Bank Lending Channel and Monetary Policy in Nigeria

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Highlights

We study the dynamic effects of monetary policy on the banking sector in Nigeria.

We show that the Bank Lending Channel improved banks resilience to monetary shocks.

Our study of the Bank Lending Channel reveals the importance of banks size and equity.

Larger banks and more capitalised banks are less sensitive to changes in monetary policy.

The Central Banks restructuring activities improved the bank lending channels impact.

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1.0 Introduction

Our study examines the Bank Lending Channel (BLC) in Nigeria between 2002 and 2008. During the nineties, the Nigerian Banking system faced a severe crisis that culminated in the failure of a large number of commercial banks. These banks failed for two reasons: (i) a large number of small under-capitalised banks became burdened by a high volume of non-performing loans. (ii) a central bank whose monetary policy objectives were hampered by fiscal indiscipline.

The financial crisis that occurred in the banking system during the 1990's contributed to the insolvency of almost 50% of financial institutions. So beginning from 1996, the central bank introduced two major reforms that altered significantly the banking landscape in Nigeria. The first major reform by the central bank of Nigeria (CBN) enforced a series of increases in minimum paid-up capital requirements. According to Somoye (2008), in 1996 there were 112 banks but by 2006, further increases in the minimum paid-up capital reduced the number of banks to 25 banks. The second major reform was in 2005 when the CBN began a program of unprecedented credit expansion to commercial banks. The purpose of this reform was to expand the supply of capital to re-capitalize failed banks to revive the financial system. These reforms have enabled some of these twenty-five banks to become key players in African Global Financial Markets.

There has been extensive research on the BLC in U.S and Europe. Kashyap and Stein (1995), Kasian and Opiela (2000), Kashyap and Stein (2000), Favero et al. (1999), Ashcraft (2006), Matousek and Sarantis (2009) among others. However, there have only been limited studies on the BLC in Africa such as Ludi and Ground (2006) and Hsing and Hsei (2014).

More so fewer of these studies (mainly on Southern Africa) have used sectoral data such as Lungu (2007) and Abuka et al. (2015). So we have identified a gap in research on the transmission of monetary policy through the Nigerian banking system. In particular, we explain why following the financial crisis in the 1990's, a restructuring of the banking system was needed to restore the ability of banks to reconcile shifts in monetary policy. In this study, we test whether monetary restrictions on bank loans differ according to bank size, capital strength and liquidity. To test the BLC, we apply the GMM estimator and the Bias Corrected Fixed Effects estimator using a sample of 23 banks from 2002 to 2008. We apply the latter in order to control for the bias that arises when applying GMM estimator to small dynamic panels.

From the foregoing, our study will contribute to our understanding of whether the process of consolidation and restructuring increased the ability of the Nigerian banking system to withstand monetary shocks. Therefore, our study contributes to the ongoing discussion as to whether the BLC is weakened or strengthened by bank consolidation and restructuring activities.

Our study shows that the BLC in Nigeria was strengthened by the consolidation process during the period 2002 and 2008. Furthermore, smaller and less capitalized banks are more responsive to changes in monetary policy.

The rest of the paper is structured as follows: Section 2 provides an overview of the evolution of the banking sector in Nigeria. Section 3 provides a literature review on recent empirical research on the BLC. This section also provides an overview of the available empirical research on the BLC. Section 4 explains the methodology while Section 5 describes our dataset. Section 6 explains the estimation procedure and reports the results. Finally Section 7 concludes.

2. An Overview of Monetary Policy and the Banking Sector in Nigeria

According to CBN (CBN, 2006), the main objectives of monetary policy is price stability and sustenance of economic growth. The CBN's monetary policy can be clearly split into two phases: the period before the Structural Adjustment Programme (SAP) of 1986 and the period beyond 1986.

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Prior to 1986, monetary policy was implemented by directly controlling both the interest rate and exchange rate. The idea was to channel cheap credit to the sectors of the economy that was viewed to be at the vanguard of growth and development (Yinusa and Akinlo, 2008). In reality, the attempt to use interest and exchange rates respectively to achieve set targets in growth were rarely achieved (Ibeabuchi, 2007). Instead these policies contributed to distortions, bottlenecks and widespread inefficiencies and wastage in resource allocation.

The period that trailed the SAP era witnessed more policy reversals than any other period. Monetary policy moved from liberalization to direct control and back to liberalization between 1986 and 1998 (World Bank, 1983). This was irrespective of the clear guidelines concerning the practice of monetary policy as encapsulated in the Banks and Other Financial Institutions Decree (BOFID, 1991). The inconsistencies in monetary policy were also due to the failed attempt of the CBN to prevent money supply from amplifying the effects of the economic recession that occurred between 1986 and 1998.

Part of the problem for the CBN was that apart from the primary objectives of price stability and sustenance of economic growth, it also set some secondary objectives. The secondary objectives were full employment, maintenance of stable long-term interest rates, optimal exchange

rate targets and strengthening of the banking system (Saxegaard, 2006). Its primary objectives often conflicted with its secondary objectives and this complicated the crafting of a proper monetary policy. For example, the CBN had trouble achieving set targets in reserve money (operational target) and broad money (intermediate target). This made it difficult for the CBN to maintain price stability and growth (Ibeabuchi, 2007). Furthermore, fiscal indiscipline on the part of the government made it difficult for the CBN to achieve its objectives of stabilizing money growth. During the period between 2001 and 2006, broad money (M2) had expanded by an average of more than 24% (BGL, 2006). Also narrow money (M1) expanded by an average of 17.4% between 2001 and 2005.

Post 1996, the monetary authorities enforced a series of increases in minimum paid-up capital requirements. This was because the 1990's a financial crisis caused almost half of the banks to become insolvent. The origin of the financial crisis began with the liberalization of the financial sector which led to small under-capitalized banks with little managerial experience. These new entrants were poorly regulated owing to political interference (Brownbridge and Kirkpatrick, 2000). In 2005, the CBN raised the minimum capital requirement for banks from 2 billion naira (approx. $15million) to 25 billion naira (approx. $183million)[1]. As a result, this led to a drastic reduction in the number of banks from 89 to 25. Consequently, this led to the disappearance of many small-sized banks with high overhead costs and heavy reliance government patronage (Lemo, 2005). The CBN's policy of bank consolidation and restructuring has been credited with helping Nigerian banks become competitive players primarily in African Financial markets and the global financial system.

3. Literature Review

[1] The exchange rate at the time fluctuated from 132 naira to the dollar to 136 naira to the dollar.

Akinci et al. (2014) explain the empirical evidence on the bank lending channel since 1995. The essential arguments within the literature are as follows: First, the BLC cannot be identified using macroeconomic time series data. Secondly, evidence drawn from disaggregated bank level data shows that the response of bank loans to changes in monetary policy depends on three key characteristics: asset size, liquidity and capital adequacy. Thirdly, evidence suggests the existence of the BLC in Germany, France, Italy and Spain. However, the significance of these results vary according to country. Finally, current research on the BLC shows that it is affected by other factors such as bank risk and the global financial crisis. Table 1 summarizes chronologically key empirical literature on the BLC. A comparison of the studies shows that more research on the BLC has been done in developed countries relative to emerging market and developing economies.

With respect to Africa, we have identified four studies that test the existence of the BLC. The first is by Sichei (2005) who examine the BLC in South Africa using quarterly bank data from 2001q1 to 2004q4. Two conditions are necessary for the BLC to work: (i) that there are bank dependent customers and (ii) that the South African Reserve Bank (SARB) can affect the supply of loans.

Table 1: A Summary of Key Literature on the BLC.

Author	Main Findings
Favero et al. (1999)	Did not find the presence of the BLC in Germany, France, Italy and Spain in 1992.
De Bondt (1999)	BLC found to be present in Germany, Belgium and the Netherlands.

Kishan and Opiela (2000)	BLC found to be present in the U.S between 1980 and 1995. The supply of loans is more sensitive to bank size irrespective of the levels of capitalization.
Altunbas et al. (2002)	BLC found in 11 European countries in the EMU. The supply of loans is more sensitive to bank capital.
Kakes and Sturm (2002)	BLC found to be present in Germany. The supply of loans is sensitive to bank size.
Ehrmann et al. (2003)	BLC found to be present in Germany, France, Italy and Spain using micro and aggregate data.
Gamborta (2005)	BLC found to be present in Italy. The supply of loans is sensitive to capitalization and liquidity.
Ludi and Ground (2006)	Using VAR's do not find the BLC in South Africa.
Lungu (2007)	Mixed results found for the existence of the BLC in South African Developing Countries (SADC) from 1990 to 2006.
Matousek and Sarantis (2009)	BLC found to be present in 8 CEE countries. The supply of loans is sensitive to bank size and liquidity.
Gambacorta and Marques-Ibanez(2011)	Finds significant changes in the operation of BLC EU member states and the U.S following the 2007 financial crisis. The supply of loans is sensitive to banks with short-term funding as well as banks with more profitable but volatile non-interest income activities.
Oliviero et al. (2011a)	BLC is weakened by the consolidation process in 18 Asian and Latin American countries.
Butt et al. (2014)	Quantitative Easing boosted the BLC in the U.K.
Hsing and Hsei, (2014)	Use a simultaneous equation model to identify the BLC in South Africa using aggregate data.
Simpasa et al. (2014)	BLC not found to exist in Zambia.
Abuka et al. (2015)	BLC found to be present in Uganda. Furthermore, an increase in the interest rate reduces the probability that loans are granted as well as reduces the volume of local currency loans to borrowers The supply of loans is sensitive to bank capital.

The bank characteristics considered in the study were capital-asset ratio and bank size. The results show that an increase in the repo rate (the base rate in South Africa). Large banks tend to attract more deposits relative to banks characterized by higher capital-asset ratios. This confirms the first condition. For the second condition, the results support the existence of the bank

lending channel in South Africa. An increase in the repo rate has a negative and significant effect on the supply on the supply of loans. Furthermore, estimates on the joint effect of size and capital-asset ratios respectively showed that large banks as well as highly capitalized banks are able to cushion the effects of contractionary monetary policy.

A second study by Walker (2012) attempts to examine the existence of the BLC in five countries that make up the East African Community namely: Burundi, Kenya, Rwanda, Tanzania and Uganda. The bank characteristics considered in the study where bank capitalization, size and liquidity. The bank characteristics considered in the study where bank capitalization, size and liquidity. Their results showed that an increase in the interest rate has a negative and significant effect on the supply of loans. Furthermore, the results also showed that large banks as well as highly capitalized banks are able to cushion the effects of contractionary monetary policy. However, the results should be interpreted with caution as the effects of the BLC was found not to be significant when tested on a country-by-country basis. Other studies that have examined the existence of the BLC in Africa include: Lungu, (2007), Hsing and Hsei, (2014), Simpasa et al. (2014) and Abuka et al. (2015).

The BLC channel in Nigeria has not been investigated using panel data techniques. Therefore, we seek to build on existing research by using panel data techniques to estimate the distributional effects of monetary policy within the banking sector for Nigeria.

4.0 Model Specification

The basic regression consists of the following specification adapted from Dervis et al. (2013):

$$\text{Log}(L_{it}) = \alpha_i + \sum_{j=0}^{1} \beta_1 \log(L_{it-1}) + \sum_{j=0}^{1} \delta_j R_{t-j} + \sum_{i=0}^{1} \lambda_i GDP_{t-j} + \sum_{j=0}^{1} \theta_i CPI_{t-j} + \sum_{i=0}^{1} \eta_i (own)_t + \sum_{j=0}^{1} \gamma_i z_{it-1} + \sum_{i=0}^{1} \omega_i z_{it-1} R_{t-j} + \varepsilon_{it} \ldots (1)$$

Where N denotes the number of banks, T is the time period and J is the number of lags. L_{it} denotes the size of bank loans for each bank i. R_{t-j} denotes the monetary policy instrument which is the short-term nominal interest rate, GDP_{t-j} denotes the Gross Domestic Product, CPI_{t-j} denotes the Consumer Price Index and own_t is a dummy variable for whether the bank is foreign owned. The dummy variable takes value of *0* if the bank is not foreign owned and *1* if the reverse is the case. z_i denotes the vector of three bank characteristics: bank size, liquidity and bank capitalization for each bank. Finally, $z_{it}R_{t-j}$ denotes the interaction between bank specific characteristics and the short-term nominal interest rate.

Our approach to estimating the BLC is motivated by the literature on dynamic panel estimation such as Arellano and Bond (1991), Islam(1995) and Ziliak(1997). In order to apply the Arellano and Bond estimator, we take the first differences of (1) and this yields equation (2)

$$\Delta\text{Log}(L_{it}) = \alpha_i + \sum_{i=0}^{1} \beta_1 \Delta\log(L_{it-1}) + \sum_{i=0}^{1} \delta_j \Delta R_{t-j} + \sum_{i=0}^{1} \lambda_i \Delta GDP_{t-j} + \sum_{j=0}^{1} \theta_i \Delta CPI_{t-j} + \sum_{i=0}^{1} \eta_i (own)_t + \sum_{j=0}^{1} \gamma_i z_{it-1} + \sum_{j=o}^{1} \omega_i z_{it-1} \Delta R_{t-j} + \varepsilon_{it} \ldots (2)$$

In the first stage of our estimation we applied the Arellano and Bond estimator. However, there were some issues concerning the robustness of the estimates. Consequently, we applied the

Arellano-Blunder/Bond and Bover estimator as well the Windmeijer estimator to reduces the problem of biased coefficients.

In both models, the distributional effects of monetary policy on banks are captured by the interaction between the monetary policy indicators (i.e. interest rate[2]) and the individual bank characteristics. The bank characteristic variables i.e. Bank size, liquidity, capitalization are defined as in Ehrmann et al. (2003), Gambacorta (2005), Matousek and Sarantis (2009) as follows:

$$S_{it} = \log A_{it} - \frac{\sum \log A_{it}}{N_t} \ldots (3)$$

$$Liq_{it} = \frac{Liq_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N} \sum_i \frac{L_{it}}{A_{it}} \right) \ldots (4)$$

$$Cap_{it} = \frac{Equity_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N} \sum_t \frac{Equity_{it}}{A_{it}} \right) \ldots (5)$$

Bank size is defined as the log of Total Assets. In order to control for the trend in size, Total Assets for each bank is normalized by subtracting the log of total assets for each bank from the sample average. Liquidity is defined as the ratio of Liquid Assets to Total Assets. Capitalization is defined as the ratio of Equity to Total Assets. As with bank size, the latter two bank characteristics are normalized by subtracting from the sample average for each single period and over the whole period.[3]

We now proceed to explain the hypothesis tests and the a-priori expectations with respect to the sign of the interaction terms. In order to test for the existence of the bank lending channel, we test if (i) smaller bank are more sensitive to changes in monetary policy (ii) less liquid banks are more sensitive to changes in monetary policy and (iii) less capitalized banks are more sensitive to

[2] We also experiment with using changes in money supply as an alternative measure of the monetary policy stance. We found that the supply of loans is more sensitive to changes in interest rate than changes in money supply.
[3] This approach was adopted Ehrmann et al.(2003)

changes in monetary policy. We expect a-priori, the interaction between bank size and changes in interest rate to be positive because lending by small banks are more sensitive to changes in interest rates relative to large banks. Secondly, we expect the interaction between interest rate and liquidity to be positive because liquidity constrained banks are more sensitive to changes in the interest rate relative to small banks. This is because more liquid banks are able to provide more lending by drawing down on their stock of liquid assets. Finally, we also expect the interaction between bank capitalization and the interest rates to be positive because more capitalized banks are less sensitive to changes in monetary policy.

Balli and Sorensen (2013) demonstrate that adding interaction terms (product of the independent variables) can lead to bias in the estimation of the main terms i.e. independent variables. This is because of the coefficient of the interaction terms have a strong influence on the main term. Consequently, it changes the meaning of the main term as the marginal effect when the other interaction term is zero. In our paper, the inclusion of the interaction term is necessary in order to test the null hypothesis of the existence of the BLC. Our hypothesis is based on a two-tail test. Consequently, we do not drop the interaction terms if they are not significant as it contributes to evaluating our hypotheses on the BLC. Furthermore, dropping the interaction terms[4] will increase the risk of specification error as they are the main variables of interest. We also do not include quadratic terms as suggested by Bali and Sorenson (2013) because we have a large number of regressors.

5.0 Data

Disaggregated annual bank data was obtained directly from the Central Bank of Nigeria (CBN) for twenty-three banks from 2002 to 2008. There are 25 consolidated banks in Nigeria but

[4] We only drop the interaction terms if their inclusion violates the Sargan/Hansen tests as well as tests for autorcorrelation.

our sample is limited to 23 of those banks owing to data availability[5]. The data obtained were bank capital, liquid assets, equity and total assets[6]. We also collected annual data on interest rates and inflation from the CBN statistical database. Finally, we collected annual data on growth in Gross Domestic Output from the World Bank[7].

Our sample covers the period when the CBN introduced its policy of consolidation and restructuring within the banking sector following the financial crisis that took place in the nineties[8]. Consequently, this is an interesting period to study the impact of CBN's policy in the monetary transmission mechanism.

Table 2 provides descriptive statistics of the banking sector in Nigeria and some macroeconomic indicators. During the period between 2002 and 2008, the average growth in bank loans was 20%. Approximately 9% of the 23 banks in our sample are foreign owned. There has also been significant volatility in growth of loans ranging from a decline of 22% to a maximum

TABLE 2: Summary Statistics (2002 to 2008)

Variable	Obs	Mean	Std. Dev.	Min	Max
Growth in Loan Supply	137	0.203	0.201	-0.222	1.056
Foreign Owned Banks	161	0.087	0.283	0	1
Growth in Bank Size	137	.0301	0.039	-0.133	0.156
Growth in Liquidity	137	-.0102 .	2.29	-1.460	0.784

[5] The banks used in the sample were: Access Bank, AfriBank, Diamond Bank, EcoBank, Equitorial Trust Bank, First City Monument Bank,Fidelity Bank, First Bank Plc, First Inland Bank, Guaranty Trust Bank, IBTC- Chartered Bank, Intercontinental, Nigeria International Bank, Oceanic Bank, Platinum Bank, Skye Bank, Spring Bank, Stanbic Bank, Standard Chartered Bank, United Bank for Africa, Sterling Bank, Union Bank, Unity Bank, Wema Bank, Zenith Bank Plc.

[6] The data was used to compute bank size, liquidity and capitalization as defined in equations (3), (4) and (5).

[7] We used the Log of GDP in the estimation.

[8] During the period of consolidation, a new governor of the CBN, Charles Soludo was appointed in 2004.

Growth in Capitalization	137	0.022	0.09	-0.282	0.310
Growth Rate of output	137	0.0780	0.04	0	0.126
Inflation Rate	137	-0.146	5.46	-13.00	7.00
Growth of Money Supply	137	0.290	0.13	0.13	0.496
Interest Rate Change	137	-.017	0.012	-0.04	0

growth of 106%. With respect to the bank characteristics, average growth in the size of banks has been around 3%, liquidity decreased by an average of 1% while capitalization has expanded by about 2.2%. Furthermore, the table also shows that there has been substantial variation in the growth of these bank characteristics.

In terms of the monetary policy stance, the central bank expanded monetary policy as money supply grew by an average of 28% and interest rates declined by an average of 1.6%. This reflects CBN's policy of credit expansion to commercial banks. Macroeconomic indicators reflect the impact of expansionary monetary policy during this period as inflation fell by 14.5% while output grew by an average of 7%.

6. Empirical Estimation and Results

6.1 Empirical Estimation

Our procedure for Generalised Method Moments (GMM) estimation is as follows: We begin by applying the Arellano Bond-Blundell and Bover (A-B-B) estimator i.e. GMM two-step estimator. We choose this method of estimation for two reasons: (i) The method is consistent with Ehrmann et al. (2003) who uses dynamic panel model to examine the reaction of bank

loans to monetary policy. (ii) it can be used to control for the weak instrument problem because the instruments are weakly exogenous.

One of the limitations of using the A-B estimator is the potential for first-order serial correlation in the residuals. This can occur because the instruments that control for endogeneity are weakly exogenous. We applied the (A-B-B) estimator to control for the weak instrument problem by including instruments with differences as well as instruments in levels. The consistency of the A-B-B estimator depends crucially on the assumption that there is no second order serial correlation. In addition to the A-B-B estimator, we use the Windmeijer (2005) estimator to reduce the problem of biased coefficients. This is particularly useful when the number of instruments are large and are weakly exogenous. Secondly, the consistency of the estimator is also examined by testing for second order serial correlation where the null hypothesis that residuals are uncorrelated.

The consistency of the GMM two-step estimator depends on the validity of the instruments. In order to control for the size of the instruments which can lead to over-fitting of the model, we applied the "GMM-style collapse command" in *Stata*. This forces the GMM estimator to keep down the number of instruments. The null-hypothesis of weakly exogenous instruments is tested using the Sargan's test of over-identifying restrictions (Sargan, 1988). We also report the Hansen test (Hansen, 1982) as an alternative test for over-identification and that the model is correctly specified. According to Baum et al. (2003), the Hansen test and the Sargan test also tests for orthogonal conditions. A rejection of null hypothesis indicates that the instruments are not uncorrelated with the error term.

In each regression, we applied the general-to-specific method with respect to our choice of instruments using initially instruments dated at *t-2*. In total, we used a range of fifteen to twenty

instruments. We deleted instruments when its inclusion led to a rejection of second-order autocorrelation test and/or the Sargan/Hansen tests respectively. We also experimented with allowing the GMM two step estimator to optimally choose the appropriate number of instruments. The advantage of this procedure is that it prevents over-fitting the model with additional instruments.

6.1 The Effect of a Change in the Monetary Policy Stance on the Supply of Loans

Table 3 presents the results of the model estimated in equation (2). Following the application of the A-B and A-B-B estimators respectively, we do not reject the null hypothesis that the instruments are valid according to both the Sargan's and Hansen statistics respectively. Our results show that we do not reject the null hypothesis of second-order serial correlation. This suggests that the model is correctly specified.

Table 3 reports the results for the effect of a change in interest rate on the supply of loans. Each column also reports the estimates of the distributional effects of monetary policy as shown by the interaction between the monetary policy stance and the bank characteristic. Column (1), (2), (3) were estimated using A-B-B estimator respectively. Column (1) shows the impact of bank size on the supply of loans. Column (2) shows the impact of liquidity and column (3) shows the impact of capitalization on the supply of loans respectively.

Table 3: Results of Tests for the Bank Lending Channel in Nigeria

Estimation Method	GMM		
	(1)	(2)	(3)

	Size	Liquidity	Capital
$\Delta log(L_{it-1})$	**-0.0772*** **	**0.382***	**0.578*** **
ΔGDP_t	0.305	-	-0.017
ΔCPI_t	**-0.0429***	2.235	-2.47
$\Delta RATE_t$	**-7.946*** **	**-27.932*** **	**-25.63*** **
$\Delta RATE_{t-1}$	**2.965***	13.028	**2.712*** **
Owner	Dropped	Dropped	**1.31***
ΔGDP_{t-1}	0.461	-	-
ΔCPI_{t-1}	-0.0570*	-	**-3.24***
$Size_{t-1}$	**3.224*** **	-	
$Size_{t-1}\Delta Rate_t$	**3.121*** **	-	
$Size_{t-1}\Delta Rate_{t-1}$	-1.014	-	
Liq_{t-1}	--	1.315	
$Liq_{t-1}\Delta Rate_t$	-		
$Liq_{t-1}\Delta Rate_{t-1}$	-	-0.393	
CAP_t	-	-	-0.134
$CAP_{t-1}\Delta Rate_t$	-	-	**-53.773*** **
$CAP_{t-1}\Delta Rate_{t-1}$	-	-	**-10.462** **
N	113	115	137
Number of cross-sections	23	23	23
Number of instruments	18	12	18
AR(1) (p-value)	0.051	0.056	0.067
AR (2) (p-value)	0.142	0.537	0.914
Sargan (p-value)	0.974	0.175	0.114
Hansen (p-value)	0.354	0.221	0.448

*- 10% significance level, ** - 5% significance level, ***- 1% significance level

This is contrary to our a-priori expectations as higher capitalized banks are more likely to supply loans. One reason for the result might be banks end to hold liquidity in excess of legal requirements for precautionary purposes. This leads to credit rationing because high interest rates increase the risk of lending and price safe borrowers out of the market. As a result, banks are less willing to lend even though they have high levels of liquidity (Walker, 2012).

We now focus on the interaction terms to assess the distributional effects of monetary policy in order to test for the existence of the BLC. Columns (1) shows that the interaction between the interest rate and size is positive and significant at the 5% level. This means that when the interest rate rises, smaller banks increase the supply of loans. In Column (2), the interaction between interest rates and liquidity does not show a significant relationship. Columns (3) and (3a), supports our a-priori expectations that highly capitalized banks supply are less sensitive to changes in monetary policy. The relationship is weakly significant at the 10% level. However, after a lag of one year, the interaction between the interest rate and capitalization becomes negative and significant. This suggests that measures by the CBN to increase the level of capital may have contributed to credit rationing among banks.

The significance of the joint effect of monetary policy and in the three bank characteristics confirm that the consolidation and restructuring activities strengthened the bank lending channel. The corollary to this is that efforts by the CBN to strengthen the banking sector in the aftermath of the financial crisis improved the monetary transmission mechanism. According to Bond et al. (2001), using a pooled regression will bias the coefficient of the lagged dependent variable upwards while using fixed effects regression will bias the coefficient of the lagged dependent variable downwards. Consequently, we expect the coefficient of the lagged dependent variable to be between the corresponding OLS and fixed effects values respectively. The results of the estimation using OLS and fixed effects are presented in Appendix A. More detailed results are available upon request from the owner. The results correspond to the Bond et al. (1990).

7.0 Conclusion

The paper investigates for the first time the bank lending channel in Nigeria from 2002 to 2008. During this period, the Central Bank of Nigeria introduced a policy of consolidation and restricting in the banking system following the financial crisis in the 1990's. This resulted in a drastic reduction in the number of banks from 89 to 25. There are few studies that examine the bank lending channel using sectoral data in Africa. Therefore, our paper contributes to the literature by using sectoral data to study the role of banks in the monetary transmission mechanism in Nigeria.

Using the method of GMM, the empirical results support the hypothesis that there is a significant BLC in Nigeria following the period of consolation. We find that bank size, liquidity and capitalization are significant determinants for loan supply.

Among these bank characteristics, the supply of loans is more sensitive to changes in bank size and consolidation. In other words, we find that smaller banks, liquidity constrained banks and highly capitalized banks are more sensitive to monetary policy. This shows that the BLC was strengthened by the actions of the CBN.

In addition to using the GMM estimator, we also applied Windmeijer estimator to control for the bias that can occur when applying GMM to small samples. We also compared our results to the results from pooled and fixed effects estimation. The results concur with the literature that coefficient of the lagged dependent variable from the GMM estimator lies between the values of the pooled and fixed effects estimators respectively. The analysis of the BLC represents an innovation in the study of the monetary policy transmission in Africa. In our view, further work should be carried to examine the BLC in other African countries which attract huge amounts of credit through cross-border bank lending.

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Appendix

Table 4: Pooled-OLS and Fixed Effects of the Specific Model sin Table 3

	Fixed			Pooled		
	(1b)	(2b)	(3b)	(1c)	(2c)	(3c)
	Size	Liquidity	Capital	Size	Liquidity	Capital
$\Delta\log(L_{it-1})$	**-0.399****	**0.522*****	**0.379*****	-0.0130	**0.852*****	**0.796*****
ΔGDP_t	**-0.435****	-	**-0.032*****	0.651	-	**-0.023*****
ΔCPI_t	**-16.62*****	**2.193***	**3.486***	-0.000	**3.543*****	2.933
$\Delta RATE_t$	-2.122		-	**-5.76*****	-	-
$\Delta RATE_{t-1}$		**-24.861*****	-	2.814	**-14.895*****	-
ΔGDP_{t-1}		-		0.0707	-	-
ΔCPI_{t-1}	-1.704	-	**-4.064**	0.0087	-	-0.450
$Size_{t-1}$	0.239	-			-	
$Size_{t-1}\Delta Rate_t$	**-30.251*****	-		**3.199*****	-	
$Size_{t-1}\Delta Rate_{t-1}$	**27.261*****	-		**2.378*****	-	
Liq_{t-1}		0.520			0.210	
$Liq_{t-1}\Delta Rate_t$		-0.153				
$Liq_{t-1}\Delta Rate_{t-1}$		-			-0.100	
CAP_t		-	**-0.317***			**-0.311****
$CAP_{t-1}\Delta Rate_t$		-	-			
$CAP_{t-1}\Delta Rate_{t-1}$		-	15.638			-2.35
N	137	115	137	137	115	137

*** - 1% significance, **- 5% significance, *** - 10% significance