Bank risk and lending supply during conventional and unconventional monetary policies

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Abstract

This paper examines the effect of bank risk on the transmission mechanism of monetary policy for a sample of 149 US banks over the period from 2007 to 2016. Using quarterly balance sheet data and employing a GMM approach to deal with endogeneity concerns, we document that bank risk positions are relevant for the transmission mechanism through the bank lending channel during the FED Quantitative easing (QE) programmes. We conclude that QE programs helped banks to supply new loans through the reduction of bank risk conditions, as perceived by financial market investors. These results are relevant for the way monetary policy was conducted in response to the financial crisis, since QE programmes were effective in reducing the heterogeneous transmission of the monetary policy in the US.

Keywords: Banks, risk, lending, monetary policy, quantitative easing,
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1. Introduction

This paper explores the importance of bank risk conditions in the transmission mechanism of monetary policy during conventional and unconventional monetary policy interventions for a panel of 149 US banks over the period from 2007 to 2016.

Traditional conceptualization of the bank lending channel (Bernanke and Blinder, 1988; Kashyap and Stein, 1995) are based on the ability of central banks to directly manipulate the level of deposits through their control of bank reserves and the money multiplier mechanism. The underlying mechanism is the following: monetary policy tightening causes a fall in deposit that forces banks to substitute deposits with more expensive forms of market funding, with the result of contracting loan supply. The examination of the traditional framework suggests that bank access and cost of market based funding sources is not relevant for the transmission mechanism.

However, financial innovation and the higher reliance of banks to wholesale funding sources have increased the importance of banks' access to external financing in the functioning of the bank lending channel. Financial system changes have led to a new theoretical framework (Bernanke, 2007; Disyatat, 2011) in which the bank lending channel works primary through the impact of monetary policy on banks' external finance premium as determined by their balance sheet strength. The main hypothesis of the new theoretical framework is that monetary tightening leads to a rise in the price of funding liquidity, which constrains lending activities. Banks' cost of funds is sensitive to their underlying financial health, thus riskier or banks in poorer conditions have to pay a risk premium on their uninsured deposits. The risk premium constraints banks' access on external financing and ultimately limit asset expansion and loan growth.

The financial crisis has made very clear that the perception of risk by financial markets is crucial to banks' capability to raise new funds. Following, the eruption of the crisis only banks with strong capital positions and higher reliance on stable funding sources were able to sustain their lending activities (Cornett et al., 2011), while liquidity dried for banks with a higher proportion of market based funding sources. The liquidity constraints, the inability to access to new freshly funding sources due to the higher balance sheet risks and the exceptional monetary policy interventions have made relevant the investigation on how investors' perception of bank risks influence the effectiveness of unconventional monetary policy interventions.

The importance of bank risk positions on the transmission mechanism in an environment with conventional monetary policy interventions is investigated in Altunbas et al. (2010), for a sample of EU banks. In this paper, we take a step further, analysing the effect of unconventional monetary policy that are likely to change the relationship. Unconventional monetary policy interventions in response to the crisis, may have drastically reduced the importance of bank risk in the provision of new loans. QE programs helped banks to restore their lending activities by influencing both the supply and demand side of loans. On the supply side, QE reduces financing costs for banks through lower depository rates and higher value of assets on the balance sheet. While on the demand-side, it increases consumer demand through a wealth effect due to improvement in asset prices. In respect to this, the observation of the effect of QE programs on bank balance sheets give rise to the following research questions: Did QE helps riskier banks to reduce funding constraints and ultimately sustain their lending activities?

This paper is related to a growing literature on the impact of unconventional monetary policy on bank lending behaviour. Previous works have shown that the Fed QE programs led to higher loan growth (Chakraborty et al., 2016) and risk taking within banks' loan portfolio

(Kandrac and Schluche, 2016). Our work takes a different perspective, as it sheds light on the effect of bank risks on the transmission mechanism of QE programs. Specifically, we investigate if QE programs alleviates funding constrains of risky banks and ultimately support the production of new loans for those banks. To perform the analysis, we use a dataset of US bank balance sheet items and banks' risk positions over the period 2007 to 2016 at quarterly frequencies. The estimation is performed using a similar approach of Altunbas et al. (2010). To tackle endogeneity problems from the interactions between bank risk and monetary policy, we adopt a GMM system with robust standard errors as suggested by Blundell and Bond (1998).

We achieve two main results that demonstrate the effects of the QE programs on lending. First, we show that bank risk positions matter for the supply of new loans. Then, we demonstrate that riskier banks have benefited more of the QE programs to support their lending activities. However, unconventional monetary policy actions have also a negative effect on bank profitability. Since QE reduces long-term yields, lending to deposit interest rate spreads fall making harder for banks generate interest income on new loans. This negative effect may hamper the effectiveness of the interventions. We also control for this effect, finding that the results remain virtually unchanged. In particular, bank's risk positions, together with the monetary policy interactions remain unchanged. Basically, we do not find evidence of a net interest income channel at work that could reduce the effectiveness of unconventional monetary policy interventions in US.

The remainder of this paper is organised as follows. The next section discusses the literature. Section 3 and 4 describes the data and the methodology, respectively. Section 5 and 6 presents the empirical results and robustness checks. The last section summarises the main conclusions.

2. Literature Review

In this section, we discuss some recent contributions on the effects of quantitative easing QE on the transmission mechanism of monetary policy in the US and the heterogeneity in the transmission owing to bank characteristics.

Most of the literature on the transmission mechanism of monetary policy through the bank lending channel focuses on environments with positive policy rates and standard monetary policy interventions. After the massive FED and ECB interventions in response of the global financial crisis, the literature has started to study the effect of large scale asset purchases from different perspective. Morais et al. (2017) provide evidence of credit supply spillovers from US and European banks to Mexico after Quantitative Easing (QE) interventions, while Di Maggio et al. (2017) looks at the re-financing and consumption choices. Kandrac and Schulsche (2016) assess the effect of QE on lending and risk-taking. The authors find that QE leads to higher loan growths and more risk taking within loan portfolios. Darmouni and Rodnyansky (2017) show that banks with a large fraction of Mortgage Back Securities on their balance sheet expand lending more aggressively after QE1 and QE3 interventions.

A large number of studies have analysed the response of lending to shifts in monetary policy, depending on bank-specific characteristics. A tightening in monetary policy causes a drop-in deposit (Drechsler et al., 2017, Choi and Choi, 2017), that forces banks to rely on other external funding sources. Raising external debt financing is difficult for banks with weak balance sheets, so their lending is more sensitive to monetary shocks. In this regard, bank balance sheet is measured in terms of capital, funding composition, liquidity, size and credit risk.

Bank equity capital plays part in the provision of new loans, owing to the existence of regulatory capital constraints and imperfect competition in the market for bank-fund raising. The recent empirical literature (Carlson et al., 2013; Gambacorta and Mistrulli, 2004;

Osborne et al., 2016) shows a cyclical relationship between bank capital and lending, i.e. the relationship is stronger during periods of credit contraction and weaker during credit expansion. One of the possible explanations relates to the cyclical mechanisms on bank decision making that have emerged since the financial crisis. As risk measures tend to vary procyclically (Borio and Zhu, 2012), bank willingness to accept risk exposure increases during periods of rapid expansion and decreases during credit contractions. Therefore, banks during the pre-crisis period, operated with low levels of capital and accepted relatively high portfolio risks. Then, during the financial crisis the same banks needed to reduce leverage and portfolio risk. Moreover, Carlson et al. (2013) also show that the elasticity of bank lending with respect to capital ratios is higher for banks with capital ratios near the minimum regulatory requirements, suggesting a nonlinear effect of capital ratios on bank lending. Further, funding composition plays a role on the provision of loans. There is a closer connection between the conditions in the financial markets and banks' ability to raise funds from wholesale funding sources. Consequently, the reliance on those funding sources makes banks' incentive and ability to lend sensitive to investors' perceptions and overall financial market conditions. This means that the transmission of monetary policy depends on the funding composition of the banking sector. Ivashina and Scharfstein (2010) and Cornett et al. (2011) demonstrate that banks cut less lending during the global financial crisis if they were less dependent on short-term debt.

In addition to funding composition, exposures on off-balance sheet loan commitments plays a role in the provisioning on new loans. According to Kashyap et al. (2002) demand deposits and loan commitments offer to bank customers a similar service: liquidity on demand to accommodate unpredictable needs. Indeed, in a loan commitment, the borrower has the option to take the loan on demand over some specified period of time; therefore, loan commitments can turn to loans at any time when the borrower chooses to withdraw funds.

Berger and Bouwman (2009) finds that half of the liquidity creation at commercial banks occurs through committed credit lines. Thus, banks should consider loan commitments in their liquidity risk practices and their management should impact the production of new loans. Moreover, monetary policy effects are different under a commitment relative to loans not made under a commitment. Morgan (1998) note that bank loans not made under a commitment slow after monetary policy tightening, while loans under commitment accelerate or remain unchanged.

Bank size also matters. Size proxies for a few sources of heterogeneity in the banking sector. The perception of bank credit risk depends on the size of the bank. Market participants perceive systemic banks as too-big-to fail and thus less risky than the smaller counterparts. Moreover, larger banks have an easier access to alternative funding sources to finance their lending activities, thus are less sensitive to monetary policy changes.

Finally, Altunbas et al. (2010) suggests that bank risk conditions need to be considered among the other balance sheet indicators. According to the authors, banks with lower default probabilities are better able to protect their loan supply activity from monetary policies and external shocks.

3. Empirical model

To test the hypotheses, we propose the following dynamic model:

$$\Delta Loans_{i,t} = \alpha \Delta Loans_{i,t-1} + \beta X_{i,t-1} + \gamma Fed\ Funds_{t-1} * X_{i,t-1} + SSR_{t-1} * X_{i,t-1} + T_t^1 + \varepsilon_{i,t} \quad (1)$$

The dependent variable $\Delta Loans$ measures the growth rate in loan supply for bank i in quarter t relative to quarter $t-1$ scaled by total assets. The vector $X_{i,t-1}$ represent the (lagged) five bank specific variables that I identify in the discussion of the literature: (1) capital, (2) deposit funding, (3) loan commitments, (4) asset size, (5) bank risk position. The first four bank specific variables are expressed in the following way: capital is the fraction of shareholders' funds to total assets, deposit funding is the ratio of total costumers' deposits over total assets and assets size is the logarithm of total assets.

The fifth bank-specific variable is the bank risk position, identified with two risk variables: the loan loss provision as a percentage of total assets (LLP) and the Bloomberg credit risk measure. The LLP is a standard ex-post accounting measure of credit risk (Altunbas et al., 2010). The second variable is the Bloomberg 1-year ahead expected default probability, which is a forward-looking indicator of credit risk computed by Bloomberg professional service using financial and market data. The methodology used by Bloomberg to estimate the 1-year ahead expected default probability is an improvement of the Merton distance to default model[1]. The bank specific covariates are interacted with both the conventional ($Fed\,Funds_{t-1}$) and the unconventional (SSR_{t-1}) monetary policy indicators. The interactions coefficients capture the effect of monetary policy changes in the supply of credit.

Finally, the specification also includes time fixed effects T_t^1 to control for loan demand shifts.

The analysis performed in this paper can be affected by endogeneity issues. Monetary policy affects credit supply of banks, but the situation of the banking sector can influence monetary policy as well. Moreover, monetary policy affects banks' funding composition as well. A central bank increase in interest rates causes a drop on deposits (Drechsler et al., 2017; Choi and Choi, 2017), that causes a substitution of deposits with wholesale funding sources. To deal with endogeneity concerns, we adopt the one step system GMM with robust standard errors (Blundell and Bond, 1998). In the estimation, we use the second and third lags

[1] For further methodological details see Bloomberg Credit Risk DRSK white paper on the Bloomberg professional service terminal.

of interaction variables as instruments in the level equation and the second and third lags of the bank-specific covariates as instruments in the difference equation.

4. Data

The data used in this paper is from Bloomberg professional service. We first select all active banks headquartered in the United States. There were 1040 individual banks active in 2016Q3. We exclude all foreign-controlled banks and banks not subject to the Trouble Asset Relief Program (TARP), which leaves a sample of 251 banks. Further, we exclude banks with no balance sheet data for at least 4 years. The final sample consist of 149 individual banks.

We collect detailed financial information for all banks in the final sample at quarterly frequencies for the period 2007Q1 – 2016Q4. In particular, we collect balance sheet information on bank assets, deposits, capital and off-balance sheet loan commitments. We start from 2007 because default probabilities started to rise between 2007Q3 and 2009Q3 with the eruption of the global financial crisis. The period of analysis contains the three QE programs conducted by the Fed. More precisely, the timeline of the unconventional monetary policy interventions is the following. In November 2008, the Fed started the first QE program with securities purchases beginning in the following month. By the end of the first quarter of 2010 the first QE program had concluded, however weaknesses of the U.S. economy continued to persist. In response to them the Fed Open Market Committee (FOMC) announced another large-scale asset purchase program on November, 3, 2010. In September 2012 FOMC meeting announced a third QE program that ultimately ends in October 2014.

To measure conventional monetary policy actions, we use the official Fed funds target rate as in Choi and Choi, (2017) and Drechsler et al. (2015) among others. The Fed funds target rate set by the Federal Open Market Committee is, on my opinion, a better measure of the stance of conventional monetary policy than the three-months Libor rate, used in Borio and Gambacorta (2017); because the latter is also influenced by developments in liquidity risk in the interbank market. For unconventional monetary policy, we use the shadow short rate as developed in Krippner (2013a; 2013b). The shadow short rate reflects the effects that unconventional monetary policy actions have on the term structure of interest rates (Pericoli and Taboga, 2015). Using the shadow short rate instead of the central bank's balance sheet volume, as a proxy for measuring the effect of unconventional monetary policy actions, as the advantage of evaluating the different impact of different unconventional policy actions on the term structure of interest rates. However, the estimation of the shadow short rate is particularly difficult and have been so far only estimated with approximate methods. In this paper, we use the methodology developed in Krippner (2013a; 2013b) and we estimate the shadow short rate with MatLab code provided by the author.

[Insert table 1 about here]

5. Results

Table (3) presents the main results of the paper. The equations have been estimated using the GMM estimator. The results of the estimations passed both the AR (2) and the Sargan test. This confirms, respectively, that there is no second-order serial correlation in the first-difference residuals and that the instruments are valid.

Column 1 reports the estimates of the baseline regression (1). Column 2 shows the estimates of the baseline model, with a triple interaction to analyse the incremental effect of bank risk position for riskier banks on the supply of new loans. Column 3 reports the estimates of the baseline model in column 1 with an additional interaction to control for the procyclicality of the risk measures.

The coefficients of the bank specific covariates demonstrate that the riskiness of the bank portfolio has a negative effect on the ability of banks to provide lending. Other things being equal, higher loan-loss provision (LLP) reduces profits and capital, thus the variable have a negative effect on lending supply. A similar and higher effect is detected for the Bloomberg default risk variable. The results suggest that bank risk position matter for the supply of new loans. As indicated, Bloomberg default risk is a forward-looking measure of credit risk that includes market perceptions of banks' credit risk. In this respect, there is evidence that investors are sensible to credit risk, thus a higher Bloomberg default risk limits the ability of banks to rise external funds. As a result, for riskier banks it would be difficult to raise public equity or debt in capital markets. In this respect, the empirical evidence shows that US investors in bank's debt are sensitive to bank risk (Flannery, 1998; Goyal, 2005). More precisely, the sensitivity is analysed for subordinated debt instruments and the results suggests that it would be difficult for riskier banks issue uninsured debt to finance their lending activities.

Moving to the other bank specific covariates and their interactions. we observe a statistically negative effect for commitment credit lines, reflective of the takedown demand of funds that move from off-balance to on-balance sheet accounts. This negative sign indicates that banks more exposed to pre-existing commitments tend to drop total credit production for liquidity risk management purposes. However, the coefficients of the interactions between commitment credit lines and both the conventional and unconventional monetary policy indicators are not statistically significant.

As expected, the interaction terms of capital, deposits and size with the fed fund rates have positive signs. In line with the bank lending channel literature, well capitalized banks with stable funding sources are better able to offset conventional monetary policy changes (Gambacorta and Mistrulli, 2004; Cornett et al., 2011; Ivashina and Scharfstein, 2010). The interactions of capital and size with unconventional monetary policy measures (SSR) have the negative expected sign, while for deposits the coefficient is not significant. The results are consistent with my expectations: also during unconventional monetary policy tools strong capitalized banks are better able to expand their lending activities.

We also analyse the effect of monetary policy on lending relative to the overall level of bank's risk. The interactions between the Bloomberg credit risk and the Fed funds rates indicates that the transmission of conventional monetary policy is not sensitive to banks' risk position. The result is in contrast with the findings of Altunbas et al. (2010), who find that the transmission mechanism is less effective for riskier European banks. For the transmission mechanism under unconventional monetary policy, we find, as expected, a statistically significant negative sign of the interaction between the Bloomberg credit risk indicator and the shadow short rate. The sign of the coefficient suggests that the transmission of unconventional monetary policy measures is more effective for riskier banks. Thus, riskier banks have benefited more of the quantitative easing programs to support their lending activities.

We confirm this result in column 2 with two triple interaction terms: $Bloomberg\ Default\ risk_{t-1} * Fed\ funds * high\ yield$ to measure the sensitivity of lending supply to conventional monetary policy changes of non-investment grade banks, and $Bloomberg\ Default\ risk_{t-1} * SSR * high\ yield$ to measure the sensitivity of lending supply to unconventional monetary policy changes of non-investment grade banks. The coefficient $high\ yield$ is a dummy variable which takes value one for banks classified non-investment grade in the Bloomberg credit risk measure[2]. The sign of the coefficient of the first triple interaction remains statistically insignificant, while the coefficient of the second is positive and statistically significant. The magnitude and the significance of the latter

[2] The Bloomberg credit risk measure is a transformation of the Bloomberg one year ahead default probabilities on a rating scale. Non-investment grade banks are those with a default probability higher than 0.5200%.

coefficient further proofs our assertion that riskier banks have benefited more of the quantitative easing programs to support their lending activities.

The effect of bank risk on lending may be different over the business cycle due to the diverse market perception of risk. Moreover, the loan loss provision could be used as a discretionary tool to smooth earnings over time (Cornett et al., 2009). Therefore, we introduced two additional interaction terms in column 3. Firstly, we interact the growth rate in nominal GDP with the Bloomberg default risk measure and the loan loss provision. The idea is the following: if the market perception of risk is lower during expansionary phase of the cycle and vice versa during downturns as suggested in Borio et al. (2001), the coefficient of the interaction term would be negative. For the second interaction, we expect that banks that set aside provision during expansionary periods, are better able to absorb losses and thus they can continue their lending activity. The results displayed in column 2 of Table (3) indicate that the interaction term of the loan loss provision with the business cycle indicator is positive and statistically significant, while the interaction of the Bloomberg default risk measure with the business cycle indicator is negative and not statistically significant. Other coefficients remain roughly unchanged. The positive sign of the interaction, suggests that banks that set aside provision in positive states of the economy, would been in a better position to absorb portfolio losses during downturns and continue their lending activities.

[Insert table 2 about here]

6. Controlling for the existence of a "net interest income channel"

Conventional monetary policy changes (i.e. reduction in interest rates) are typically associated with an increase of the yield curve and an increase in net interest income, which amplifies the transmission mechanism. On the contrary, unconventional monetary policy measures entail a flattening of the yield curve, which erodes future profitability and impairs the effectiveness of monetary policy measures on banks; especially those more exposed on loan activities. To this issue, Borio and Gambacorta (2017) indicate that monetary policy is less effective in a low interest rate environment, owing to a different behaviour of capital-constrained banks and heterogeneity in bank risk. Given the effect of unconventional monetary policy on net interest income, we assume that the net interest income channel could shape the relationship between lending supply and bank risk. If this assumption is true, we would expect a reduction of the significance and the magnitude of the coefficients measuring bank risk position when testing for the net interest income channel.

To test the net interest income channel, we modify equation (1) in the following way:

$$\Delta Loans_{i,t} = \alpha \Delta Loans_{i,t-1} + \beta X_{i,t-1} + \gamma Fed\ Funds_{t-1} * X_{i,t-1} + SSR_{t-1} * X_{i,t-1} + Nii_{i,t-1} + Nii_{i,t-1} * Fed\ Funds_{t-1} + Nii_{i,t-1} * SSR_{t-1} + T_t^1 + \varepsilon_{i,t} \quad (2)$$

Where: Nii is the ratio of net interest income to total assets, which measures the contribution of the net interest income to the formation of the return on assets. $Nii_{i,t-1} * Fed\ Funds_{t-1}$ and $Nii_{i,t-1} * SSR_{t-1}$ are the interaction of the net interest income with the Fed funds and the shadow short rate, respectively.

The results of the estimation are shown in table (3). For equation 2, we use the same estimation procedure of equation 1. More specifically, we rely on the same lags for instruments in the level and in the difference equation.

[Insert Table 3 around here]

We find that the estimated coefficients remain virtually unchanged. In particular, bank risk position variables together with the monetary policy interactions remain roughly unchanged.

This result suggest that the net interest income channel do not shape the relationship between credit supply and bank risk during both conventional and unconventional monetary policy changes. For the interactions of the net interest income over total assets (Nii) with the fed funds rates and the shadow short rates, we do not find a statistically significant sign relationship. The result is in contrast with the empirical findings of Albertazzi et al. (2016) for European banks and Borio and Gambacorta (2017) for a sample of international banks.

Part of this could be explained by the reduction of borrowing costs that boosted the net interest margin.

7. Conclusions

The higher reliance on alternative funding sources have make banks more sensible on market perception of credit risk. The increase of investors' perception of bank's risks has severely hit banks with larger shares of market base funding on their balance sheets. In response to these weaknesses in the banking sector and with the aim of restoring liquidity and reducing market uncertainty, central banks around the world started large asset purchase programs. The unconventional monetary policy interventions helped banks to access to external funds through the reduction of market risk premia of uninsured deposit funding.

In this paper, we analyse how bank risk positions influences bank credit supply following unconventional monetary policy interventions. Using a sample of US banks over the period 2007 to 2016, we find that bank risk plays an important role in the transmission mechanism of QE programs. In particular, we demonstrate that riskier banks have benefited more of the QE programs to support their lending activities. To further refine our results, we control for the "net interest income channel", finding no major differences.

Our results provide important policy implications. Firstly, we show that the impact of monetary policy actions can be both amplified or attenuated by changes in the health of the banking sector. Thus, central bank's monetary policy actions can have a different impact on the real economy depending on the perceived and real financial sector balance sheet strength. Secondly, the results suggest that, especially during stress periods, a close coordination between central bank monetary policy and supervisory activity is required with the aim of increasing the effectiveness of the transmission mechanism through the bank lending channel.

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Table 1
Variables definition and summary statistics.
This table provides the definition and summary statistics of the variables used in the regression. The sample consist of 149 banks corresponding to 3373 observations during the 2007-2016 period.

Variable	Definition	Mean	Standard Deviation	Min	Max
Loans to Total Assets	Net loans divided to total assets	0.690	0.105	0.153	0.
Commitment credit lines	The ratio of loans under commitment to total assets	0.358	0.271		
Capital	Total Shareholders' Funds divided by total assets	0.071	0.033	0.014	0.168
Size	Natural logarithm of total assets	3.485	0.826	1.746	6.997
Deposits	Total customers' deposits divided by total funding	0.878	0.087	0.382	
Bloomberg Default Risk	Bloomberg 1-year ahead default frequencies	0.422	0.265	0.111	0.987
LLP	The ratio of loan loss provision over total assets	0.003	0.003		
Fed funds		0.008	0.015	0.0012	0.052
SSR	The shadow short rate	-0.953	2.443	-4.12	5.04
GDP	The level of GDP growth	1.37	2.57	-8.2	5
Unemployment	The level of unemployment	6.995	1.837	4.5	9.93
Nii	The ratio of net interest income over total income				

Table 2
Regression results.
This table shows the Blundell and Bond (1998) estimation results of equation 1, for a sample of 149 over the 2007-2016 period. P-values based on robust standard errors are shown in brackets. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)
$\Delta Loans_{t-1}$	0.092**	0.061	0.093**
	(2.07)	(1.40)	(2.09)
Bank characteristics			
$Commitment\ credit\ lines_{t-1}$	-0.084**	-0.069*	-0.084*
	(-2.04)	(-1.69)	(-2.02)
$Capital_{t-1}$	0.007	0.011	0.008
	(0.13)	(0.22)	(0.17)
$Size_{t-1}$	-0.054**	-0.043*	-0.55**
	(-2.05)	(-1.69)	(-2.07)
$Deposits_{t-1}$	-0.281	-0.165	-0.28
	(-0.97)	(-0.58)	(-0.96)
$Bloomberg\ Default\ risk_{t-1}$	-0.023***	-0.019***	-0.023***
	(-4.97)	(-5.71)	(-4.90)
LLP_{t-1}	-0.067***	-0.069***	-0.067***
	(-2.65)	(-2.34)	(-2.65)
Interactions			
$Commitment\ credit\ lines_{t-1} * Fed\ Funds$	-0.655	-0.51	-0.644
	(-0.13)	(-1.07)	(-0.13)
$Capital_{t-1} * Fed\ Funds$	0.078**	0.071**	0.076**
	(1.93)	(1.85)	(1.87)
$Deposits_{t-1} * Fed\ funds$	0.660***	0.355*	0.665***
	(2.60)	(1.69)	(2.62)
$Size_{t-1} * Fed\ funds$	0.077***	0.049**	0.077***
	(3.26)	(2.21)	(3.30)
$Bloomberg\ Default\ risk_{t-1} * Fed\ funds$	-0.772		-0.687
	(-0.84)		(-0.75)
$Commitment\ credit\ lines_{t-1} * SSR$	-0.005	0.003	-0.005
	(-0.32)	(0.14)	(-0.30)
$Capital_{t-1} * SSR$	-0.034**	-0.037**	-0.034**
	(-1.88)	(-1.94)	(-1.90)
$Deposits_{t-1} * SSR$	-0.025	-0.046	-0.028
	(-0.19)	(-0.34)	(-0.21)

$Size_{t-1} * SSR$	-0.017*	-0.020*	-0.018*
	(-1.65)	(-1.83)	(-1.56)
$Bloomberg\ Default\ risk_{t-1} * SSR$	0.003**		0.004**
	(2.02)		(2.05)
$Bloomberg\ Default\ risk_{t-1} * Fed\ funds * high\ yield$		-0.244	
		(-0.65)	
$Bloomberg\ Default\ risk_{t-1} * SSR * high\ yield$		0.003**	
		(2.40)	
$\Delta GDP * Bloomberg\ Default\ risk_{t-1}$			-0.006
			(-0.61)
$\Delta GDP * LLP_{t-1}$			0.014*
			(1.78)
Time Dummies	YES	YES	YES
AR (1)	0.000	0.000	0.000
AR (2)	0.198	0.336	0.181
Sargan Test	0.559	0.093	0.585
N. of observations	3373	3373	3373

Table 3
Regression results of the "net interest income channel".
This table shows the Blundell and Bond (1998) estimation results of equation 2, for a sample of 149 over the 2007-2016 period. P-values based on robust standard errors are shown in brackets. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)
$\Delta Loans_{t-1}$	0.091**	0.090**	0.098**
	(2.08)	(2.07)	(2.40)
Bank characteristics			
$Commitment\ credit\ lines_{t-1}$	-0.078**	-0.081**	-0.075**
	(-1.94)	(-2.01)	(-1.89)
$Capital_{t-1}$	-2.369	-2.436	-2.957
	(-1.24)	(-1.28)	(-1.30)
$Size_{t-1}$	-0.048**	-0.048*	-0.053***
	(-1.88)	(-1.85)	(-2.10)
$Deposits_{t-1}$	-0.217	-0.217	-0.270
	(-0.78)	(-0.76)	(-1.03)
$Bloomberg\ Default\ risk_{t-1}$	-0.22***	-0.022***	-0.216***
	(-5.08)	(-4.81)	(-5.33)
LLP_{t-1}	-0.076***	-0.076***	-0.073***
	(-3.11)	(-3.01)	(-2.94)
Interactions			
$Commitment\ credit\ lines_{t-1} * Fed\ Funds$	-0.55	-0.392	-1.00
	(-0.12)	(-0.08)	(-0.23)
$Capital_{t-1} * Fed\ Funds$	0.099**	0.092**	0.078*
	(2.06)	(1.91)	(1.59)
$Deposits_{t-1} * Fed\ funds$	0.61**	0.615**	0.592***
	(2.47)	(2.49)	(2.72)
$Size_{t-1} * Fed\ funds$	0.073***	0.076***	0.071***
	(3.12)	(3.21)	(3.52)
$Bloomberg\ Default\ risk_{t-1} * Fed\ funds$	-0.859		-0.430
	(-0.99)		(0.55)
$Commitment\ credit\ lines_{t-1} * SSR$	-0.009	-0.009	-0.009
	(-0.54)	(-0.57)	(-0.59)
$Capital_{t-1} * SSR$	-0.069***	-0.068***	-0.064***
	(-3.26)	(-3.19)	(-3.23)
$Deposits_{t-1} * SSR$	-0.016	-0.018	-0.069
	(-0.13)	(-0.14)	(-0.59)

$Size_{t-1} * SSR$	-0.016*	-0.016	-0.021**
	(-1.50)	(-1.47)	(-1.92)
$Bloomberg\ Default\ risk_{t-1} * SSR$	0.004**		0.004***
	(2.30)		(2.40)
$Bloomberg\ Default\ risk_{t-1} * Fed\ funds * high\ yield$		-0.556	
		(-1.01)	
$Bloomberg\ Default\ risk_{t-1} * SSR * high\ yield$		0.003**	
		(2.22)	
Net interest income Channel			
Nii	2.365	2.433	2.945
	(1.23)	(1.28)	(1.30)
$Nii * Fed\ funds$	-2.640	-2.427	1.243
	(-0.65)	(-0.59)	(0.91)
$Nii * SSR$	0.35	0.036	0.213
	(1.38)	(1.41)	(0.59)
$Nii * Fed\ funds * Capital_{t-1}$			-0.124
			(-1.15)
$Nii * SSR * Capital_{t-1}$			0.006
			(0.24)
$Constant$	0.200	-2.885**	-2.459**
	(0.47)	(-2.80)	(-2.64)
Time Dummies	YES	YES	YES
AR (1)	0.000	0.000	0.000
AR (2)	0.183	0.165	0.136
Sargan Test	0.472	0.484	0.720
N. of observations	3373	3373	3373