

# **Bank Lending Channel of the Monetary Policy Transmission Mechanism in Uganda: Evidence from Disaggregated Bank-level Data**

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## **Abstract**

This paper examines the relevance of the bank lending channel of the monetary policy transmission mechanism in Uganda using micro-level data. In addition, the impact of individual bank characteristics of size, liquidity, and capitalization on the banks' loan supply function are also investigated. This is estimated in a dynamic panel data framework based on a generalized method of moment (GMM) dynamic panel estimator of Arellano and Bond, 1991, Arellano and Bover, 1995 and recently extended by Blundell and Bond, 1998. This framework has an advantage that it helps control for potential biases induced by endogeneity which is inherent in our specification due to the inclusion of lagged dependent variables as regressors. The empirical results indicate the presence of the bank lending channel of the monetary policy transmission mechanism in Uganda. In addition, individual bank-characteristics of liquidity and capitalization also play a significant role in influencing the supply of bank loans. There is there need for the central bank to monitor the micro-dynamics of individual bank behaviour in order to enhance the efficacy of the lending channel of monetary policy transmission mechanism.

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## **1 Introduction**

The theory of monetary policy transmission mechanism posits that monetary policy influences real economic activity via several channels, such as the interest rate channel, exchange rate channel, other asset price channels and the credit channels. Bernanke and Gertler (1995) demonstrate two possible mechanisms of the credit channel, namely balance-sheet channel (BSC), and bank-lending channel (BLC). The BSC emphasizes the impact of adjustments of the monetary policy stance on the borrower's balance sheet, while the BLC focuses on the possible direct effects of monetary policy actions on the supply of loans by the banking system.

The BLC illustrates the importance that banks play in an economy through facilitating the savings-investment process. Bernanke and Gertler (1989) argue that monetary policy can affect the size and composition of a bank's asset portfolio; in terms of loans, securities and bank reserves. The BLC therefore plays an important role in affecting economic activity because any changes in the monetary policy stance will affect the bank behavior on both the assets and liabilities side. A tight monetary policy will for instance drain reserves from the banking system, which in turn will induce banks to restrict the supply of loans, which will consequently lead to a decline in investment spending, a fall in economic activity and output, and a reduction in inflationary pressures.

This paper examines the efficacy of the BLC of the monetary transmission mechanism in Uganda using disaggregated bank-level data. In addition to individual bank characteristics of size, liquidity, and capitalization, the study also examines the impact of macroeconomics variables (GDP, and inflation) and the monetary policy stance on bank lending behaviour. The significance of BLC is examined by estimating the banks' loan supply function in a dynamic panel data framework using generalized method of moment (GMM) dynamic panel estimator. The empirical results indicate the presence of the BLC of the monetary policy transmission mechanism in Uganda. In addition, individual bank-characteristics of liquidity and capitalization also play a significant role in influencing the supply of bank loans.

The remainder of the paper is structured as follows: Section 2 discusses the structure of the financial system and monetary policy process in Uganda. Section 3 presents a selective review of the theoretical and empirical literature on the monetary policy transmission mechanism. Section 4 discusses the methodological aspects of the study while section 5 presents the empirical findings of the study. Finally, the conclusions and policy implications are presented in section 6.

## **2 Financial system and Monetary Policy framework in Uganda**

### **2.1 Structure of the Financial System**

Uganda's formal financial system is dominated by banking sector, which holds about 80 percent of total assets of the formal financial system. There are currently 24 commercial banks, 3 credit institutions and 4 microfinance deposit-taking institutions. The financial sector has undergone considerable reform since the late 1980s. Before 1988, the formal financial sector was highly regulated with direct government controls over credit, interest rates and access to foreign exchange. Following the poor performance of the financial sector, partly on account of financial repression and macroeconomic instability, several

reforms were initiated in 1991. The interrelated objectives of these reforms were to strengthen techniques of monetary control, boost deposit mobilization, stimulate competition and enhance efficiency in the banking system, improve prudential regulation and supervision, and promote diversification of financial products. These reforms led to the rapid expansion of the banking and non-banking sector after 1994, and rapid growth of intermediation after 2000.

Notwithstanding the aforementioned reforms and the rapid growth of the banking sector, it remains relatively underdeveloped, not just in relation to the financial systems of advanced and emerging economies, but also in relation to those of other low-income countries and Sub-Saharan Africa (SSA). As shown in Table 1, although most of the indicators have improved over time, they nonetheless remain low in comparison to the SSA average. Furthermore, the net interest margins in Uganda remain relatively high, which not only reflects the high cost of borrowing, but may also be indicative of high intermediation costs.

Table 1: Indicators of Financial Sector Development

| Indicator in percentage      | 1991-<br>1995 | 1996-<br>2000 | 2001-<br>2005 | 2006-<br>2010 | 2011 | 2012 | SSA<br>* |
|------------------------------|---------------|---------------|---------------|---------------|------|------|----------|
| M2/GDP                       | 7.3           | 10.3          | 12.1          | 14.0          | 18.0 | 17.0 | 17.0     |
| Deposits/GDP                 | 6.6           | 11.0          | 15.5          | 15.0          | 21.0 | 22.0 | 31.0     |
| Currency/M2                  | 36.3          | 30.1          | 27.8          | 27.0          | 24.0 | 26.0 | -        |
| Private sector<br>credit/GDP | 5.0           | 5.8           | 6.1           | 9.0           | 15.0 | 16.0 | 20.0     |
| Net interest margin          | -             | -             | 10.9          | 10.4          | 10.8 | 12.7 | 8.0      |

\* SSA average for 2011, excluding south Africa & Nigeria

Source: Bank of Uganda

The banking industry also remains relatively concentrated, with big banks dominating the asset portfolio and the market share. This has implications for competition in the industry as banks with a high asset share may be less sensitive to monetary policy shocks as opposed to small banks that highly depend on borrowing from the central bank.

## 2.2 Monetary Policy Framework

The post-independence monetary policy framework that was in place up to 1993 was largely geared towards the cheap financing of government activities, extension of subsidized credit to privileged sectors of the economy and the pursuit of a fixed exchange rate rather than the control of inflation. In 1993, the Reserve Money Program (RMP)<sup>3</sup> was introduced, following the enactment of the BOU Act (1993). Since then, the primary objective of monetary policy has been to maintain low and stable inflation, expressed as a medium-term target of 5 percent per annum.

<sup>3</sup>The RMP rests on strong underlying economic relationships between base money, broader monetary aggregates, economic growth, and inflation. The relationship between broad money (M2) and the money base is relayed through the multiplier effect of financial intermediation and the propensity of people to hold cash.

Under the RMP, the overall macroeconomic objectives of desired real GDP growth, inflation, and balance of payments were defined. Broad money (M2) growth was then projected consistent with these macroeconomic objectives, given assumptions on velocity. The growth of the monetary base, the operating target<sup>4</sup> is then projected in line with the broader monetary aggregate and inflation, given assumptions about the money multiplier. In 2009, the RMP was modified, and a more flexible version of the RMP adopted with Net Domestic Assets (NDA) as the operating target to allow the central bank to tolerate faster growth in reserve money if this was driven by foreign exchange inflows. The structural transformation of the economy and developments in the financial sector over the last two decades weakened the underlying relationship between base money, broader monetary aggregates, and inflation as the money multiplier became very unstable. This necessitated the reform of the monetary policy framework. Consequently, an inflation targeting-lite (ITL) monetary policy framework was adopted in July 2011. Under the ITL framework, BoU sets the Central Bank Rate (CBR) consistent with the desired monetary policy stance for the month and supplies and/or drains liquidity in the interbank money market to ensure that the 7-day interbank money market rate is consistent with the CBR for the month.

### 3 Literature Review

#### 3.1 Theoretical Considerations – monetary Policy Transmission Channels

Various contributors have identified several channels through which monetary policy impulses are conveyed to the real economy. Bernanke and Blinder (1988; 1992), Christiano and Eichenbaum (1992), Mishkin (1995), among others have identified four core channels through which changes in monetary policy actions are transmitted to the economy: interest rate channel, exchange rate channel, other assets price channel and the credit channel.

The basic premise of the interest rate channel is that a tight monetary policy will lead to an increase in short-term nominal interest rates, and since prices are sticky, at least in the short-run, real interest rates follow suit. The high cost of capital causes firms and households to cut down investment spending and to scale down their purchases of consumer durables and houses, respectively. This will lead to a fall in aggregate demand, which consequently leads to a fall in output, given the assumption of sticky prices.

On the other hand, the exchange rate channel operates through the interest rate parity condition. The exchange rate channel affects aggregate spending through two sub-channels including the *balance-sheet effect*, in a way that if households and enterprises have debts denominated in foreign currency, movements in the exchange rate will change their net worth and debt-to-asset ratio, which in turn affects their spending and investment decisions. Secondly, the *relative price effect*, in which an appreciation of the domestic currency increases the demand for foreign goods relative to domestic goods (Mishkin 1996).

Monetary policy actions are also transmitted to the economy through the “*other assets*” channel. Changes in the monetary policy stance affects prices of other assets, such as,

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<sup>4</sup>Base money was adopted as the operating target since it was available with a shorter lag than data on broader Monetary aggregates.

foreign and domestic bonds, real estate and equities. Two channels are often emphasized, the Tobin's  $q$  theory of investment<sup>5</sup> and *wealth effects* on consumption<sup>6</sup>.

The Credit channel, which has assumed greater importance in contemporary research, emphasizes the role of asymmetric information and how the costly enforcement of contracts creates agency problems in financial markets (Bernanke and Gertler, 1995). In particular, two basic channels, the *traditional bank lending channel* (BLC) and the *balance-sheet channel* (BSC) are identified.

The BSC, operates through the net worth of business firms. It is based on the premise that a lower (higher) net worth of business firms will increase (decrease) the severity of adverse selection and moral hazard problems in bank lending. Thus, a lower net worth will induce banks to scale back their lending. A decline in net worth, which raises the probability of adverse selection, decreases lending to finance investment spending. Lower net worth of business firms also increases the moral hazard problem because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Since taking on riskier investment projects makes it more likely that lenders will not be paid back, a decrease in business firms' net worth decreases lending and investment spending.

Moreover, the BSC affects consumer expenditures on durable goods and housing, an important factor during the great Depression as highlighted by Mishkin, 1978. In the liquidity-effects view, the effects of the balance-sheet channels are most felt through their impact on consumers' desire to spend other than on lenders' desire to lend. In this model, if consumers expect a higher likelihood of finding themselves in financial distress, they would rather hold fewer illiquid assets like consumer durables or housing and more liquid financial assets.

In the BLC, a contractionary monetary policy decreases bank reserves and bank deposits thus leading to a decline in funds available for lending and investment spending. The important role of the BLC in monetary policy transmission can be traced back to Bernanke and Blinder (1988), who argue that there are three conditions for the existence of the BLC, that is: imperfect substitution between bank loans and bonds for borrowers, the central bank should be able to affect the supply of bank loans by changing the quantity of reserves, and the existence of imperfect price adjustment that prevents any monetary shocks from being neutral with respect to real output. Using the traditional IS-LM model, where IS curve was replaced by the credit-commodity curve (CC), Bernanke and Blinder (1988) formulated the CC-LM model, in which monetary policy is deemed to affect real economic activity through the credit channel or bank loan channel.

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<sup>5</sup>The Tobin's  $q$  theory presents a mechanism through which the effect of monetary policy to the economy is realized through the valuation of equities. A tight monetary policy puts the public in a situation that it (public) has less money than it requires, so it reduces spending to compensate for this deficit. Since it is easier to reduce spending in the stock market, demand for equities will fall, which consequently leads to a fall in equity prices leading to a lower  $q$ , which leads to lower investment spending, and consequently to a fall in aggregate demand and output. Also, a rise in interest rates reduces the price of bonds. If equities and bonds are substitutes, the fall in bond prices should also induce a fall in equity prices.

<sup>6</sup>Modigliani (1971) argues that consumer spending is determined by the lifetime resources of consumers, which comprise human capital, real capital and financial wealth. A major component of financial wealth is common stocks. When stock prices fall, the value of financial wealth decreases, which leads to a decline in lifetime resources, and consequently a fall in consumption and output.

The effect of monetary policy on bank loans supply depends on the characteristics of the banking sector including the size of banks, market concentration, capitalization and liquidity. A stronger *bank lending channel* will exist in a banking sector with relatively small banks with low liquidity and capitalization and weak bank market concentration, given the fact that these banks are highly exposed to market imperfections and hence face more difficulties in attracting non-deposit financing.

Financial strength is also characterized by loan loss provisions, operating costs and return on assets, number of bank failures in the past, and the ownership structure in the banking sector. For the latter, state influence exerted either through state control or direct public ownership of banks provides more funding possibilities and further lessens informational asymmetries. Additionally, foreign ownership weakens the bank lending channel, as foreign bank subsidiaries are likely to experience less financing constraints due to potential supply of additional funding from their parent banks. Other factors such as the regulatory framework deposit insurance requirements among other factors also play a key role in determining bank loan supply (Kashyap and Stein, 1993).

### 3.2 Empirical Literature

The empirical literature investigating the existence of the bank lending channel in developed countries using disaggregated bank-level data is well documented [see Kashyap et al. (1995a, 1995b), Kishan and Opiela (2000), Huang (2003), Altunvas et al. (2002), Ehrmann et al. (2003), Walsh (2003)], Angeloni et al. (2003), Gambacorta (2005), Ashcraft (2006), Zulkefly et al. (2010), among others. The general conclusion in most of these studies is that a tight monetary policy leads to a decline in bank credit (loans), which in turn has a negative impact to the economy. However, in Uganda there is a dearth of empirical research on the bank lending channel using disaggregated micro-level panel data. The only available study, at least to my knowledge, is Walker (2012), who uses annual bank-level data on bank lending and balance sheets for the period 1993 – 2008 to investigate the transmission of monetary policy, through the bank lending channel, in the five East African Community countries. He finds evidence that the lending behaviour of less well-capitalised banks and smaller banks is more sensitive to monetary policy shocks than that of better-capitalised banks and larger banks. His results lend support to the hypothesis that there exists a bank lending channel of monetary policy transmission in the EAC countries taken as one whole. He also finds evidence that, in contrast to advanced economies, the liquid asset ratio plays little or no role in explaining the volume loans lent out by banks, or the extent to which they react to monetary policy shocks.

Walker (2012) also ran the within groups regressions country-by-country. In the case of Uganda, he found the coefficients to be insignificant, or in some cases significant with counter-intuitive signs. He attributed these to the small sample size and argued that since Uganda had a fairly small number of observations, lack of degrees of freedom may help to explain these results, as may the likely downward bias in the Within Groups estimator.

## 4 Methodology

### 4.1 Specification of Empirical Model

The study follows Ehrmann et al. (2003) in specifying a model that allows for identification of the bank lending channel. The model posits that a profit maximizing bank decides the optimal amount of loans. Accordingly, the balance sheet identity of a profit maximizing bank  $i$  is defined as:

$$L_i + S_i = D_i + B_i + C_i \quad (1)$$

where  $L$  is the volume of loans,  $S$  is securities,  $D$  is the volume of deposits,  $B$  is the level of non-secured funding,  $C$  is capital of bank, and subscript  $i$  as earlier defined. It is further assumed that the loan market characterized by monopolistic competition.

Bank  $i$  faces a loan demand function,  $L_i^d$ , that depends on the level economic activity (Gdpg), inflation (infl), and the nominal lending interest rate (Irate). The loan demand function for bank  $i$  is thus specified as:

$$L_i^d = \beta_1 Gdp + \beta_2 \text{infl} + \beta_3 \text{irate}_i, \beta_1 > 0, \beta_3 < 0 \quad (2)$$

The demand for loan in an individual bank is expected to be positively related to economic activity, and negatively related to the bank individual lending or loan rate. However, there is no a priori sign for the coefficient on inflation.

Bank capital is assumed to be linked to the level of loans:

$$Cap_i = \lambda L_i \quad (3)$$

Assuming that deposits are demanded only because of their role as a means of payment and no interest is paid on them and that; a proportion of them is secured so as to avoid any liquidity risk. In this case, securities are expressed as:

$$S_i = \phi D_i \quad (4)$$

On the other hand, demand for deposits is a decreasing function of the interest rate on risk-free assets ( $RS$ ). This relationship is represented by equation (5).

$$D = \delta RS, \delta < 0 \quad (5)$$

Since banks do not remunerate deposits, they do not affect the amount of deposits that each bank holds ( $D_i$ ). Therefore, aggregate deposits remain exogenous to the bank and decrease with a tight monetary policy.

Furthermore, assuming that all banks have access to an alternative source of funds, which is unsecured and for which it pays an additional interest rate. The suppliers of the unsecured funding will require an external finance premium. The interest rate that bank  $i$  pays for these unsecured funding ( $RB_i$ ) will be equal to the risk-free rate ( $RS$ ) plus a premium. The premium depends on the bank's health signal ( $x_i$ ). The lower  $x_i$ , the higher the external finance premium. The interest rate that bank  $i$  pays for unsecured funds is thus given as:

$$RB_i = RS(\mu - \theta x_i) \quad (6)$$

Where  $(\mu - \theta x_i) \geq 1$ , for all individual banks. It then follows that the profit function for any individual bank, say bank  $i$ , is specified as:

$$\Pi_i = L_i * lrate_i + S_i * RS - B_i * RB_i - \Omega_i \quad (7)$$

Where  $\Omega_i$  defines the bank-specific administrative and remuneration costs for the required capital holdings.

Substituting equations (1) – (5) into the profit function, equation (7), and assuming equilibrium condition in the loan market<sup>7</sup>, the profit function of bank  $i$  can be re-written as:

$$\Pi_i = L_i \left( -\frac{1}{\psi_0} L_i + \frac{\psi_1}{\psi_0} Gdp + \frac{\psi_2}{\psi_0} Inf \right) + (S\phi D_i)RS + [(1-\lambda)L_i - (1-\phi)D_i]RB_i - \Omega_i \quad (8)$$

Each bank maximizes profit subject to its loan disbursements. Taking the first-order condition with respect to  $L_i$  and substituting equation (6) yields:

$$L_i = \frac{\psi_1}{2} Gdp + \frac{\psi_2}{2} Inf - \frac{\psi_0 \mu (1-\lambda)}{2} RS + \frac{\psi_0 \theta (1-\lambda)}{2} x_i RB_i - \frac{\psi_0}{2} \frac{\partial \psi_i}{\partial L_i} \quad (9)$$

Equation (9) is the standard loan equation in which monetary policy tightening through an increase in interest rates ( $RS$ ) leads to a reduction in deposits ( $D$ ). The bank can however keep the asset side of its balance sheet unchanged if it increases others sources of

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<sup>7</sup>The loan supply by bank  $i$ ,  $L_i^s$ , is a function of the available amount of money or deposits ( $Dep$ ), the nominal lending or loan interest rate ( $lrate$ ), and of the monetary policy instrument ( $MPS$ ), where the instrument can either be the interest rate set by the Central Bank or the reserve requirements rate on deposits or both. The direct impact of the policy interest rate represents the opportunity costs for banks when banks make use of the interbank market as a liquidity source. The loan supply function for bank  $i$ ,  $L_i^s$ , is thus specified as:  $L_i^s = \phi_i(x_i)Dep_i + \beta_4 lrate + \beta_5 MPS$ ,  $\beta_4 > 0$ ,  $\beta_5 < 0$ . The supply of loans is expected to be positively related to the loan nominal interest rate and negatively related to the monetary policy instrument. It is assumed that not all banks are equally dependent on deposits.



funding. But the interest rates that the bank has to pay for these funds were increased by the policy of monetary tightening. Banks pass at least part of this higher cost to the borrowers through increase in their loan rate ( $lrate_i$ ), which in turn reduces the demand for loans. It is therefore expected that the monetary policy variable ( $RS$ ) in equation (9) will have a negative sign, indicating that loans decline when a tight monetary policy stance is implemented.

At the individual bank level, loan supply is also influenced by bank specific characteristics, such as bank size ( $Size_i$ ), liquidity ( $Liq_i$ ) and bank capitalisation ( $Cap_i$ ).

These bank characteristics are interacted with the monetary policy variables. For example, interacting bank-liquidity with a monetary policy variable will help explain how the bank-loan supply responds with the bank-liquidity after monetary policy tightening. Therefore, the augmented loans equation in the dynamic panel data based on equation (9) is specified as given in equation (10).

$$\begin{aligned} \log(L_{it}) = & \beta_i + \sum_{j=1}^l \phi_j \log(L_{it-j}) + \sum_{j=1}^l \lambda_j RS_{t-j} + \sum_{j=1}^l \delta_j \log(Gdp_{t-j}) + \sum_{j=1}^l \alpha_j Inf_{t-j} \\ & + \beta X_{it-1} + \sum_{j=1}^l \varphi_j X_{it-1} RS_{t-j} + \mu_i + v_{it} \end{aligned} \tag{10}$$

From equation (10), the supply of bank loans ( $L_{it}$ ) is determined by the lagged dependent variable ( $L_{it-j}$ ), monetary policy stance defined by ( $RS$ ), gross domestic product ( $GDP$ ), inflation ( $Inf$ ), bank specific characteristics ( $X_i$ ), and the interaction term of bank characteristics and the monetary policy variable ( $X_i \cdot RS$ ).  $\mu_i$  ( $\mu_i \sim IID(0, \sigma_\mu^2)$ ) is bank specific effect while  $v_{it}$  ( $v_{it} \sim IID(0, \sigma_v^2)$ ) is the remainder error term. The total error term is therefore given as:  $\varepsilon_{it} = \mu_i + v_{it}$ .

#### 4.2 Data, Variables and Sample Characteristics

The size of an individual bank is defined as the total of assets of that bank in relation to the total of assets in the banking system, while liquidity is defined as the ratio of liquid assets of the bank to total assets of that bank. Capitalization is defined as the ratio of capital and reserves to total assets of the respective bank. Following Zulkefly, Ngah, Saini and Bakri (2010), all the three bank characteristics are normalized with respect to their average across all the banks in the sample. These variables are thus computed as defined in equations (11) – (13).

$$Size_{it} = \log A_{it} - \frac{1}{N_t} \sum_i \log A_{it} \tag{11}$$

$$Liq_{it} = \frac{LA_{it}}{A_{it}} - \frac{1}{T} \sum_i \left( \frac{1}{N_t} \sum_i \frac{LA_{it}}{A_{it}} \right) \quad (12)$$

$$Cap_{it} = \frac{(C + R)_{it}}{A_{it}} - \frac{1}{T} \sum_i \left( \frac{1}{N_t} \sum_i \frac{(C + R)_{it}}{A_{it}} \right) \quad (13)$$

The bank-specific data is taken from the balance sheets of 20 commercial banks. The data constitute an unbalanced panel since only a few banks have operated continuously during the period under investigation, 2000-Q1 to 2012-Q4. The study also uses macroeconomic time series data on inflation, quarterly GDP and the 91-day Treasury bill rate, which is used as a proxy of the monetary policy stance.

### 4.3 Empirical Framework

The study employs the generalized method of moments (GMM) dynamic panel estimator proposed by Arellano and Bond (1991), Arellano and Bover (1995) and recently extended by Blundell and Bond (1998). The advantage of the framework is that it helps control for potential biases induced by endogeneity (the correlation between the lagged dependent variable and the error term), which is inherent in equation (10) because of the inclusion of lagged dependent variables as regressors. However, Roodman (2009) argues that the system GMM can generate moment conditions prolifically, in which case, too many instruments in the system GMM overfits endogenous variable and weakens the Hansen test of the instruments' joint validity. Following Zulkefly et al. (2010), this study adopts two techniques to remedy the problem of instruments proliferation. First, not all available lags for instruments are used. Secondly, combining instruments through addition into smaller sets by collapsing the block of the instrument matrix. This technique has been used by Calderon et al. (2002), Cardovic and Levine (2005) and Roodman (2009), among others.

The study employs both one-step and two-step system GMM estimation. Zulkefly, Ngah, Saini and Bakri (2010) argue that the success of the GMM estimator in producing unbiased, consistent and efficient results is highly dependent on the adoption of the appropriate instruments. Therefore, three specifications tests suggested by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) are conducted. First, the Hansen test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analogue of the moments conditions used in the estimation process.<sup>8</sup> Second, the non serial correlation among the transformed error term is tested. Lastly, the difference in Hansen test is used to test the validity of extra moment's conditions on the system GMM.<sup>9</sup>

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<sup>8</sup>If the moment condition holds, then the instrument is valid and the model has been correctly specified

<sup>9</sup>This test measures the difference between the Hansen statistic generated from the system GMM and the difference GMM. Failure to reject the three null hypotheses gives support to the estimated model.

## **5 Empirical Findings**

The results of both the one-step system GMM and two-step system GMM estimation of the determinants of the commercial banks' loan supply function in Uganda are presented in Table 2. The coefficient of the 91-day Treasury bill rate, the indicator of the monetary policy stance is expected to be negative since monetary tightening lowers loans provided by the banking system. In both the one-step and two-step system GMM estimation, the coefficient of the 91-day Treasury bill rate is negative and statistically significant, which indicates that the bank lending channel is effective. In the one-step-system GMM model, a one percentage point increase in the 91-day Treasury bill rate leads to a contemporaneous decrease in the banks' loan supply by 0.132. In the two-step GMM estimation, the corresponding impact of a one percentage point increase in the 91-day Treasury bill rate is a decline in bank loan supply by 0.098 percentage points. The 91-day Treasury bill rate also affects the banks' loan supply with a lag, which in part indicates some persistence of the impact of the monetary policy stance on the supply of bank credit. The control variables, inflation and the real GDP, which are included to control for economic activity and cyclical patterns, are insignificant in explaining the supply of bank loans, save for the lag of inflation. This could be partly explained by the fact that the central bank usually responds to inflation by tightening the monetary policy stance. This is therefore expected to affect the commercial banks loan supply function with a lag.

The distributional effect of monetary policy on the lending behavior is captured by the interaction of the monetary policy variable with the individual bank characteristics. The coefficient of the interaction between the monetary policy indicator and liquidity is positive. This is consistent with theory, as more liquid banks are expected to be less sensitive to tight monetary policy relative to illiquid banks since they are able to provide more lending by drawing down on their stock of liquid assets. Zulkefly et al. (2010) argue that the positive coefficient of the interaction between bank liquidity and the monetary policy variable indicates that a low level of bank liquidity interact with monetary tightening to reduce the supply of bank loans. Ehrmann et al. (2003) also argues that banks with more liquid balances sheet can use their liquid asset to maintain their loan portfolio, and are therefore not grossly affected by a contractionary monetary policy stance. Kashyap and Stein (2000) also argues that liquid banks can insulate their loan portfolios by reducing their liquid assets, while less liquid banks are unable to do so, which makes liquidity an important determinant of banks' loan supply.

The interaction term between bank capitalization and monetary policy is also positive and significant. Zulkefly et al. (2010) argue that a positive relationship implies that banks with high capitalization ratio are able to offer more loans during a period of monetary policy tightening. The interaction between the bank size and the monetary policy variable is expected to be positive since lending by large banks is less sensitive to monetary tightening relative to small banks. A positive and significant coefficient would imply that large banks are less sensitive to monetary contraction than small banks since they continue to provide loans even after a monetary shock. The interaction term between bank asset or bank size and monetary policy is however not statistically significant, which implies that the size of bank assets is not relevant in influencing the supply of bank loans in Uganda.

Table 2: System GMM estimation results of determinants of Bank Loan Supply Function in Uganda:

|                                 | One-step GMM |              |          | Two-step GMM |              |          |
|---------------------------------|--------------|--------------|----------|--------------|--------------|----------|
|                                 | Coefficient  | Stand. error | p-value  | Coefficient  | Stand. error | p-value  |
| <b>Constant/Intercept</b>       | 2.451        |              |          | 2.412        |              |          |
| <b>Lagged log of bank loans</b> | 0.679        | 0.062        | 0.000*** | 0.723        | 0.061        | 0.000*** |
| <b>Macroeconomic variables</b>  |              |              |          |              |              |          |
| 91-day Tbill rate               | -0.132       | 0.049        | 0.032**  | -0.098       | 0.047        | 0.043**  |
| Lagged 91-day Tbill rate        | -0.396       | 0.231        | 0.000*** | -0.197       | 0.048        | 0.041**  |
| Log of GDP                      | 0.012        | 0.006        | 0.273    | -0.269       | 0.013        | 0.128    |
| Lagged log of GDP               | -0.281       | 0.056        | 0.273    | 0.115        | 0.357        | 0.239    |
| Inflation                       | -0.612       | 0.149        | 0.182    | 0.328        | 0.361        | 0.364    |
| Lag of Inflation                | -0.232       | 0.073        | 0.021**  | -0.053       | 0.847*       | 0.073*   |
| <b>Bank characteristics</b>     |              |              |          |              |              |          |
| Liquidity x MPV                 | 0.320        | 0.034        | 0.008*** | 0.247        | 0.021        | 0.037**  |
| Capitalization x MPV            | 0.224        | 0.012        | 0.029**  | 0.232        | 0.011        | 0.000*** |
| Size x MPV                      | -0.152       | 0.426        | 0.231    | 0.067        | 0.645        | 0.415    |
| <b>AR(2)-p value</b>            | 0.261        |              |          | 0.282        |              |          |
| <b>Hansen test -p value</b>     | 0.142        |              |          | 0.143        |              |          |

Source: Author's computations.

Note: The dependent variable is log of bank loans and all other variables as previously defined. \*\*\*, \*\*, and \* denote significance at the 1% level, 5% level and 10% level, respectively.

The AR(2) test for serial correlation and the Hansen test for the validity of instruments indicate that there is no serial correlation (autocorrelation) in the transformed residuals, and the instruments (moments conditions) used in the models are valid. As shown in Table 2, the p-values for the AR (2) and Hansen tests are statistical insignificant at the ten percent significance level, implying that the empirical model is correctly specified.

## 6 Conclusions and Policy Recommendations

This paper found the relevance role of the BLC of monetary policy in Uganda. In effect, tightening monetary policy influences the banks' loan supply. The findings also indicate the significant role of bank characteristics, liquidity and capitalization in influencing the banks' loan supply. More liquid banks possess a buffer in their balance sheets that enables them to mitigate the effects of monetary policy tightening on their lending. During monetary policy tightening, banks may be able to maintain their loan to the customer by using excess liquidity and bank capital as alternatives of loan financing. The BLC therefore plays an important role in affecting economic activity in Uganda. Any changes in the monetary policy stance will affect the bank behavior on both the assets and liabilities sides. A tight monetary policy will for instance drain reserves from the banking system, which in turn will make banks to restrict the supply of loans, which consequently

will lead to a decline in investment spending and fall in economic activity. Nonetheless, this paper has shown that there is a need for the central bank to monitor the micro-dynamics of individual bank behavior in order to enhance the efficacy of the lending channel of monetary policy transmission mechanism.

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