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***Ali Awdeh* [*], *Zouhour Jomaa* [**] *and Mohamad Kassem* [***]**

[*] *Lebanese University, Beirut, Lebanon*

E-mail: ali.awdeh@ul.edu.lb

[**] *American University of Beirut, Beirut, Lebanon*

E-mail: zhj04@mail.aub.edu

[***] *Lebanese International University, Beirut, Lebanon*

E-mail: mohammad.kassem@liu.edu.lb

The Effect of Bank Heterogeneity on the Interest Rate Channel in Lebanon

Abstract: The effect of bank heterogeneity on the transmission of monetary policy is capturing an increasing attention, and the debate on how bank specific characteristics may determine their reaction to monetary actions is mounting. This paper participates in this flow of research by studying the reaction of 40 banks operating in Lebanon between 1994 and 2017, to a change in lending interest rate, taking into consideration: size, market power, capitalisation, credit risk, and liquidity. The empirical results show that the impact of a change in interest rate on loan supply depends on bank market power and bank liquidity only. Consequently, interest rate channel in Lebanon operates through banks with high market power and banks with high liquidity stocks.

Keywords: Monetary policy. Interest rate channel. Panel data econometrics.

JEL Classifications: E51, E52, E58.

1. Introduction

The channels through which the monetary policy spills over and impacts the aggregate demand and real economy remain a subject of widespread debate by economists and policymakers, considering that an effective conduct of the monetary policy crucially hinges on the speed and symmetry of some key channels.

The conventional transmission channel or "the money view" postulates that there is no information asymmetry in financial markets, and thus, the main direct transmission channel remains the interest rate. According to this neoclassical channel, an expansionary monetary policy leads to a fall in the short-term nominal rate, and assuming sticky wages and prices, the short-term real interest rate falls as well, stimulating a rise in investments due to a lower cost of capital. This in turn raises the aggregate demand and output (Mishkin, 1996). Monetary policy is also transmissible through other main channels such as the exchange rate, the asset prices, and the credit channel. In fact, the importance of the credit channel in particular emerged predominantly after the 2008 international financial turmoil, where the credit market friction, the zero lower-bound constraint on market rates, the inadequate capital adequacy ratio of "too big to fail" institutions, and the inability of traditional monetary channels to contain the bursting bubble, all casted doubts about the effectiveness of the inside money channel to solely influence market rates (Joyce et al, 2012). In this regard, Fabris (2018) argues that the global financial crisis has indeed challenged the traditional monetary policy that was based on the approach involving one instrument (reference interest rate) and one goal (price stability).

Unlike the interest rate channel, the credit view assumes imperfect financial markets with a prevailing information asymmetry between lenders and borrowers. In the aftermath of the 2008 financial crisis, macroeconomists perceived the significant interaction between monetary policy, macro-prudential policy tools and credit growth (Tressel and Zhang, 2016). The role of financial intermediaries in smoothing or fractioning the transmission of the monetary policy was extensively highlighted, prompting further investigations in the credit view channel. Although the attention of central bankers shifted to the non-neoclassical channel, and in spite of the scaled interest in examining the heterogeneous lending behaviour of banks during monetary shocks, there is a noticeable scanty of studies explaining the divergence of the lending behaviour at the bank level, particularly in the developing countries.

With respect to Lebanon (our case study), the country witnessed deep structural changes that shaped its monetary policy over the past 25 years. Lebanon's monetary policy adopted an exchange rate targeting in 1994 and embraced two long-run operational targets related to interest rate. The first target is based on preserving an attractive spread between foreign-currency deposit rates in the country and those on the international markets, in order to stimulate financial inflows. The second target is based on another spread between local currency deposit rates and dollar deposit rates in Lebanon, to promote deposits in the local currency. The literature states that countries with underdeveloped capital

market (like Lebanon) are most likely to rely on the exchange rate transmission channel and the peg makes the monetary policy subordinated to the prime goal of preserving the exchange rate stability. Hence, interest rates adjustments must shadow the fluctuations in the anchor currency interest rates.[1] In parallel, safeguarding the soundness of the national banking system – which is relatively very large[2] and one of the most developed and dynamic banking sectors in the MENA region – remains a critical consideration on the Lebanon`s central bank agenda, especially since the banking sector is predominant and highly concentrated, where 97% of the financial sector is composed of banks with the leading top 10 banks controlling over 75% of the market share (IMF, 2017). The resilient, highly liquid, and very well capitalised banking sector on one hand, the shallow financial market, the pegged exchange rate, and the highly dollarized economy on the other hand, make the interest rate channel more potent in Lebanon. This motivates our study to assess the speed and symmetry scope of the pass-through of this channel into Lebanese banks.

In the present study, we aim at digging deeper in the interest rate transmission channel by investigating the behaviour of commercial banks following a monetary shock, particularly on the interest rate front. We address the question of how banks` key heterogeneous characteristics, mainly size, liquidity, capitalisation, credit risk and market power can shape the transmission of the monetary policy via loans supply. By exploiting a panel data formed of a sample of 40 banks and a period of 24 years, the results reveal that an increase in lending interest rate is translated into an increase in credit supply by banks with high market power and banks holding high liquidity buffers. This shows that the impact of interest rate on loan supply depends on both bank market power and liquidity. The main value added by this paper is that by using a panel data to study the differential lending responses at bank level, we show that bank heterogeneity does affect the transmission of monetary policy actions.

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[1] Krušković (2017) argues that the exchange rate is an important transmission mechanism of monetary policy because it affects inflation and aggregate demand, especially in a small open economy. However, this channel is intertwined with the interest rate channel, since a decline in domestic interest rates will translate into a fall in rates on deposits denominated in local currency, and a demand shift to deposits denominated in foreign currencies, engendering a depreciation of the local currency. However in countries where the exchange rate is pegged, this channel becomes questionable since the domestic interest rates shadow foreign interest rates.

[2] The banking sector's total assets equalled to 430% of country's GDP by end-2017. We also note that the Lebanese banking sector is highly globalised with a wide network of subsidiaries and branches operating in 12 MENA countries, 11 European countries, 4 Sub-Saharan African countries, 2 West Asian countries, in addition to a presence in both North America and Australia.

The paper proceeds as follows: Section 2 provides an overview of relevant literature. Section 3 explains the used methodology and variables. The dataset is illustrated in Section 4. Section 5 reports and interprets the empirical results. Finally, Section 6 states the conclusions of the study.

2. Literature review

2.1 The interest rate channel

The classical Keynesian interest rate channel follows the IS-LM model and targets the cost of borrowing. This view presumes that an increase in short-term nominal rates will translate into an increase in long-term nominal rates, as investors will try to arbitrage away the difference in the expected risk-adjusted return on held debt instruments of various maturities. With rigid prices, real interest rates will go up as well, thus, firms will try to cut some investment expenditures as their cost of borrowings becomes higher. Similarly, households will reduce their spending on durable goods and fixed assets purchases as they also face a higher cost of debt. Consequently, both aggregate demand and output fall (Ireland, 2005).

Kapuściński et al. (2014) argue that a change in interest rates induced by the central bank impacts short-term interbank rates, which in turn affects both deposit and loan rates, in addition to government and corporate bond yields. The authors add that the expectations of economic agents on the future movement of short-term interest rates will affect long-term interest rates. This increase in interest rates is translated into an increase in the cost of capital, which discourages corporations and households from investment and consumption, thus reducing both output and inflation. Berg et al (2013) claim that given price or wage rigidities, changes in the monetary policy (represented by changes in short-term nominal interest rates) affect real interest rates, which in turn pass through to aggregate demand and prices through changing firms` investment and households` consumption decisions. These deviations of aggregate demand from the potential output of the economy result in inflationary or deflationary pressures through the Phillips Curve mechanism. Roşoiu and Roşoiu (2013) state that interest rate channel is based on the relation between short-term interest rate and domestic demand. In a first stage, the "policy rate" passes through to banks' rate, and afterwards to household deposit and loan rates. Therefore, monetary policy rate is considered as opportunity cost for the excess liquidity and directly influences the money market interest rate. Roşoiu and Roşoiu add that in the second stage, the increase in nominal interest rate is translated into increase in real rate interest

and cost of borrowing (i.e. cost of capital) leading to a fall in consumption growth rate. This retreat in consumption and investments leads to a fall in output.

2.2 The effect of bank characteristics on lending decision

2.2.1 The effect of bank size

The size of the bank proxied by total assets has been intensively used in assessing the differential lending behaviour of banks. Large banks have an easier access to alternative sources of finance that may be unavailable for small banks. Large banks can raise uninsured finance faster, explaining their sluggish response following a monetary shock. In this vein, Kashyap and Stein (1995) contend that the lending volume of small banks in the U.S. is more sensitive to a monetary tightening, where loans supply of large banks appeared to increase in the short-run following a monetary contraction. Kashyap and Stein (2000) also assessed the bank-lending channel in the U.S. by using a large panel data set of American banks over the period 1976-1993, and traced a bank-lending channel in the U.S. The authors found that this channel works through smaller banks that are unable to raise alternative sources of funding in the money market. Conversely, Gambacorta (2001) using a panel approach on Italian banks, argues that small banks have a closer relationship with their customers, thus, to maintain this relationship they have a vested interest in smoothing the effect of monetary tightening on credit squeeze, and the probability of credit rationing is reduced.

2.2.2 The effect of market power

To detect the impact of market power on bank lending behaviour, Brissimis and Delis (2010) applied the GMM technique on a sample of U.S. and European banks over the period 1994-2007 and found that high market power can act as a buffer to interest rates changes, where banks with higher market power earned higher profits when interest rates rose. The authors argue that this explains why high market power banks' lending attitude was shielded when encountering a shift in policy rates, while banks with low market power adopt risk-averse strategies.

2.2.3 The effect of capitalisation

Capital indicates the health of the bank and its ability to raise funds during periods of monetary contraction (Brissimis et al, 2001). Capitalisation proxied by

the excess capital is considered as a buffer against interest rates shocks, enabling credit institutions to shelter their customers from bearing the costs of an interest rate surge. Kishan and Opiela (2000) found that well capitalised banks are less constrained during periods of monetary tightening and can isolate their loan portfolios from economic shocks. Similarly, Altunbas et al (2002), using and ARDL model on loans for a sample consisting of 11 European countries, found that undercapitalised banks are more responsive to a monetary shock. In this respect, Jayaratne and Morgan (2000) clarify that the cost of non-reservable funding such as certificates of deposits, is higher for undercapitalised banks if they are perceived by the market as risky, thus they are more exposed to information asymmetry and are less able to shield their loans supply. Juurikkala et al (2011) found evidence supporting the presence of the lending channel in Russia, and their empirical results affirm that well-capitalised and highly liquid banks are able to insulate their lending from monetary policy changes.

2.2.4 The effect of credit risk

Altunbas et al (2009) stated that bank risk must be considered when assessing the role of the lending channel in transmitting the monetary policy – especially in the presence of financial innovation – where banks size, capitalisation and liquidity may not capture accurately banks' ability and willingness to increase their loans supply. It has been argued that more diversified banks (proxied by non-interest income to assets) are less responsive to monetary shocks as they have alternative sources of income to subsidise their activities (Demirguc-Kunt et al, 2004).

2.2.5 The effect of liquidity

Ehrman et al (2001) show that liquidity is the most significant factor in determining the response of banks to a monetary shock where banks holding low share of liquid assets reduce their lending following a monetary tightening. Aydın and Igan (2012) used quarter data from 2002-2008 and found that liquidity constrained banks in Turkey curtail their lending the most during monetary contraction. This is also consistent with Kashyap and Stein (2000) for the U.S. and Gambacorta (2005) for the Italian context, where credit growth of banks with higher liquidity ratios are less altered than that of illiquid banks. Along the same line, Kapoor (2017) argues that highly liquid banks in India that are able to raise alternative finance such as time deposits can insulate their lending during monetary tightening. Finally, Haase (2016) studies the reaction of 5,008 industrial firms to monetary policy shocks over the period 1971-2008. The author finds that

financially constrained firms (i.e. firms facing difficulty in raising outside capital) have a more significant response in their fixed investment expenditure patterns than unconstrained firms, following monetary policy shocks to interest rates.

3. Empirical methodology and variables specification

The exploited data set is a panel data that includes banks widely dispersed in terms of size, market power, capitalisation, liquidity, credit risk, and performance. The standard ordinary least squares method cannot tackle these differences properly, and the estimated coefficients may be wrong. The Panel Fixed Effects and Random Effects methods can account properly for these differences. The Panel Fixed Effects method allows taking into consideration the bank-specific effects in the regression estimates by including individual intercepts for each cross-section in the regression equation. Similarly, the Panel Random Effects allows capturing two types of unobserved effects affecting the explained variable: bank-specific time-constant effect (which is assumed random) and an idiosyncratic time-varying random error.

As for the variables, the study exploits the per-bank annual percentage growth rate of loans to customers (LOANG) as dependent variable.

To proxy for interest rates, studies on interest rate channel usually exploit a certain "policy rate" or a monetary policy reference interest rate as independent variable. Nevertheless, Lebanon lacks such policy rate, and only in 2009, the Association of Banks in Lebanon introduced the Beirut Reference Rate (on both Lebanese pound and US dollar), which is currently used as a benchmark for the local market interest rates. Due to the short time series of this reference rate, this study resorts to proxy for the market interest rate by using (the annual percentage change of) the weighted-average Lebanese pound lending rate (INTEREST).[3]

To control for the effect of bank characteristics on lending behaviour, the paper exploits the following bank-level variables. The log of assets (SIZE) is used to control for the effect of bank size; the equity-to-asset ratio (EQUITY) to control for bank capitalisation; the net interest margin ratio (NIM) to control for market power; the bank liquid assets-to-total assets ratio (LIQUID) to control for liquid-

[3] We add that the adopted lending rate could represent a good proxy for market rate because it is highly correlated with the "official rates". For instance, the coefficient of correlation between monthly lending rate and monthly 1-year Treasury bill rate over the studied period was 0.931. And the coefficient of correlation between monthly lending rate and monthly 60-day central bank's certificate of deposit rate over the studied period was 0.967.

ity; and the loan loss provisions-to-gross loans ratio (LLP) to control for credit risk. Finally, we include the annual real GDP growth rate (GDPG) to control for the effect of macroeconomic conditions on credit availability.

The main question of this study is whether interest rate channel (i.e. the impact of interest rate on credit supply) is shaped by bank characteristics. In other words, does the reaction of banks to a change in interest rate depend on the above listed variable (size, capitalisation, market power, liquidity, and credit risk)? Therefore, to detect whether the impact of a change in interest rate on loan supply depends on these variables, we include in our estimations interaction terms between INTEREST on one hand, and the other five bank characteristics on the other.

4. Data

The empirical estimation is based on a panel data set formed of 40 Lebanese commercial banks, and covering a long time frame extending between 1994 and 2017. The source of – annual – bank data is BilanBanques, while the GDP growth rate is extracted from the IMF database. Table 1 presents some summary statistics for the exploited variables and Table 2 contains the correlation matrix of these variables.

Table 1: Variables descriptive statistics (%)

	LOANG	INTEREST	SIZE	EQUITY	NIM	LLP	LIQUID	GDPG
Mean	18.729	-4.392	3.071	10.381	2.574	14.974	66.701	4.257
Median	12.868	-3.938	3.038	8.204	2.233	11.380	68.014	3.100
Maximum	462.597	36.231	4.824	98.092	14.621	96.420	98.123	10.190
Minimum	-66.764	-29.689	1.047	0.099	0.000	0.000	25.643	-0.800
Std. Dev.	37.884	12.400	0.723	9.756	1.452	13.918	11.919	3.329
Observations	897	954	906	902	901	899	902	954

Table 2: Variables correlation matrix

	LOANG	INTEREST	SIZE	EQUITY	NIM	LLP	LIQUID	GDPG
LOANG	1							
INTEREST	0.047	1						
SIZE	-0.133	0.078	1					
EQUITY	-0.068	0.040	-0.334	1				
NIM	0.280	-0.044	-0.452	0.131	1			
LLP	-0.208	-0.063	-0.219	0.258	-0.008	1		
LIQUID	-0.030	-0.099	0.094	0.041	-0.067	0.250	1	
GDPG	0.133	-0.141	-0.156	-0.002	0.138	0.062	0.093	1

5. Empirical analysis

5.1 Detecting the existence of an interest rate channel in the Lebanese banking system

Firstly, the selection between the Fixed Effects and Random Effects method in the estimations is based on the Hausman test and the results are reported in Table 3.

Table 3: Empirical estimations – dependent variable LOANG

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
C	20.724 (15.321)	21.567 (15.342)	20.972 (15.331)	12.375 (11.031)	20.689 (15.324)	20.526 (15.297)
INTEREST	0.222** (0.089)	0.568* (0.347)	0.150 (0.143)	0.457** (0.181)	0.138 (0.133)	0.671 (0.474)
SIZE	-10.010*** (3.396)	-10.143*** (3.398)	-9.910*** (3.400)	-5.230** (2.276)	-9.934*** (3.397)	-10.380*** (3.396)
EQUITY	-0.170 (0.169)	-0.164 (0.169)	-0.150 (0.171)	-0.252* (0.142)	-0.178 (0.169)	-0.202 (0.169)
NIM	7.023*** (1.148)	7.010*** (1.148)	7.011*** (1.149)	7.297*** (0.981)	7.055*** (1.149)	6.930*** (1.147)
LLP	-0.761*** (0.130)	-0.765*** (0.130)	-0.753*** (0.130)	-0.621*** (0.100)	-0.734*** (0.133)	-0.753*** (0.129)
LIQUID	0.310** (0.141)	0.303** (0.141)	0.296* (0.143)	0.168 (0.111)	0.302* (0.142)	0.341** (0.142)
GDPG	0.910*** (0.340)	0.888*** (0.340)	0.928*** (0.341)	1.002*** (0.333)	0.898*** (0.340)	0.924*** (0.339)
INTEREST*SIZE		-0.129 (0.126)				
INTEREST*EQUITY			0.008 (0.013)			
INTEREST*NIM				0.196*** (0.046)		
INTEREST*LLP					0.005 (0.006)	
INTEREST*LIQUID						0.013* (0.007)
Adjusted R-squared	0.186	0.185	0.185	0.155	0.185	0.188
F-statistic	5.424	5.331	5.314	21.510	5.322	5.403
Prob(F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000
			Hausman test			
x^2	14.876	17.936	14.037	13.286	15.607	16.218
Prob. x^2	0.037	0.021	0.080	0.102	0.048	0.039
Model type	FE	FE	FE	RE	FE	FE

Notes: Standard error in parentheses. ***, **, * denotes significant at the 1%, 5% level and 10% level respectively. FE: Fixed Effects. Included observations: 894.

Firstly, the results in column 2 of Table 3 (Model 1) do suggest the existence of an interest rate channel in the Lebanese banking sector, because INTEREST (the independent variable) captures a positive and significant effect (at the 5% level) on LOANG (the dependent variable). Therefore, an increase in interest rates encourages Lebanese banks to expand their supply of credit, and vice versa. We note here that Awdeh (2018) shows that the cost of lending (i.e. lending rate) does not affect the demand for loans in Lebanon, due to the lack of financing alternatives, which forces businesses to be totally bank-dependent regardless of borrowing cost, at least in the short-run.

As for the other independent variables, the results of the estimation show firstly a negative and significant association (at the 1% level) between bank size and credit growth, suggesting that smaller banks tend to expand lending (relatively) more than their larger counterparties. Equity-to-asset ratio does not show to have an effect on loan growth rates, which is shown by the lack of a significant effect of EQUITY on LOANG. This result is in line with that of Berrospide and Edge (2010) suggesting that an increase in regulatory capital does not reduce credit supply, and there is no trade-off between bank capitalisation and loan supply (see also Awdeh, 2016). NIM proxying for market power is positively and significantly associated (at the 1% level) with loan growth rates. Therefore, higher market power may encourage banks to expand lending as it could be translated into higher pricing power. Credit risk has a negative impact on bank lending, which is shown by the negative and significant (also at the 1% level) association between LLP and LOANG. This may show that an increase in the riskiness of bank loan portfolio, forces Lebanese banks to cut lending and credit supply. Liquidity shows to be a major determinant of loan growth, which is shown by the positive and significant (at the 5% level) impact of LIQUID on the growth rate of loans. Thus, high liquid asset stocks provide banks with more capacity to expand lending. Finally, economic improvement (proxied by a growth in GDP) does have a positive effect on credit supply growth. In fact, an increase in GDP growth reflects an improvement of economic activities, which encourages businesses to borrow and expand their investments. This provides support for the theory of a procyclical relationship between economic growth and bank lending, where higher economic growth results in higher level of credit supply.

5.2 The effect of bank heterogeneity on the interest rate channel

Now, in order to capture the effect of bank heterogeneity on the interest rate channel in Lebanon (and how the impact of interest rate on loan supply depends on bank characteristics), we run five regression models that include interaction

terms between INTEREST and each of the five exploited micro-variables. The interaction term INTEREST*SIZE will help detect if/how the impact of a change in interest rate on loan supply depends on bank size and whether the transmission of the monetary policy (the interest rate channel) is affected by this variable. The interaction term INTEREST*EQUITY will help detect if/how the impact of a change in interest rate on loan supply depends on bank capitalisation. The interaction term INTEREST*NIM will help detect if/how the impact of a change in interest rate on loan supply depends on bank market power. The interaction term INTEREST*LLP will help detect if/how the impact of a change in interest rate on loan supply depends on bank credit risk. And finally, the interaction term INTEREST*LIQUID will help detect if/how the impact of a change in interest rate on loan supply depends on bank liquidity. The results of empirical estimations are reported in columns 3 through 7 in Table 3.

Firstly, the results in column 3 of Table 3, suggest the lack of impact of bank size on the interest rate channel, as the interaction term INTEREST*SIZE does not capture a significant effect. Consequently, a change in interest rate by the monetary policy is transmitted similarly through both large and small banks, and this transmission does not depend on bank size.

The estimation results presented in column 4 of Table 3 show a positive but insignificant effect recorded by the interaction term INTEREST*EQUITY. This result also suggests that all banks react similarly to an increase in interest rate regardless of their capitalisation levels. Thus, the impact of interest rate on loan supply and the transmission on monetary policy does not depend on bank capital.

The results in column 5 of Table 3 show that banks with high market power (represented by high net interest margin) do amplify the interest rate channel, unlike banks with low market power. This is shown by the positive and significant effect (at the 1% level) captured by the interaction term INTEREST*NIM. Thus, an increase in interest rates persuades banks with high pricing power to boost their credit supply as they have the ability to pass-through this increase in interest rates to their customers. Conversely, banks with lower pricing power may hesitate to expand credit supply following an increase in interest rate as they do not have the ability to pass-through this increase in rates to their customers. As a conclusion, the effect of a change in interest rate on credit supply does depend on bank market power.

The estimations of the effect of credit risk on the interest rate channel are contained in column 6 of Table 3. Surprisingly, the empirical results show that credit risk is not a crucial factor in discriminating between banks regarding their re-

action to a change in interest rates and high credit risk banks react similarly to low credit risk banks following an increase/decrease in interest rates. Therefore, credit risk may not be a factor that constraints the transmission of monetary policy through the interest rate channel.

Finally, the regression model for the impact of bank liquidity is included in column 7 of Table 3. The empirical results show that the interaction term INTEREST*LIQUID affects positively and significantly (at the 10% level) LOANG. This reveals the importance of liquidity buffers for banks to be able to increase their credit supply as a reaction to a rise in interest rates, and banks with lower liquidity may not be able to benefit from such interest rate increases to boost their lending supply. Consequently, interest rate transmission channel depends on bank liquidity and this channel operates solely through banks with high liquidity stocks.

6. Conclusion

The interaction between bank characteristics and the monetary policy transmission mechanisms is capturing an increasing attention from researchers and policy makers. Specifically, there is a mounting debate on how banks' heterogeneity may shape their reaction to monetary shocks, particularly on the interest rate front. This paper aimed at participating in this flow of research by detecting the response of a sample of 40 commercial banks operating in Lebanon between 1994 and 2017, to a change in lending interest rate, with a focus on the impact of five microeconomic control variables: size, market power, capitalisation, credit risk, and liquidity. The empirical results based on panel data econometrics suggest (1) the existence of an interest rate channel in Lebanon, and that (2) this channel operates through banks enjoying high market power and banks holding high liquidity stocks. Conversely, the results reveal that banks with different size, different capitalisation, and different credit risk react similarly to an interest rate shock. Therefore, the interest rate channel in Lebanon does not depend on bank size, bank capital or bank credit risk.

The findings of this study add evidence to the literature on how effective is the interest rate channel when accounting for bank heterogeneous characteristics. This could help the monetary authorities to re-examine the monetary transmission mechanisms for a better functioning of the adopted monetary tools.

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