stronger to changes in

U.S. monetary policy, especially when economic growth is low. For instance, Column 6 reveals that a 100 bps tightening in the fed funds rate would lower the C&I lending growth of a low capitalized bank 0.63 percentage points more than that of a high capitalized bank when economic growth is low – but by much less (0.03 percentage points) when growth is high. Importantly, the specifications throughout Table 4 consistently confirm the findings of Basset and Berrospide (2017): well capitalized banks maintain significantly higher lending growth than low capitalized ones.

In Table 5, we repeat the Table 3 specifications, studying the bank balance sheet channel of monetary policy by using the equity capital to assets ratio as a measure of a bank's funding constraint. We find some evidence that lower capitalized banks' residential lending flows respond stronger to changes in U.S. monetary policy, especially in lower growth periods – the coefficients on the simple and double interaction terms are positive and negative, respectively, and generally significant. In Column 2, for instance, the differential response of a low capitalized bank to a 100 bps tightening in the fed funds rate is 0.36 percentage points greater than that of a low capitalized bank when growth is low, but this differential response is near zero when economic growth is high. There is no evidence of the bank balance sheet channel in consumer lending (Columns 5 through 8 of Table 5). However, the result that better capitalized banks lend significantly more, prevails throughout all specifications in the table.

In Tables 6 and 7, we turn to our weighted estimations: we include *all* U.S. banks (the largest banks as well as the smaller banks we studied thus far) and weigh each bank's lending flows by that bank's market share in the given market segment. Specifically, in Table 6 we study the bank balance sheet channel in the weighted total and C&I lending flows of all U.S. commercial banks. There is evidence of the bank balance sheet channel in the weighted total lending flows

regressions (Columns 1 through 4). The coefficients on the simple interaction term show that in response to a 100 bps increase in the fed funds rate over four quarters, a one percentage point increase in the capital ratio would correspond to a 0.73 to 0.75 percentage points stronger lending response. The double interaction terms reveal that even a 1 percentage point increase in the GDP growth rate would attenuate this differential impact by 0.79 to 0.88 percentage points. These relative magnitudes imply that in the weighted estimations, the bank balance sheet channel of monetary policy transmission is present only in times of very low economic growth – notably, below the 25th percentile of the distribution of economic growth rates over time in our sample. Nonetheless, the economic significance calculations at the bottom of Table 6 reveal that the bank lending channel is indeed quite strong in the lowest-growth periods.

We find even more significant and bigger coefficient estimates in our analysis of weighted C&I lending flows (Columns 5 through 8). The simple interaction coefficient estimates range from 1.10 to 1.25 in magnitude, and the double interaction coefficients are in the 1.12 to 1.26 range – all significant at the 1 percent level. The relative magnitudes of these coefficients suggest that as in the case of total lending flows, the bank balance sheet channel of monetary policy transmission is present in C&I lending flows only in times of low economic growth – as the calculations at the bottom of the table also confirm. Additionally, it is interesting that the strong positive relationship between capitalization and lending growth (which we highlighted in our discussion of the Tables 4 and 5 results) no longer holds in our weighted estimations.

In Table 7, we turn to examining the strength of the bank balance sheet channel in all U.S. banks' weighted residential and consumer lending flows. There is no evidence of the existence of the bank balance sheet channel of monetary policy transmission in residential lending flows (Columns 1 through 4). However, we do find consistent evidence in consumer lending flows

(Columns 5 through 8) – where the coefficients on the interaction terms are large and significant at the 1 percent level throughout. The economic significance of these results is quite large: for instance, calculations based on the coefficient estimates in Column 7 imply that for a bank with the medial capital to assets ratio, a 100 bps increase in the fed funds rate would reduce consumer lending flows by 2.53 percentage points, at the median economic growth rate. The negative and significant coefficients on the double interaction terms suggest that these negative lending effects are significantly larger in periods of low economic growth. Indeed, a 100bps increase in the fed funds rate lowers the lending growth of a low capitalized bank by 4.7 percentage points more than that of a high capitalized bank when economic growth is low – but this differential reverses signs (suggesting the lack of a bank lending channel) when growth is high.

5. Additional specifications

5.1. Post-2007 period

In Table 1A, we repeat the most complete specifications for each loan type from Tables 2 through 7 for the 2008-2016 period, using Krippner (2016)'s shadow short-term interest rate as our measure of the stance of the post-2007 "nonconventional" monetary policy actions (that is, the period during which the effective lower bound was binding). During this period, we do not find consistently significant evidence of the existence of either the bank lending or the bank balance sheet channel of monetary policy transmission. This is an interesting finding in the domestic context, seeing as Morais et al. (2017) and Temesvary et al (2017) found some evidence of the bank credit channel in U.S. banks' lending in foreign countries.

5.2. IV estimations – Using forecast economic growth measures

To alleviate concerns that the potential endogeneity of GDP growth to monetary policy actions may be driving our results, we also repeat our estimations instrumenting actual concurrent GDP growth with one-quarter lagged forecast values. This instrumental variable is, in effect, yesterday's prediction of today's GDP growth rate, and hence is not correlated with realized values of today's macroeconomic indicators.

Table 2A in the Appendix repeats the most complete specifications for each loan type for each of Tables 2 through 7, using the IV formulation. So, for instance, the first column in Table 2A corresponds to the Column 4 specification of Table 2; Column 2 is the Column 8 specification of Table 2, and so on. So in short, we repeat the most complete specification (for each loan type) – including time fixed effects. Our IV results are consistent, in magnitude and significance, with the main findings we describe above. Therefore, we conclude that our main findings are robust to correcting for potential endogeneity bias.

5.3. Bank lending channel in an underperforming economy – When GDP growth is below trend

Table 3A in the Appendix shows the bank lending channel results when the US economy is operating "below trend" – that is, when the output gap (as defined by the Congressional Budget Office, or CBO) is below zero. Table 3A repeats the most complete specification for each loan type, now using only those observations when the economy is "below trend" (CBO GDP gap < 0).

A quick examination of the Table 3A results suggests that the bank lending channel operates stronger when the economy is under-performing. This finding is in line with the literature which shows that the funding cost-alleviating role of banks' net worth is particularly expressed when economic activity is low (Bernanke, Gertler and Gilchrist, 1999).

5.4. Bank lending channel and the business cycle

Motivated by our Table 3A results, in Table 4A we examine the strength of the bank lending channel at various points along the business cycle. We do so by replacing real GDP growth with the CBO output gap in Equation (1). For each loan type, Table 4A repeats the first and third column specifications of Tables 2 and 3. As before, the simple interaction of changes in the Fed funds rate and the securities to assets ratio is positive and significant throughout – showing strong evidence of the bank lending channel.

As the coefficients on the double interaction term show, in line with what the Table 3A results suggest, there is evidence that the bank lending channel is counter-cyclical (as implied by the significant negative coefficients on the double interaction terms in four out of the eight specifications). However, this counter-cyclicality appears to hold for consumer (other) and total lending – and is not significantly present in C&I or residential lending.

5.4. Bank lending channel and the business cycle – Using monetary policy forecast errors

In Table 5A, we re-examine the relationship between the bank lending channel and the business cycle, now using monetary policy forecast errors as out monetary policy measures. Specifically, we repeat the Table 4A specifications (using the CBO's output gap as measures of the business cycle), now also replacing the quarterly change in the Fed funds rate with the Romer and Romer monetary policy forecast residual (as updated by Wieland and Yang, 2015).

The Table 5A results show consistently strong evidence that (1) the bank lending channel operates strongly (as shown by the positive significant coefficients on the simple interaction terms of the securities to assets and monetary policy residual terms, and (2) the bank lending channel is counter-cyclical (that is, particularly strong when economic activity is weak). These findings hold consistently across the various lending types.

6. Conclusion

In this paper, we study the bank credit channel of monetary transmission in U.S. commercial banks' lending flows. First, we establish evidence of the bank lending channel in smaller U.S. banks' various types of lending over the 1986 to 2008 era, and show that this channel is significantly stronger in times of low economic growth. Second, we show that the bank balance sheet channel also exists in these banks' lending flows, and is stronger in a low growth environment, as well. Third, we show strong evidence of the bank balance sheet channel in all U.S. commercial banks' weighted lending flows.

Our findings have direct policy relevance, as the Fed continues to remove policy accommodations, and monetary policy returns to "conventional" – as interest rates move higher above the zero lower bound. In this era, rising interest rates will increasingly activate the bank credit channel, which will likely again become a potent venue through which changes in U.S. monetary policy impacts the real economy. Our estimates, based on historical analysis, may provide some insight into the strength of the bank credit channel in the coming years.

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Table 1: Summary statistics and definitions of model variables

Variables	Units	Definition	[1] mean	[2] sd	[3] min	[4] p25	[5] p50	[6] p75	[7] max	[8] N
Lending flows										
Total	%	Quarterly change in the natural logarithm of each bank's stock of total loans, multiplied by 100	2.088	5.637	-49.75	-0.73	1.845	4.621	49.96	523,517
Commercial & Industrial (C&I)	%	Defined as above, for C&I loans	1.708	12.47	-49.99	-4.638	1.388	8.008	50	512,551
Residential	%	Defined as above, for residential loans	1.869	8.312	-50	-1.841	1.372	5.066	49.98	519,370
Other categories	%	Defined as above, for "other" loans	0.888	9.789	-49.98	-3.629	0.74	5.271	49.98	517,041
Measures of funding constraint										
Leverage ratio	%	Total equity capital divided by total assets, multiplied by 100	9.835	2.344	6.366	8.092	9.244	11.02	18.21	519,323
Securities to assets ratio	%	Total securities holdings divided by total assets, multiplied by 100	12.51	16.21	0	0	4.39	21.36	65.47	523,516
Bank characteristics										
Log of real net income	Integers	Natural logarithm of each bank's net income, deflated using the PCE of 2016 Q3	5.872	1.673	-1.184	5.123	6.04	6.918	11.57	523,517
Return on assets	%	Total income divided by total assets, multiplied by 100	0.686	0.539	-3.434	0.336	0.629	0.992	2.58	523,517
Log of real total assets	Integers	Natural logarithm of each bank's total assets, deflated using the PCE of 2016 Q3	11.11	1.009	7.275	10.4	11.08	11.78	14.12	523,517
Growth of real total assets	%	Quarterly change in the natural logarithm of each bank's real total assets, times 100	1.775	4.713	-11.99	-0.808	1.352	3.789	30.78	523,517
Deposits to assets ratio	%	Total deposits divided by total assets, multiplied by 100	0.857	0.063	0.0391	0.834	0.872	0.897	0.947	523,517
Macro controls										
Unemployment rate	%	Number of unemployed divided by the labor force	5.537	1.011	3.9	4.7	5.5	6.2	7.6	523,517
Recession dummy	0/1	Indicator variable which takes a value of 1 in quarters where the U.S. economy is in a recession as characterized by the NBER, and 0 otherwise	0.0939	0.292	0	0	0	0	1	523,517
Quarterly change in the fed funds rate	%	Quarterly change in the effective federal funds rate	-0.0951	0.503	-1.424	-0.242	-0.013	0.226	0.701	523,517
Quarterly real GDP growth	%	Quarterly change in the natural logarithm of total U.S. GDP, deflated using the PCE of 2016 Q3	1.247	0.587	-1.994	1.017	1.232	1.612	2.436	523,517
Quarterly inflation	%	Quarterly change in the natural logarithm of the U.S. PCE	0.425	0.297	-1.451	0.332	0.431	0.532	1.037	523,517
Log of real investment	Integers	Natural logarithm of total U.S. investment, deflated by the PCE of 2016 Q3	7.309	0.328	6.726	7.039	7.389	7.533	7.797	523,517
Demand and risk controls										
Excess bond premium	%	Excess bond premium (monthly averaged to quarterly)	-0.00618	0.56	-0.832	-0.408	-0.092	0.159	2.528	523,517
SLOOS demand index	Integers	Macro weighted SLOOS variable - demand across all loan categories	-0.0168	0.201	-0.568	-0.139	-0.0371	0.132	0.389	497,328
SLOOS standards index	Integers	Macro weighted SLOOS variable - standards across all loan categories	0.0806	0.219	-0.196	-0.0814	0.0384	0.178	0.873	514,728

Table 2: The impact of changes in U.S. monetary policy on the total and C&I lending of "small" U.S. banks with different securities to assets ratios: 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lending flows:	*Total*	*Total*	*Total*	*Total*	*C&I*	*C&I*	*C&I*	*C&I*
Variables								
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	0.108	0.324	-0.772		1.637	1.014	1.912	
	[0.075]	[0.095]***	[0.160]***		[0.163]***	[0.213]***	[0.379]***	
Quarterly Change in the Fed Funds Rate * GDP Growth {t-1 to t-4}	-0.070	-0.473	0.123		-0.778	-0.491	-1.150	
	[0.055]	[0.064]***	[0.103]		[0.118]***	[0.141]***	[0.242]***	
Quarterly Change in the Fed Funds Rate * Securities to Assets Ratio {t-1 to t-4}	0.074	0.027	0.037	0.023	0.076	0.043	0.021	0.022
	[0.004]***	[0.004]***	[0.005]***	[0.005]***	[0.008]***	[0.009]***	[0.013]	[0.010]**
Quarterly Change in the Fed Funds Rate * Securities to Assets Ratio * GDP Growth {t-1 to t-4}	-0.038	-0.019	-0.018	-0.020	-0.024	-0.014	0.004	-0.009
	[0.003]***	[0.003]***	[0.004]***	[0.003]***	[0.006]***	[0.006]**	[0.010]	[0.007]
Securities to Assets Ratio {t-1 to t-4}	0.024	0.020	0.063	0.029	0.026	0.031	0.049	0.032
	[0.003]***	[0.003]***	[0.005]***	[0.004]***	[0.006]***	[0.007]***	[0.011]***	[0.008]***
Securities to Assets Ratio * GDP Growth {t-1 to t-4}	-0.010	0.012	-0.023	0.008	-0.024	-0.005	-0.023	-0.005
	[0.002]***	[0.002]***	[0.003]***	[0.002]***	[0.004]***	[0.004]	[0.008]	[0.005]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	Yes	n/p	No	Yes	Yes	n/p
Demand Controls	No	No	Yes	n/p	No	No	Yes	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes
R-squared	0.20	0.21	0.22	0.22	0.06	0.06	0.06	0.06
Number of Observations	821,146	821,146	514,365	821,146	743,255	743,255	474,847	743,255

Interaction of changes in the federal funds rate with the securities to assets ratio, cumulative over four quarters, at the 10th percentile of GDP growth

	0.051	0.015	0.027	0.011	0.061	0.035	0.023	0.017

Interaction of changes in the federal funds rate with the securities to assets ratio, cumulative over four quarters, at the 90th percentile of GDP growth

	0.004	-0.009	0.005	-0.015	0.031	0.017	0.028	0.005

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a low growth environment (at the 10th percentile of GDP growth)

	-1.936	-0.579	-1.016		-2.321	-1.315	-0.875	

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a high growth environment (at the 90th percentile of GDP growth)

	-0.168	0.334	-0.183		-1.183	-0.638	-1.044	

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' total and C&I lending, between 1986 and 2008. The dependent variable is the quarterly change in the natural logarithm of each "small" bank's stock of total (Columns 1 through 4) and C&I (Columns 5 through 8) loans, where "small" indicates a bank whose total asset size is below the 95th percentile of the cross-sectional size distribution of all U.S. banks in a given quarter. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Variable definitions and summary statistics are shown in Table 1. Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 3: The impact of changes in U.S. monetary policy on the residential and "other" lending of "small" U.S. banks with different securities to assets ratios: 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lending flows:	*Residential*	*Residential*	*Residential*	*Residential*	*Other*	*Other*	*Other*	*Other*
Variables								
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	-1.293	-0.706	-0.462		1.135	1.235	-1.343	
	[0.114]***	[0.143]***	[0.249]*		[0.129]***	[0.165]***	[0.284]***	
Quarterly Change in the Fed Funds Rate * GDP Growth {t-1 to t-4}	0.548	-0.229	-0.210		-0.199	-0.699	0.971	
	[0.084]***	[0.099]**	[0.163]		[0.094]**	[0.112]***	[0.188]***	
Quarterly Change in the Fed Funds Rate * Securities to Assets Ratio {t-1 to t-4}	0.096	0.065	0.030	0.052	0.066	0.014	0.022	0.011
	[0.005]***	[0.006]***	[0.008]***	[0.006]***	[0.006]***	[0.006]**	[0.009]**	[0.007]
Quarterly Change in the Fed Funds Rate * Securities to Assets Ratio * GDP Growth {t-1 to t-4}	-0.053	-0.041	-0.007	-0.035	-0.034	-0.020	-0.011	-0.013
	[0.003]***	[0.004]***	[0.006]	[0.005]***	[0.004]***	[0.004]***	[0.007]*	[0.005]**
Securities to Assets Ratio {t-1 to t-4}	0.046	0.024	0.064	0.040	0.021	-0.016	0.061	0.020
	[0.004]***	[0.004]***	[0.007]***	[0.005]***	[0.004]***	[0.005]***	[0.007]***	[0.006]***
Securities to Assets Ratio * GDP Growth {t-1 to t-4}	-0.025	-0.006	-0.030	-0.013	-0.002	0.039	-0.022	0.012
	[0.003]***	[0.003]***	[0.005]***	[0.004]***	[0.003]	[0.003]	[0.005]	[0.004]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	Yes	n/p	No	Yes	Yes	n/p
Demand Controls	No	No	Yes	n/p	No	No	Yes	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes
R-squared	0.08	0.08	0.10	0.09	0.12	0.12	0.14	0.13
Number of Observations	781,190	781,190	498,975	781,190	782,348	782,348	490,705	782,348

Interaction of changes in the federal funds rate with the securities to assets ratio, cumulative over four quarters, at the 10th percentile of GDP growth

| | 0.064 | 0.040 | 0.026 | 0.031 | 0.046 | 0.002 | 0.015 | 0.003 |

Interaction of changes in the federal funds rate with the securities to assets ratio, cumulative over four quarters, at the 90th percentile of GDP growth

| | -0.002 | -0.012 | 0.017 | -0.013 | 0.004 | -0.023 | 0.000 | -0.012 |

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a low growth environment (at the 10th percentile of GDP growth)

| | -2.437 | -1.515 | -0.982 | | -1.732 | -0.065 | -0.556 | |

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a high growth environment (at the 90th percentile of GDP growth)

| | 0.061 | 0.428 | -0.636 | | -0.151 | 0.866 | -0.020 | |

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' residential and "other" lending, between 1986 and 2008. The dependent variable is the quarterly change in the natural logarithm of each "small" bank's stock of residential (Columns 1 through 4) and "other" (Columns 5 through 8) loans, where "small" indicates a bank whose total asset size is below the 95th percentile of the cross-sectional size distribution of all U.S. banks in a given quarter. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Variable definitions and summary statistics are shown in Table 1. Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 4: The impact of changes in U.S. monetary policy on the total and C&I lending of "small" U.S. banks with different leverage ratios: 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lending flows:	*Total*	*Total*	*Total*	*Total*	*C&I*	*C&I*	*C&I*	*C&I*
Variables								
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	-0.798	-0.878	-1.552		0.211	0.241	0.791	
	[0.269]***	[0.28]***	[0.307]***		[0.633]	[0.664]	[0.747]	
Quarterly Change in the Fed Funds Rate * GDP Growth {t-1 to t-4}	0.525	0.147	0.471		0.752	0.121	-0.681	
	[0.19]***	[0.195]	[0.228]**		[0.457]*	[0.471]	[0.558]	
Quarterly Change in the Fed Funds Rate * Leverage Ratio {t-1 to t-4}	0.090	0.131	0.092	0.158	0.132	0.162	0.126	0.170
	[0.027]***	[0.027]***	[0.029]***	[0.027]***	[0.064]**	[0.064]**	[0.068]*	[0.064]***
Quarterly Change in the Fed Funds Rate * Leverage Ratio * GDP Growth {t-1 to t-4}	-0.047	-0.074	-0.026	-0.095	-0.085	-0.091	-0.023	-0.095
	[0.019]**	[0.019]***	[0.022]	[0.019]***	[0.046]*	[0.046]*	[0.053]	[0.047]**
Leverage Ratio {t-1 to t-4}	0.188	0.152	0.144	0.142	0.282	0.243	0.215	0.208
	[0.023]***	[0.024]***	[0.025]***	[0.024]***	[0.053]***	[0.054]***	[0.057]***	[0.054]***
Leverage Ratio * GDP Growth {t-1 to t-4}	-0.033	-0.034	-0.026	-0.030	-0.097	-0.105	-0.089	-0.087
	[0.017]**	[0.017]**	[0.017]	[0.017]*	[0.038]**	[0.038]***	[0.040]**	[0.038]**
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	Yes	n/p	No	Yes	Yes	n/p
Demand Controls	No	No	Yes	n/p	No	No	Yes	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes
R-squared	0.20	0.21	0.21	0.21	0.06	0.06	0.06	0.06
Number of Observations	523,517	523,517	462,745	523,517	482,104	482,104	428,706	482,104
Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth								
	0.062	0.087	0.076	0.101	0.081	0.108	0.112	0.113
Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth								
	0.004	-0.005	0.043	-0.017	-0.024	-0.005	0.084	-0.005
Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a low growth environment (at the 10th percentile of GDP growth)								
	-0.363	-0.511	-0.448		-0.477	-0.634	-0.662	
Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a high growth environment (at the 90th percentile of GDP growth)								
	-0.023	0.028	-0.255		0.144	0.029	-0.496	

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' total and C&I lending, between 1986 and 2008. The dependent variable is the quarterly change in the natural logarithm of each "small" bank's stock of total (Columns 1 through 4) and C&I (Columns 5 through 8) loans, where "small" indicates a bank whose total asset size is below the 95th percentile of the cross-sectional size distribution of all U.S. banks in a given quarte. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Variable definitions and summary statistics are shown in Table 1. Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 5: The impact of changes in U.S. monetary policy on the residential and "other" lending of "small" U.S. banks with different leverage ratios: 1986-2008

Lending flows: Variables	[1] Residential	[2] Residential	[3] Residential	[4] Residential	[5] Other	[6] Other	[7] Other	[8] Other
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	-1.106	-0.081	-0.772		0.863	-0.123	-1.687	
	[0.399]***	[0.415]	[0.471]		[0.473]*	[0.497]	[0.557]***	
Quarterly Change in the Fed Funds Rate * GDP Growth {t-1 to t-4}	0.653	-0.431	-0.060		0.042	-0.155	1.000	
	[0.293]**	[0.301]	[0.354]		[0.336]	[0.348]	[0.415]**	
Quarterly Change in the Fed Funds Rate * Leverage Ratio {t-1 to t-4}	0.061	0.091	0.043	0.099	-0.008	0.035	0.007	0.061
	[0.040]	[0.040]**	[0.043]	[0.040]**	[0.046]	[0.046]	[0.050]	[0.046]
Quarterly Change in the Fed Funds Rate * Leverage Ratio * GDP Growth {t-1 to t-4}	-0.045	-0.050	0.000	-0.056	0.007	-0.013	0.015	-0.040
	[0.029]	[0.029]*	[0.033]	[0.029]*	[0.033]	[0.033]	[0.039]	[0.033]
Leverage Ratio {t-1 to t-4}	0.128	0.169	0.164	0.133	0.162	0.149	0.124	0.116
	[0.035]***	[0.035]***	[0.037]***	[0.035]***	[0.038]***	[0.038]***	[0.041]***	[0.038]***
Leverage Ratio * GDP Growth {t-1 to t-4}	-0.016	-0.049	-0.042	-0.030	-0.041	-0.051	-0.034	-0.035
	[0.025]	[0.025]**	[0.026]	[0.025]	[0.02]	[0.027]**	[0.029]	[0.027]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	Yes	n/p	No	Yes	Yes	n/p
Demand Controls	No	No	Yes	n/p	No	No	Yes	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes
R-squared	0.08	0.09	0.09	0.09	0.14	0.14	0.15	0.15
Number of Observations	507,201	507,201	449,701	507,201	502,124	502,124	443,744	502,124

Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth

	0.034	0.061	0.043	0.066	-0.004	0.027	0.015	0.037

Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth

	-0.021	-0.001	0.043	-0.003	0.004	0.011	0.034	-0.012

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a low growth environment (at the 10th percentile of GDP growth)

	-0.201	-0.358	-0.254		0.024	-0.158	-0.091	

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a high growth environment (at the 90th percentile of GDP growth)

	0.125	0.003	-0.252		-0.024	-0.066	-0.200	

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' residential and "other" lending, between 1986 and 2008. The dependent variable is the quarterly change in the natural logarithm of each "small" bank's stock of residential (Columns 1 through 4) and "other" (Columns 5 through 8) loans, where "small" indicates a bank whose total asset size is below the 95th percentile of the cross-sectional size distribution of all U.S. banks in a given quarter. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Variable definitions and summary statistics are shown in Table 1. Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 6:

Weighted regressions: The impact of changes in U.S. monetary policy on the total and C&I lending of U.S. banks with different leverage ratios: 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lending flows:	*Total*	*Total*	*Total*	*Total*	*C&I*	*C&I*	*C&I*	*C&I*
Variables								
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	-5.385	-2.990	-3.844		-8.346	-7.541	-8.205	
	[3.046]*	[2.937]	[3.347]		[3.015]***	[2.893]***	[3.563]**	
Quarterly Change in the Fed Funds Rate * GDP Growth {t-1 to t-4}	6.246	3.872	4.280		9.784	7.460	8.021	
	[2.502]**	[2.397]	[3.033]		[2.975]***	[2.948]**	[3.672]**	
Quarterly Change in the Fed Funds Rate * Leverage Ratio {t-1 to t-4}	0.750	0.735	0.782	0.729	1.129	1.100	1.250	1.107
	[0.339]**	[0.332]**	[0.345]**	[0.329]**	[0.325]***	[0.284]***	[0.300]***	[0.288]***
Quarterly Change in the Fed Funds Rate * Leverage Ratio * GDP Growth {t-1 to t-4}	-0.789	-0.809	-0.884	-0.815	-1.130	-1.134	-1.261	-1.121
	[0.303]***	[0.292]***	[0.316]***	[0.295]***	[0.304]***	[0.287]***	[0.328]***	[0.274]***
Leverage Ratio {t-1 to t-4}	-0.013	-0.188	-0.185	-0.171	0.078	-0.139	-0.127	-0.136
	[0.391]	[0.394]	[0.412]	[0.388]	[0.474]	[0.395]	[0.409]	[0.371]
Leverage Ratio * GDP Growth {t-1 to t-4}	0.143	0.178	0.188	0.166	-0.261	-0.184	-0.207	-0.207
	[0.329]	[0.323]	[0.332]	[0.316]	[0.353]	[0.295]	[0.306]	[0.278]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	Yes	n/p	No	Yes	Yes	n/p
Demand Controls	No	No	Yes	n/p	No	No	Yes	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes
R-squared	0.14	0.16	0.17	0.17	0.15	0.17	0.18	0.18
Number of Observations	544,999	544,999	482,503	544,999	499,935	499,935	445,365	499,935
Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth								
	0.277	0.250	0.252	0.240	0.451	0.420	0.493	0.434
Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth								
	-0.702	-0.754	-0.845	-0.771	-0.950	-0.987	-1.070	-0.956
Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a low growth environment (at the 10th percentile of GDP growth)								
	-1.629	-1.470	-1.482		-2.656	-2.471	-2.906	
Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a high growth environment (at the 90th percentile of GDP growth)								
	4.133	4.438	4.974		5.597	5.811	6.304	

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' total and C&I lending, between 1986 and 2008. The dependent variable is the quarterly change in the natural logarithm of each bank's stock of total (Columns 1 through 4) and C&I (Columns 5 through 8) loans. Each observation is weighted by the given bank's share in the total market segment. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Variable definitions and summary statistics are shown in Table 1. Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 7:

Weighted regressions: The impact of changes in U.S. monetary policy on the residential and "other" lending of U.S. banks with different leverage ratios: 1986-

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lending flows:	Residential	Residential	Residential	Residential	Other	Other	Other	Other
Variables								
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	7.409	13.950	12.390		-11.110	-9.056	-10.650	
	[4.198]*	[6.356]**	[7.310]*		[4.202]***	[3.879]**	[4.436]**	
Quarterly Change in the Fed Funds Rate * GDP Growth {t-1 to t-4}	-2.770	-6.674	-6.999		7.919	5.516	6.546	
	[3.159]	[4.838]	[6.647]		[3.384]**	[3.139]*	[3.817]*	
Quarterly Change in the Fed Funds Rate * Leverage Ratio {t-1 to t-4}	-0.885	-1.015	-0.841	-0.740	1.618	1.579	1.550	1.423
	[0.407]**	[0.554]*	[0.540]	[0.456]	[0.477]***	[0.463]***	[0.487]***	[0.460]***
Quarterly Change in the Fed Funds Rate * Leverage Ratio * GDP Growth {t-1 to t-4}	0.345	0.329	0.148	0.146	-1.222	-1.216	-1.253	-1.125
	[0.315]	[0.385]	[0.416]	[0.325]	[0.409]***	[0.392]***	[0.412]***	[0.400]***
Leverage Ratio {t-1 to t-4}	-1.047	-1.451	-1.405	-1.273	0.218	0.103	0.049	0.057
	[0.552]*	[0.735]**	[0.759]*	[0.600]**	[0.496]	[0.493]	[0.532]	[0.517]
Leverage Ratio * GDP Growth {t-1 to t-4}	1.140	1.331	1.320	1.174	-0.111	-0.113	-0.0694	-0.06
	[0.417]***	[0.535]**	[0.541]**	[0.420]***	[0.396]	[0.386]	[0.403]	[0.396]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	Yes	n/p	No	Yes	Yes	n/p
Demand Controls	No	No	Yes	n/p	No	No	Yes	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	No	No	No	Yes
R-squared	0.18	0.20	0.21	0.22	0.16	0.17	0.18	0.19
Number of Observations	525,036	525,036	466,233	525,036	521,044	521,044	461,089	521,044

Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth

	-0.678	-0.818	-0.752	-0.652	0.885	0.849	0.798	0.748

Interaction of changes in the federal funds rate with the leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth

	-0.250	-0.410	-0.569	-0.471	-0.630	-0.658	-0.756	-0.647

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a low growth environment (at the 10th percentile of GDP growth)

	3.993	4.816	4.430		-5.211	-5.003	-4.701	

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low leverage ratio (at the 10th percentile) vs a bank with a high leverage ratio (at the 90th percentile), in a high growth environment (at the 90th percentile of GDP growth)

	1.474	2.413	3.350		3.714	3.878	4.450	

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' residential and "other" lending, between 1986 and 2008. The dependent variable is the quarterly change in the natural logarithm of each bank's stock of residential (Columns 1 through 4) and "other" (Columns 5 through 8) loans. Each observation is weighted by the given bank's share in the total market segment. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Variable definitions and summary statistics are shown in Table 1. Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Appendix tables

Table 1A: Post-2007: The impact of changes in U.S. monetary policy on the lending of U.S. banks with different securities to assets or leverage ratios: 2008-2016

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Lending flows:	Total	C&I	Residential	Other	Total	C&I	Residential	Other	Total	C&I	Residential	Other
Ratio Variables	Securities to Assets	Securities to Assets	Securities to Assets	Securities to Assets	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
Quarterly Change in the Short-term Shadow Rate * Ratio {t-1 to t-4}	0.003	-0.014	-0.003	0.013	0.031	0.033	0.017	0.084	-0.075	-0.062	-0.193	-0.085
	[0.00855]	[0.0118]	[0.0104]	[0.00911]	[0.0227]	[0.0396]	[0.0487]	[0.0471]*	[0.174]	[0.282]	[0.521]	[0.459]
Quarterly Change in the Short-term Shadow Rate * Ratio * GDP Growth {t-1 to t-4}	-0.003	-0.003	-0.012	-0.009	-0.027	-0.091	-0.059	-0.153	0.223	0.084	0.505	-0.005
	[0.00906]	[0.0126]	[0.00754]	[0.0106]	[0.0259]	[0.0367]**	[0.0487]	[0.0718]**	[0.177]	[0.222]	[0.452]	[0.433]
Ratio {t-1 to t-4}	0.038	0.031	0.023	0.035	0.268	0.400	0.215	0.179	0.116	0.218	0.013	-0.079
	[0.00613]***	[0.014]**	[0.00783]***	[0.0112]***	[0.0263]***	[0.0493]***	[0.0352]***	[0.0608]***	[0.139]	[0.193]	[0.296]	[0.233]
Ratio * GDP Growth {t-1 to t-4}	-0.004	0.004	0.001	-0.008	-0.022	-0.028	0.011	-0.048	-0.001	-0.174	-0.063	-0.027
	[0.00378]	[0.00742]	[0.00423]	[0.00517]	[0.0107]**	[0.0254]	[0.0217]	[0.0195]**	[0.1]	[0.158]	[0.218]	[0.244]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
Demand Controls	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.27	0.09	0.14	0.18	0.26	0.09	0.13	0.18	0.26	0.23	0.27	0.27
Number of Observations	177,257	167,032	173,327	164,002	160,753	152,098	157,447	149,946	168,637	159,278	163,921	156,370
Interaction of changes in the short-term shadow interest rate with the securities to assets or leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth												
	0.001	-0.016	-0.010	0.007	0.015	-0.021	-0.019	-0.008	0.058	-0.012	0.110	-0.088
Interaction of changes in the short-term shadow interest rate with the securities to assets or leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth												
	-0.002	-0.020	-0.024	-0.004	-0.019	-0.134	-0.093	-0.197	0.335	0.092	0.736	-0.095

(that is, including bank and time fixed effects as well as bank balance sheet controls) from Tables 2 through 7. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 2A: IV specifications: The impact of changes in U.S. monetary policy on the lending of "small" U.S. banks with different securities to assets or leverage ratios: 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Lending flows:	Total	C&I	Residential	Other	Total	C&I	Residential	Other	Total	C&I	Residential	Other
Ratio Variables	Securities to Assets	Securities to Assets	Securities to Assets	Securities to Assets	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
Quarterly Change in the Fed Funds Rate * Ratio {t-1 to t-4}	0.054 [0.007]***	-0.023 [0.013]*	0.067 [0.008]***	0.058 [0.010]***	0.097 [0.034]***	-0.056 [0.082]	-0.020 [0.051]	-0.023 [0.060]	0.040 [0.129]	0.075 [0.187]	-0.508 [0.463]	0.244 [0.396]
Quarterly Change in the Fed Funds Rate * Ratio * GDP Growth {t-1 to t-4}	-0.036 [0.005]***	0.015 [0.012]	-0.064 [0.008]***	-0.046 [0.007]***	-0.370 [0.050]***	-0.111 [0.066]*	-0.266 [0.070]***	-0.278 [0.077]***	-0.137 [0.0875]	-0.118 [0.158]	-0.008 [0.164]	-0.377 [0.282]
Ratio {t-1 to t-4}	0.659 [0.055]***	-0.023 [0.065]	-0.131 [0.035]***	0.078 [0.005]***	0.202 [0.010]***		-0.677 [0.215]***	1.758 [0.257]***	5.068 [2.508]**	1.103 [2.048]	23.130 [13.65]*	-3.438 [3.545]
Ratio * GDP Growth {t-1 to t-4}	-0.020 [0.002]***	0.021 [0.004]***	-0.012 [0.003]***	-0.032 [0.004]***		0.216 [0.023]***	0.159 [0.015]***	0.275 [0.017]***	0.037 [0.036]	-0.017 [0.039]	-0.137 [0.085]	0.130 [0.076]*
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
Demand Controls	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.11	0.02	0.03	0.07	0.12	0.01	0.03	0.09				
Number of Observations	683,444	623,647	658,065	651,691	523,517	482,104	507,201	502,124	544,780	499,678	524,808	520,790

Interaction of changes in the federal funds rate with the securities to assets or leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth

	0.032	-0.013	0.028	0.031	-0.125	-0.123	-0.180	-0.190	-0.042	0.004	-0.513	0.018

Interaction of changes in the federal funds rate with the securities to assets or leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth

	-0.013	0.006	-0.052	-0.027	-0.584	-0.260	-0.510	-0.534	-0.212	-0.143	-0.523	-0.450

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' lending to various market segments, between 1986 and 2008. Each column represents the most complete specification for each loan type (that is, including bank and time fixed effects as well as bank balance sheet controls) from Tables 2 through 7. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 3A: The impact of changes in U.S. monetary policy on the lending of U.S. banks with different securities to assets or leverage ratios when GDP is "below trend": 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Lending flows:	Total	C&I	Residential	Other	Total	C&I	Residential	Other	Total	C&I	Residential	Other
Ratio Variables	Securities to Assets	Securities to Assets	Securities to Assets	Securities to Assets	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage	Leverage
Quarterly Change in the Fed Funds Rate * Ratio {t-1 to t-4}	0.030	0.030	0.053	0.023	0.199	0.215	0.115	0.118	0.434	1.189	-0.591	0.681
	[0.00496]***	[0.0109]***	[0.00684]***	[0.00776]***	[0.0299]***	[0.0718]***	[0.0441]***	[0.0515]**	[0.369]	[0.396]***	[0.335]*	[0.46]
Quarterly Change in the Fed Funds Rate * Ratio * GDP Growth {t-1 to t-4}	-0.027	-0.014	-0.033	-0.023	-0.115	-0.121	-0.057	-0.066	-0.538	-0.983	0.245	-0.416
	[0.00363]***	[0.00776]*	[0.00496]***	[0.00568]***	[0.0213]***	[0.0523]**	[0.0331]*	[0.0372]*	[0.231]**	[0.286]***	[0.24]	[0.392]
Ratio {t-1 to t-4}	0.028	0.038	0.045	0.019	0.167	0.204	0.113	0.154	-0.236	-0.002	-0.820	0.135
	[0.0039]***	[0.00849]***	[0.0058]***	[0.0061]***	[0.0277]***	[0.0637]***	[0.0415]***	[0.0443]***	[0.498]	[0.357]	[0.45]*	[0.532]
Ratio * GDP Growth {t-1 to t-4}	0.014	-0.006	-0.012	0.017	-0.049	-0.083	-0.016	-0.070	0.241	-0.339	0.942	-0.0791
	[0.00271]***	[0.00585]	[0.00402]***	[0.00429]***	[0.0202]**	[0.0466]*	[0.0301]	[0.033]**	[0.428]	[0.271]	[0.365]***	[0.426]
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
Demand Controls	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p	n/p
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.22	0.07	0.09	0.14	0.22	0.07	0.10	0.16	0.19	0.20	0.26	0.22
Number of Observations	627,260	564,790	593,918	597,611	380,295	348,236	367,727	364,776	395,600	360,763	380,413	378,355

Interaction of changes in the federal funds rate with the securities to assets or leverage ratio, cumulative over four quarters, at the 10th percentile of GDP growth

	0.014	0.022	0.033	0.009	0.130	0.142	0.081	0.078	0.111	0.599	-0.444	0.431

Interaction of changes in the federal funds rate with the securities to assets or leverage ratio, cumulative over four quarters, at the 90th percentile of GDP growth

	-0.019	0.004	-0.008	-0.019	-0.013	-0.008	0.010	-0.004	-0.556	-0.620	-0.140	-0.084

Note: The table above shows the impact of U.S. monetary policy on U.S. banks' lending to various market segments, between 1986 and 2008, when the output gap is negative (that is, the economy is operating below the CBO's long-term output growth trend). Each column represents the most complete specification for each loan type (that is, including bank and time fixed effects as well as bank balance sheet controls) from Tables 2 through 7. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 4A: The impact of changes in U.S. monetary policy on the lending of "small" U.S. banks with different securities to assets ratios: 1986-2008

Lending flows: Variables	[1] Total	[2] Total	[3] C&I	[4] C&I	[5] Residential	[6] Residential	[7] Other	[8] Other
Quarterly Change in the Fed Funds Rate {t-1 to t-4}	-0.460	0.039	-0.362	-0.939	-0.981	0.293	0.283	2.121
	[0.0446]***	[0.119]	[0.0947]***	[0.266]***	[0.0649]***	[0.174]*	[0.0756]***	[0.204]***
Quarterly Change in the Fed Funds Rate * GDP Gap {t-1 to t-4}	-0.315	0.142	-0.593	-1.339	-0.211	0.430	-0.340	1.091
	[0.0273]***	[0.0642]**	[0.06]***	[0.147]***	[0.0416]***	[0.0967]***	[0.047]***	[0.114]***
Quarterly Change in the Fed Funds Rate * Securities to Assets Ratio {t-1 to t-4}	0.015	0.013	0.038	0.021	0.019	0.021	0.019	0.017
	[0.00191]***	[0.00398]***	[0.00436]***	[0.00925]**	[0.0027]***	[0.00539]***	[0.00297]***	[0.00603]***
Quarterly Change in the Fed Funds Rate * Securities to Assets Ratio * GDP Gap {t-1 to t-4}	-0.005	-0.008	0.000	-0.001	-0.001	-0.001	-0.006	-0.007
	[0.00111]***	[0.00234]***	[0.00251]	[0.00535]	[0.0016]	[0.00329]	[0.00174]***	[0.00353]*
Securities to Assets Ratio {t-1 to t-4}	0.004	0.030	-0.022	0.013	0.007	0.019	0.006	0.021
	[0.000879]***	[0.00168]***	[0.00197]***	[0.00376]***	[0.00135]***	[0.00247]***	[0.00133]***	[0.00253]***
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	No	Yes	No	Yes	No	Yes
Demand Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No	No	No
R-squared	0.20	0.22	0.06	0.06	0.08	0.10	0.12	0.14
Number of Observations	821,146	514,365	743,255	474,847	781,190	498,975	782,348	490,705

Marginal effect of a 100bps change in the federal funds rate over four quarters, for a bank with the median securities to assets ratio, at the 50th percentile of GDP Gap

	-0.145	-0.103	0.231	0.400	-0.770	-0.137	0.623	1.030

Marginal effect of a 100bps change in the federal funds rate over four quarters, for a bank with the median securities to assets ratio, in a low GDP gap (at the 10th percentile)

	0.507	-0.397	1.459	3.172	-0.333	-1.027	1.327	-1.228

Marginal effect of a 100bps change in the federal funds rate over four quarters, for a bank with the median securities to assets ratio, in a high GDP gap (at the 90th percentile)

	-0.696	0.146	-0.807	-1.943	-1.139	0.616	0.028	2.939

Interaction of changes in the federal funds rate with the securities to assets ratio, cumulative over four quarters, at the 10th percentile of GDP Gap

	0.031	0.038	0.037	0.023	0.023	0.023	0.037	0.038

Interaction of changes in the federal funds rate with the securities to assets ratio, cumulative over four quarters, at the 90th percentile of GDP Gap

	0.011	0.006	0.038	0.020	0.018	0.021	0.015	0.012

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a low GDP gap environment (at the 10th percentile of GDP Gap)

	-0.509	-0.615	-0.599	-0.381	-0.366	-0.380	-0.593	-0.620

Difference in marginal effect of a 100bps change in the federal funds rate over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a high GDP gap environment (at the 90th percentile of GDP Gap)

	-0.178	-0.104	-0.622	-0.329	-0.288	-0.335	-0.244	-0.193

Note: The table above shows the impact of U.S. monetary policy on "small" U.S. banks' lending to various market segments, between 1986 and 2008, where "small" indicates a bank whose total asset size is below the 95th percentile of the cross-sectional size distribution of all U.S. banks in a given quarter. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.

Table 5A: The impact of changes in U.S. monetary policy on the lending of "small" U.S. banks with different securities to assets ratios: 1986-2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lending flows:	Total	Total	C&I	C&I	Residential	Residential	Other	Other
Variables								
Romer and Romer Residual {t-1 to t-4}	-0.299	-1.840	-0.459	-1.616	-0.609	-1.951	0.422	-0.782
	[0.0607]***	[0.13]***	[0.133]***	[0.301]***	[0.09]***	[0.197]***	[0.106]***	[0.223]***
Romer and Romer Residual * GDP Gap {t-1 to t-4}	0.266	-0.074	-0.627	-2.165	0.096	0.409	-0.461	0.987
	[0.0494]***	[0.0929]	[0.108]***	[0.214]***	[0.0738]	[0.139]***	[0.0841]***	[0.162]***
Romer and Romer Residual * Securities to Assets Ratio {t-1 to t-4}	0.005	0.023	0.037	0.027	0.006	0.032	0.014	0.025
	[0.00372]	[0.00539]***	[0.00872]***	[0.0126]**	[0.00531]	[0.00762]***	[0.00581]**	[0.00776]***
Romer and Romer Residual * Securities to Assets Ratio * GDP Gap {t-1 to t-4}	-0.038	-0.009	-0.014	0.003	-0.024	-0.001	-0.022	-0.007
	[0.00274]***	[0.00379]**	[0.00643]**	[0.00914]	[0.00389]***	[0.00548]	[0.00418]***	[0.00546]
Securities to Assets Ratio {t-1 to t-4}	0.007	0.029	-0.015	0.013	0.007	0.020	0.011	0.022
	[0.00087]***	[0.00163]***	[0.00193]***	[0.00369]***	[0.00136]***	[0.00243]***	[0.00129]***	[0.00244]***
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	No	Yes	No	Yes	No	Yes	No	Yes
Demand Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No	No	No
R-squared	0.20	0.23	0.06	0.06	0.08	0.10	0.12	0.15
Number of Observations	801,708	494,927	725,451	457,043	762,592	480,377	764,554	472,911
Marginal effect of a 100bps change in the Romer and Romer Residual over four quarters, for a bank with median securities to assets ratio, at the 50th percentile of GDP								
	-0.565	-1.766	0.168	0.549	-0.705	-2.360	0.883	-1.769
Marginal effect of a 100bps change in the Romer and Romer Residual over four quarters, for a bank with the median securities to assets ratio, in a low GDP gap								
	-1.116	-1.612	1.466	5.031	-0.903	-3.207	1.837	-3.812
Marginal effect of a 100bps change in the Romer and Romer Residual over four quarters, for a bank with the median securities to assets ratio, in a high GDP gap								
	-0.100	-1.896	-0.929	-3.240	-0.537	-1.644	0.076	-0.042
Interaction of changes in the Romer and Romer Residual with the securities to assets ratio, cumulative over four quarters, at the 10th percentile of GDP Gap								
	0.121	0.052	0.078	0.019	0.078	0.035	0.081	0.045
Interaction of changes in the Romer and Romer Residual with the securities to assets ratio, cumulative over four quarters, at the 90th percentile of GDP Gap								
	-0.024	0.016	0.026	0.029	-0.012	0.031	-0.002	0.020
Difference in marginal effect of a 100bps change in the Romer and Romer Residual over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a low GDP gap environment (at the 10th percentile of GDP Gap)								
	-1.957	-0.846	-1.270	-0.302	-1.269	-0.562	-1.312	-0.734
Difference in marginal effect of a 100bps change in the Romer and Romer Residual over four quarter, for a bank with a low securities to assets ratio (at the 10th percentile) vs a bank with a high securities to assets ratio (at the 90th percentile), in a high GDP gap environment (at the 90th percentile of GDP Gap)								
	0.383	-0.261	-0.428	-0.473	0.193	-0.504	0.038	-0.321

Note: The table above shows the impact of U.S. monetary policy on "small" U.S. banks' lending to various market segments, between 1986 and 2008, where "small" indicates a bank whose total asset size is below the 95th percentile of the cross-sectional size distribution of all U.S. banks in a given quarter. The coefficient show the cumulative effect (over the preceding four quarters) of a one unit change in the explanatory variable (as listed in the leftmost column) on percentage point changes in lending flows (as indicated at the top of each column). Standard errors, clustered at the bank level, are shown below the coefficients. Stars indicate the significance of the coefficients: *** p<0.01, ** p<0.05, * p<0.1.