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April 2024

KBA Centre for Research on Financial Markets and Policy®
Working Paper Series

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Heterogeneity in Bank Responsiveness to Policy and Economic Shocks: The Role of Capitalization

Gillian Kimundi*

Abstract

Capital is central to efficient intermediation and is a core indication of the financial health of a bank. Recent shifts in monetary policy, economic shocks and context-specific events in interbank liquidity flow in Kenya call for a revisit of banks' response through the lens of their capitalization. Using data from 27 banks between 2001 and 2021, this study first reveals that there is heterogeneity in how banks respond to policy, economic and market shifts, and that capital plays a key role in maintaining (and in some cases amplifying) balance sheet activity and cushioning operating profitability. Small, lesser-capitalized banks are more sensitive to monetary policy and shifts in interbank market liquidity, whereas large, higher-capitalized banks are more sensitive to GDP shocks. Collectively, the role of capital depends on the nature of the shock, the size of the bank and the sub-period studied. The study concludes with relevant policy and bank-level implications from these findings.

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1.0 Introduction

Kenya's banking sector has long been characterised by sound capital adequacy ratios, often above the minimum regulatory levels. The current minimum regulatory capital adequacy ratios for Core Capital to Total Deposits, Core Capital and Total Capital to Total Risk Weighted Assets are 8%, 10.5%, and 14.5% respectively. As of December 2021, Core Capital and Total Capital to Total Risk Weighted Assets were reported at 16.6% and 19.5% respectively (Central Bank of Kenya (2021)), presenting a well-capitalized sector on average[1].

Overall, sectoral increases in capital are often attributed to capital injections and retained earnings. Globally, there has been pressure for banks to increase capital buffers, following the Global Financial Crisis, the recent COVID-19 Crisis and Basel III implementation in 2023 that increased capital requirements, emphasized loss-absorbing capital (Common Equity Tier 1 - CET1) and macroprudential aspects using countercyclical capital buffers. In addition, climate risk management conversations have recently highlighted the need to have additional capital requirements to cover emerging physical and transition risks and related losses. Now, it is well-evidenced that banks optimize their balance sheet activity in line with capital regulations, risk-taking incentives, leverage levels (Adrian & Shin, 2010), the broader macroeconomic environment, etc. Examining the dynamics of these adjustments is important for policy formulation and assessing implications of macroeconomic shocks. The role of a bank's funding structure (capital) has increasingly become important, not only as an indication of financial health, but also in how banks respond to shocks.

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1. Empirical and theoretical literature in banking argues that some of the reasons behind excess capital/ buffers are the exposure to risk, but also, avoidance of costs related to market discipline and supervisory intervention by the Central Bank if the bank does not meet the minimum requirements, as a sort of insurance . In addition, Lindquist (2004) also hypothesizes that excess capital can be used as a signal of bank solvency, making them more competitive in the deposit market. Furfine (2001) argued that increasing regulatory involvement (in the form of capital requirements and/or monitoring) may be behind excess capital/buffers.

In this study, I analyse the how a bank's lending activity and net operating income growth responds to monetary policy, economic and interbank liquidity shocks, given the level of capitalization The specific objectives are as follows: First, I assess the average effect of monetary policy and GDP shocks on the loan-to-asset composition of banks across peer groups. Secondly, the analysis examines the role played by capital in banks' response. Finally, the role of capital in the banks' net operating income growth following shifts in interbank market dynamics is examined. These give room to explore insights from country specific developments in the banking sector between 2015 and 2019, including the collapse of three banks and interest rate controls.

The empirical analysis reveals the following: First, consistent with empirical literature in this area, capitalization is important in how banks respond. Particularly, I find that small banks with higher capitalization are significantly less sensitive to monetary policy. Capitalization not only supports the lending activity of small banks, but also insulates them from the negative linkages between interbank market illiquidity (higher interbank spreads) and net operating income growth. Small, lesser capitalized banks are thus more sensitive to monetary policy and shifts in interbank liquidity. Large banks with higher capitalization, are more sensitive (positive interaction) to GDP shocks, showing that their lending activity is prone to business cycle effects. Closely related to bank capitalization, it is also observed that bank liquidity in the form of lower loan-to-deposit ratio is crucial in how banks respond to an increase in reserve requirements, which drains funding liquidity.

A possible mechanism at play here is the well-studied role of capital in maintaining balance sheet activity and cushioning bank profits against market and economic shifts. This study contributes to literature by first, showing evidence of funding structure implications in a frontier market, and secondly, pointing out asymmetries in the response based on bank size, type of shock and sub-period of analysis. The empirical evidence holds implications for monetary policy and prudential policy formulation from an acknowledgement of the tailored role capitalization plays in different banks and economic contexts.

2.0 Motivation and Related Literature

The role of bank capital in their response to policy, economic and broader market shocks is well explored in theoretical and empirical work. When it comes to the effects of monetary policy on banks, the thesis of the well-known bank lending channel (Bernanke & Blinder, (1988)) is that tighter monetary policy actions (e.g., open market operations and binding reserve requirements) will have a direct negative effect on deposits, which are the driving force behind loan supply for banks. Bernanke and Blinder's (1988) model of the lending channel suggest that open market operations withdraw reserves/deposits from the system, limiting loan supply[2]. This reinforces the view that a significant driving force behind bank lending is *"policy-induced quantitative changes"* on the depository base in bank balance sheets, through reserve requirements.

However, Romer & Romer (1990) questioning the potency of the bank-lending channel, suggests that banks can access alternative nondeposit sources of finance, diluting the impact a contractionary monetary policy will have on a bank's loan supply. This proposition spun into an empirical assessment of cross-sectional asymmetries across banks where, for example, smaller banks with lower access to alternative financing sources in an imperfect capital market face more pronounced effects on their loan supply (Kashyap & Stein (2000)). Kishan & Opiela (2000) find evidence that cross-sectional asymmetries in size and capital ratios matter, where lending activity of small, undercapitalized banks is more responsive to monetary policy. Van den Heuvel (2002) formalizes this as a capital channel of monetary policy, where loan supply effects are contingent on initial capital levels. This is consistent with Peek & Rosengren (1997) analysis on how capitalization declines resulted in declines of lending by Japanese banks in the US.

2. An alternative standpoint on the role of deposits is the household portfolio rebalancing argument holds where monetary policy stances alter the comparative yields between deposits and other financial and physical assets, affecting the amount of deposit households hold (Disyatat, 2010).

Gambacorta & Mistrulli (2004) & Gambacorta (2005)[3] conclude that well-capitalized (Italian) banks can shield their loan portfolio from monetary policy shocks due to access to uninsured funding, and additionally that capital plays a role in how banks respond to GDP shocks, insulating them from negative shocks. Gambacorta (2005) emphasizes that bank size is not necessarily relevant in monetary policy transmission. Kishan & Opiela (2006) extend their original analysis and examine not only the role of capital on monetary policy transmission, but also the asymmetric effect of contractionary vs expansionary policy. They find that not only is the role of capitalization still consistent with the empirical literature, but response to contractionary and expansionary policy by lower-capitalized banks differs where, in post-Basel (stronger constraints), contractionary policy reduces lending but expansionary policy effects are weak for these banks.

Halvorsen & Jacobsen (2016) examine the role of bank capital in monetary policy transmission through a multi-regime VAR model where the capital ratio is the threshold variable. Evidence supports a reformulated bank-lending channel that works through wholesale funding, where weakly capitalized banks lead to a larger policy effect on real economic activity. Gambacorta & Shin (2018) find the effects of contractionary policies are lower for banks with more capital. Similarly, Sáiz et al, (2018) quantify the role of bank capital in expansionary and contractionary monetary policy stances showing that in European banks, higher capitalized banks increase their lending more in expansionary stances. Recent empirical evidence on emerging market dynamics from Vietnam by Nguyen & Dinh (2022) report that there is a range values of bank capital where there is no effect of monetary policy on loan supply, but a lower range where the effect is negatively significant. These studies' findings are all complementary to the strand of literature that suggests contractions in banking activity are due to a "*capital crunch*" problem, rather than a "*credit crunch*" (Bernanke & Lown,1991; Barr, 2022[4]).

Shifting focus to broader economic shocks, the role of capital in how banks respond is consistent. Thakor (2014) states that bank capital can be viewed as a sort of "*braking distance*", in that better capitalized banks have a longer distance to failure, increasing its probability of survival, and that the banks' response to "*negative income shocks*" will depend on their internal target capital ratios, regardless of regulatory required levels. In a model of a bank capital channel, Meh & Moran (2010) find that an active channel (where banks put up capital/net worth to absorb losses) actually amplifies negative technology shock propagation to investment and output, but an economy with higher capital is better able to absorb these negative externalities. Berger & Bouwman (2013) examine whether a bank's precrisis capital is a source of economic strength for its survival during a crisis. Using the average of the bank's capital ratio in the two years before financial crises including the

3. The results from their analysis is only significant when excess capital (over Basel requirements) is used, rather than the capital to asset ratio.

4. "Without adequate capital, banks can't lend", Barr (2022), Vice Chair of Federal Reserve Supervision (Speech)

collapse of LTCM, the dotcom bubble, 9/11, etc, the study finds that higher capital consistently benefits small banks and supports their survival across crises and normal times. The role of capital is particularly for medium and large banks is circumstantial and is more crucial in banking crises.

To assess the long run benefits of capitalization, Budnik, et al. (2019) show that banks with higher capitalisation are able to better withstand negative shocks to the business cycle, with less impact on credit supply. They find that this moderating effect of capital is pronounced and longer for larger banks. In an analysis of the role of capital in local shock spillovers from banks with heterogenous levels of capital, Steven & Oliver (2022) use a natural disaster and show that firms connected to banks with low capital and that are strongly exposed to the disaster experience more negative effects on their borrowing, employment and asset growth, and furthermore regional GDP is affected by such banks. Firms with connections to highly capitalized banks do not suffer these indirect exposures.

This present study explores this role in the Kenyan context, examining whether the pass-through of policy decisions, economic and market shocks to bank activity and outcomes can be viewed through the lens of their funding structures.

3.0 Empirical Methodology

The analysis is based on a sample of 27 commercial banks in Kenya across three peer groups defined by the Central Bank of Kenya: large, medium, and small banks. The main results are based on a panel data analysis of annual bank-level data from 2001 and 2021. Bank specific characteristics are obtained from financial statements of the institutions and macroeconomic indicators are obtained from the Central Bank of Kenya website.

3.1 Role of Capital in Banks' Response to Monetary Policy and GDP Growth Shocks

The empirical specification and statistical approach is informed by previous literature (Gambacorta & Mistrulli (2004), Gambacorta (2005), Sáiz et al (2018)). The model specification seeks to capture the role of bank capital in the transmission of monetary policy. Furthermore, I assess the role of bank capital in how banks adjust their lending to GDP shocks. This is captured using interaction terms between capitalization (and other bank-specific variables) and monetary policy variables and GDP shocks, all as continuous variables.

$$LTA_{it} = \alpha+\gamma LTA_{i,t-1}+\beta_1 XCAP_{it-1}+\beta_2 \Delta MP_{t-1}+\beta_3 [\Delta MP_{t-1} *XCAP_{it-1}] +\beta_4 GDPSHOCK_{t-1} + \beta_5 [GDPSHOCK_{t-1}*XCAP_{it-1}] +\beta_6 XNPLR_{it-1} + \beta_7 [\Delta MP_{t-1}*XNPLR_{it-1}] +\beta_8 XLTD_{it-1} + \beta_9 [\Delta MP_{t-1}*XLTD_{it-1}] + \theta Z'_{it-1} +\varepsilon_{it}$$

$$i=1,\dots,N \qquad t=1,\dots,T$$

LTA_{it} is the Loan-to-Asset Ratio of the bank; $LTA_{i,t-1}$ is the lag of the Loan-to-Asset Ratio; ΔMP_{t-1} represents the lagged change in the Monetary Policy Variable (The Central Bank Rate and the ratio of bank cash reserves and balances with the CBK to Total Assets).

$GDPSHOCK_{t-1}$ is the lagged standardised GDP Growth, which deducts the mean from GDP Growth and divides it by the standard deviation (mean of standardized variable is zero). As such, the estimated coefficient on the shock variable is interpreted as the effect of a unit standard deviation shock to the independent variable.

For ease of interpretation, the bank specific variables used in the estimation are normalized (to have a mean of zero). To start I define each bank's capitalization as its Tier 1 Ratio less the Regulatory Minimum. This is normalized with respect to the mean. However, the main difference in this estimation is that the normalization is done within peer groups to ensure that peer- specific capitalization levels are considered:

$$XCAP_{ijt} = CAP_{ijt} - \sum_{t=1}^{T}\left(\frac{\sum_{i=1}^{Nj} CAP_{ijt}}{N_j}\right)$$

CAP_{ijt} is the Tier 1 Ratio less the Regulatory Minimum of bank i in Peer group j at time t.

The enclosed average, $\sum_{i=1}^{Nj} CAP_{ijt}/N_j$, is the average of CAP_{ijt} in N_j banks in Peer group j at time t. The second term averages this across time for each peer group and deducts this mean from the bank' capital ratio, implying that for the average bank $XCAP_{ijt} = 0$.

The remaining bank specific characteristics are Loan-to-Deposit Ratio and Non Performing Loan Ratio. There are included to assess if the effects of capital are significant after controlling for liquidity and asset quality, and are also normalised, but using the mean across all banks in the sample, without consideration of peer group averages, as follows:

$$XLTD_{it} = LTD_{it} - \sum_{t=1}^{T}\left(\frac{\sum_{i=1}^{Nj} LTD_{ijt}}{N_j}\right)$$

$$XNPLR_{it} = NPLR_{it} - \sum_{t=1}^{T}\left(\frac{\sum_{i=1}^{Nj} NPLR_{ijt}}{N_j}\right)$$

Where $XLTD_{it}$ is the normalized Loan-to-Deposit Ratio, and $XNPLR_{it}$ is the normalized Non-Performing Loan Ratio.

Z'_{it} is a vector of macroeconomic control variables including the Treasury Bill Rate and the Inflation Rate

Most importantly, the implication of the normalization of the bank specific variables is that for an average bank (whose $XCAP_{ijt}=XLTD_{it}=XNPLR_{it}= 0$) the parameters β_2 and β_4 on the Monetary Policy variable(s) and GDP Growth shock are the average effects on loan-to-asset ratio (lending activity concentration). β_3 and β_5 are the coefficients on the interaction terms that specify the role of bank capital in the transmission of monetary policy and GDP shocks to bank lending. For instance, the marginal effect of an increase in the monetary policy variable (Change in the Central Bank Rate, growth in Reserves) is:

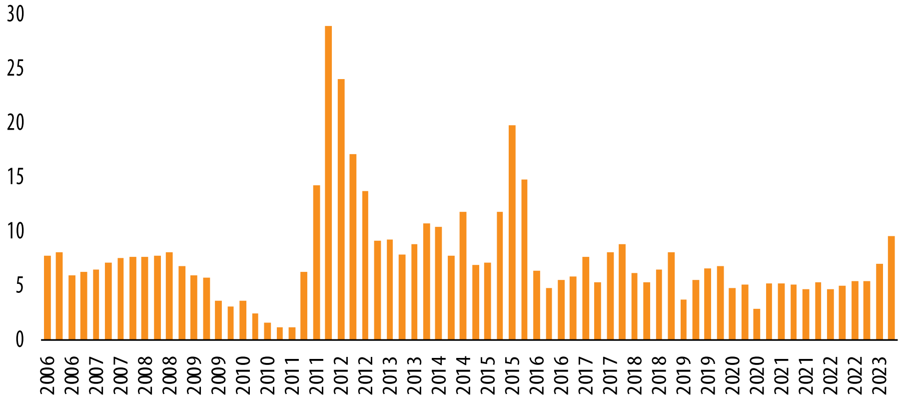
$$\partial LTA_{it} / \partial \Delta MP_{t-1} = \beta_2 + \beta_3 \left[XCAP_{it-1} \right] + \beta_7 \left[XNPLR_{it-1}\right] + \beta_9 \left[XLTD_{it-1}\right]$$

To differentiate the role of capitalization across Peer groups, an alternative model specification adds a layer to the interaction between the policy measure and capitalization, and similarly, between the GDP growth shock and capitalization,

3.2 Role of Capital in Bank's Response to Liquidity Shocks

The Kenyan banking sector has had critical periods of volatility and liquidity squeezes, especially during 2015 and 2016 following the three bank collapses.

Figure 1: Quarterly Interbank Spread %, Kenya (2006 to 2021)



Specifically: Dubai Bank went into receivership in August 2015[5], under citations of liquidity and capital deficiencies that exposed depositors, creditors and the overall banking sector to financial risk. Weak corporate governance structures also played a key role in the bank's collapse. Not long after, Imperial Bank went into receivership in October 2015[6], after "inappropriate banking practices" were brought to the regulator's attention. In April 2016, Chase Bank was placed in receivership, but was reopended at the end of the month with Kenya Commercial Bank as the receiver manager. The bank faced a run that month after liquidity concerns made their way to social media. The liquidity flow in this period was constrained as seen from the interbank market where the interbank spread (highest minus lowest rate) average 19.8% in Q3 2015 as seen in **Figure 3**, showing disparities in the access to finance by banks (Osoro & Santos (2020), Osoro & Muriithi (2017)).

The interbank market thus provides an interesting context to explore the effect of liquidity impediments on banks, given its role in shifting liquidity from banks with surplus to those facing deficits. In this discussion, it is important to consider that the interbank market typically features a price differentiation problem, where small banks are disadvantaged, paying higher rates/spreads and receiving lower rates when they lend to large banks (Furfine (2001), Kim (2017), Osoro & Muriithi (2017)). The situation is further amplified by the fact that, in September 2016, interest rate controls were imposed on the sector. According to Alper et al (2019), banks' return on equity declined in 2017 following the controls, particularly for small banks whose profitability was already below average.

5. (Central Bank of Kenya, 2015)
6. (Central Bank of Kenya, Capital Markets Authority, 2015)

Therefore, in this section, I analyse the role of capital in the propagation of liquidity shocks to operating profitability (growth in operating income less operating expenses) of banks across peer groups, where liquidity flow is captured from the change in the interbank spread in the previous year, $\Delta ISPR_{t-1}$. Specifically, the objective is to determine if capitalization inslulates banks' profitability from liquidity flow shocks, and whether the result is peer-specific.

$$OPINCGR_{it}=\alpha+\gamma OPINCGR_{i,t-1}+\beta_1 XCAP_{it-1} + \beta_2 \Delta ISPR_{t-1}+\beta_3 [\Delta ISPR_{t-1}*XCAP_{it-1} *PEER_i] +\beta_4 GDPSHOCK_{t-1} + \beta_5 [GDPSHOCK_{t-1}*XCAP_{it-1}] + \beta_6 XNPLR_{it-1} + \beta_7 XLTD_{it-1} +\theta Z'_{it-1} +\varepsilon_{it}$$

$i=1,\ldots,N$ $\qquad$ $t=1,\ldots,T$

Similar to the previous analysis on monetary policy and GDP growth shocks, an interaction with the Peer Group indicator is considered to differentiate the role of capitalization. Additionally, to capture the effect of the 2015-2019 cycle with bank collapses and interest rate controls, I define a Dummy variable "Vol", which takes a value 0 for years outside of this range, and 1 for years falling in this range. By analyzing the role of capital within and outside of this window, the analysis seeks to determine if this cuts across volatile periods in the sector.

3.3 Empirical Estimation

A dynamic panel GMM is used to estimate the above specifications. Dynamic Panel Data models contain one or more lagged dependent variables, allowing for the modelling of a partial adjustment mechanism. Due to the lagged dependent variable, the standard one-way fixed effects model become inconsistent due to the de-meaning transformation (Nickell Bias (Nickell, 1981). An instrumental variable-based estimator (IV, GMM) is required to tackle inherent endogeneity concerns. IV estimation typically fails to take all of the potential orthogonality conditions into account, therefore GMM-estimation is considered: the study relies on the System GMM (which uses Forward Orthogonal Deviations in place of demeaning (within) or first difference transformation to account for unobserved heterogeneity , Arellano and Bover (1995)). It is also well documented by Blundell and Bond (1998) that the GMM estimator with only-level instruments for the suffers from a potentially severe weak instruments problem. Their modification of the System GMM estimator includes lagged levels as well as lagged differences as instruments.

Relevant test of overidentifying restrictions (Sargan's Test) and Arellano-Bond Test of second order autocorrelation in the residuals will be done following System GMM estimations. The Sargan's test examines the crucial assumption for the validity of GMM - that the instruments are exogenous (null hypothesis). Additionally, by construction, the differenced residuals should possess first-order serial correlation. However, second order serial correlation should be absent from a well-specified model. If a significant AR (2) statistic is encountered, the second lags of endogenous variables will not be appropriate instruments.

4.0 Results

4.1 Descriptive Analysis

Table 1 reports the summary statistics of the key bank-level variables used in the empirical analysis. The Loan-to-Asset Ratio varies more in the medium and small banks sample. It is also noted that the standard deviation in the excess Tier 1 Capital Ratios (difference between the ratio and the regulatory minimum) is driven by the small bank peer group.

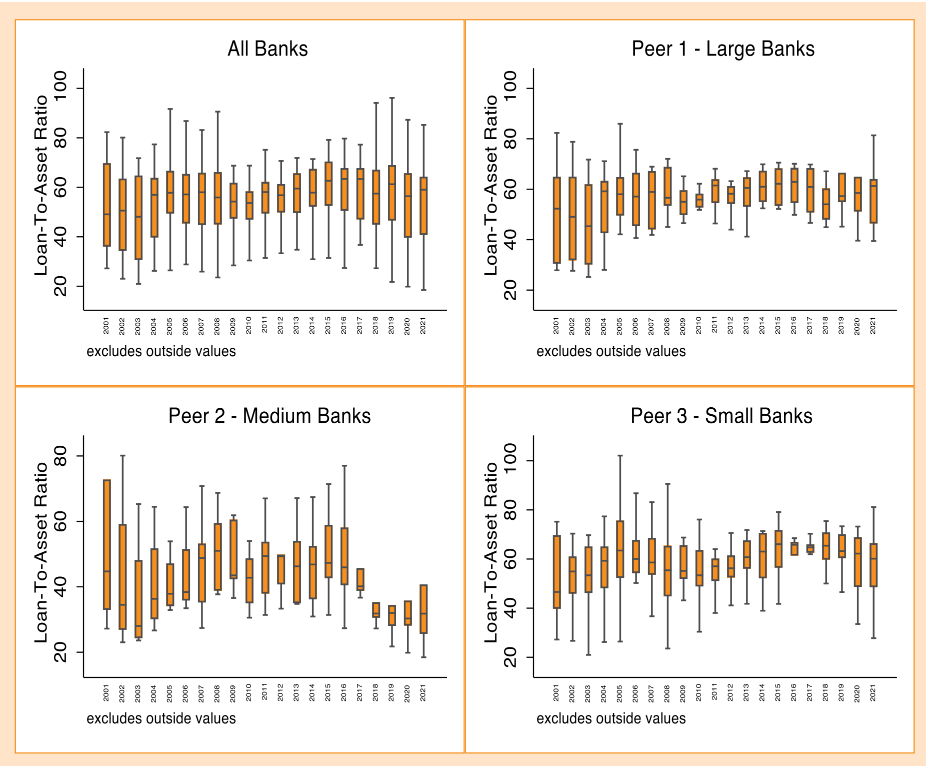
Table I: Summary Statistics

Peer Group	1 - Large		2 - Medium		3 - Small		All	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Loan to Asset Ratio	56.95	12.36	45.47	19.39	58.89	15.35	55.71	16.17
Capitalization (Tier 1 Capital - Regulatory Min)	7.20	4.58	16.97	9.85	17.99	22.67	14.44	17.44
NPL Ratio	9.81	18.14	9.46	10.40	15.58	13.79	12.58	15.03
Loan-to-Deposit Ratio	73.67	17.47	58.54	26.13	102.46	134.83	85.01	97.65
Change in Reserve to Asset Ratio	-0.23	3.05	-0.11	2.87	-0.16	5.22	-0.17	4.23
Change in Central Bank Ratio							-0.25	3.72
GDP Growth							4.42	2.17
3M Treasury Bill Rate							7.83	2.44
Inflation							8.64	5.02

In **Figure 2**, the yearly median and distribution of the loan-to-asset ratio by CBK-Defined Peer groups (Large Banks, Medium Banks, Small Banks) are provided. Kenyan commercial banks are classified into three peer groups using a weighted composite index of financial indicators. The peer group definitions in this sample of data are based on 2021 rankings.[8] On average, for the full sample of banks, the median LTA has

8 The composite index comprises of net assets, customer deposits, capital and reserves, number of deposit accounts and number of loan accounts. Large banks have a weighted composite index greater than or equal to 5 percent; Medium banks have an index between 1 percent and 5 percent; Small banks have an index lower than 1 percent.

Figure 2: Yearly Median and Distribution of Loan-to-Asset Ratios of Commercial Banks

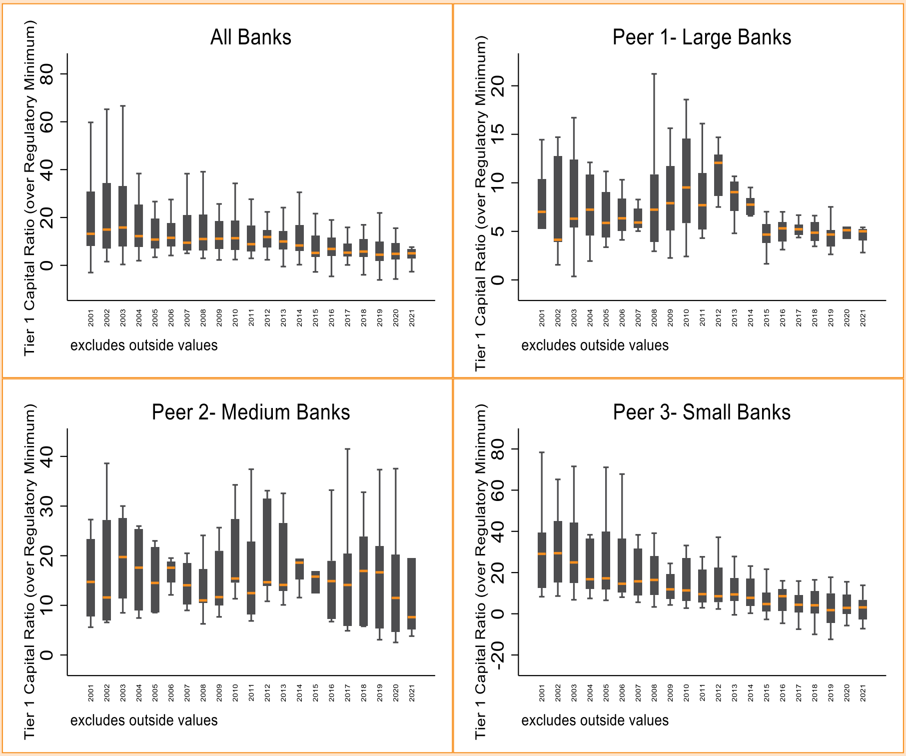


remained relatively stable since 2001 in the range of 50-60%. An assessment of the dynamics within the peer groups reveal

interesting patterns:- there is a narrowing of the distribution each year for large and medium banks in recent years. Secondly, since 2017, the LTA ratio of medium banks took a dip, with some banks starting to increase their ratios in 2021, as much as the median remains low. In 2016 and 2017, following the volatility conditions in the banking sector, the distribution of small banks' LTA narrowed around the peer median.

From **Figure 3** below, it is clear the three peer groups exhibit different trends in their capitalization ratios. On the one hand, large banks had an increasing trend in the median (excess) Tier 1 Capital ratios between 2007 and 2012, after which a decline is observed with a

Figure 3: Excess Tier 1 Capital Ratio (Median and Distribution by Peer Group)



strong dip in the median and cross-sectional variation from 2015 to 2021, settling at about 5 percentage points above the regulatory minimum. Medium banks have relatively stable median capital ratios; however, the cross-sectional variation has increased in recent years after a contraction in the same in 2014 and 2015.

For small banks, we observe high median capital ratios in the early 2000s, but also a strong trend in decapitalization, with more recent median capital ratios almost at per with that of large banks. A deeper assessment in **Figure 4** shows that prior to 2015, this was driven by their disproportionate growth in Risk-Weighted Assets (denominator) as compared to Tier 1 Capital amounts. However, since 2015 (year of collapse of 3 banks), the decline in the Tier 1 Ratio was linked to reduced balance sheet activity on both the asset and capital end.

Figure 4: % Change in Tier 1 Capital and Risk Weighted Assets - Peer Group 3 (Small)

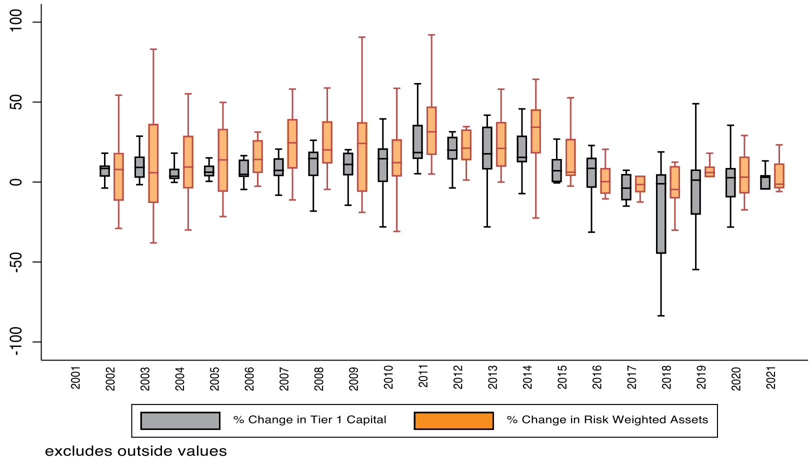


Table II: Asymmetric Effects of Monetary Policy and GDP Growth Shocks

This table presents coefficient estimates from dynamic panel data model using the Arellano-Bover/Blundell and Bond System GMM. The dependent variable is the Loan-to-Asset ratio of banks from annual financial statement data from 2001 to 2021. Column I and II define Monetary Policy using changes in the Central Bank Rate, while Column III and IV use the change in the ratio of bank cash reserves and balances with the CBK to total assets (measured as percentage points). The estimated coefficient on the GDP shock variable is interpreted as the effect of a unit standard deviation shock to the independent variable. P-values are provided in parentheses. *** indicates significance at 1%, ** indicates significance at 5% and * indicates significance at 10%

	I	II	III	IV
L1. Loan to Asset Ratio (γ)	0.937***	0.939***	0.820***	0.820***
	(0.000)	(0.000)	(0.000)	(0.000)
L1.Capitalization (β_1)	0.013	0.014	-0.016	-0.016
	(0.724)	(0.699)	(0.698)	(0.683)
L1.ΔMP (β_2)	-0.185**	-0.201*	-0.169*	-0.161*
	(0.047)	(0.066)	(0.068)	(0.063)
L1. ΔMP * L1.Capitalization	0.011**		0.008***	
	(0.047)		(0.000)	

	I	II	III	IV
Large * L1. ΔMP * L1.Capitalization		-0.016		-0.026
		(0.617)		(0.531)
Medium * L1. ΔMP * L1.Capitalization		0.0006		0.016
		(0.968)		(0.230)
Small * L1. ΔMP * L1.Capitalization		0.015**		0.007***
		(0.030)		(0.001)
L1.GDP Shock (β_4)	1.133***	1.094***	1.356***	1.345***
	(0.003)	(0.003)	(0.000)	(0.000)
L1.GDP Shock * L1.Capitalization	-0.012		0.001	
	(0.631)		(0.970)	
Large * L1.GDP Growth * L1.Capitalization		0.177**		0.161**
		(0.025)		(0.047)
Medium * L1.GDP Growth * L1.Capitalization		0.0310		0.002
		(0.739)		(0.980)
Small * L1.GDP Growth * L1.Capitalization		-0.029		-0.006
		(0.175)		(0.848)
L1.NPL Ratio	0.268***	0.267***	0.235***	0.236***
	(0.000)	(0.000)	(0.007)	(0.006)
L1. Loan to Deposit Ratio	-0.112***	-0.112**	-0.044***	-0.044***
	(0.009)	(0.013)	(0.003)	(0.003)
L1. ΔMP * L1.NPL Ratio	-0.010	-0.016	0.002	0.002
	(0.456)	(0.297)	(0.895)	(0.905)
L1. ΔMP * L1.Loan to Deposit Ratio	-0.009	-0.009	-0.007*	-0.007*
	(0.176)	(0.270)	(0.069)	(0.076)
L1.Inflation	-0.043	-0.039	0.010	0.0145
	(0.512)	(0.556)	(0.846)	(0.762)

	I	II	III	IV
L1.Treasury Bill Rate (3M)	0.479**	0.486**	-0.034	-0.018
	(0.041)	(0.047)	(0.790)	(0.891)
Constant	-0.231	-0.491	10.46***	10.24***
	(0.944)	(0.888)	(0.001)	(0.002)
N	27	27	27	27
Sargan test of overid. Restrictions (p-value)	0.388	0.342	0.377	0.312
Arellano-Bond test for AR(1) (p-value)	0.007	0.007	0.003	0.003
Arellano-Bond test for AR(2) (p-value)	0.996	0.949	0.799	0.755

p-values in parentheses "* p<0.10, ** p<0.05, *** p<0.01"

There is evidence of significant (positive) persistence in the Loan to Asset ratio. The asymmetric effects of monetary policy and GDP shocks on bank lending are inferred from the coefficients on the (change in) the Monetary Policy variables and GDP shocks and related interaction terms. Since the bank specific variables (Capitalization, NPL Ratio, Loan to Deposit Ratio are normalized with a mean of zero, the marginal effect (β_2) of the policy stance for the average bank is negative; implying tighter policy (increase in the CBR or increase in reserves) reduces the average bank's Loan to Asset ratio. Additionally, the marginal effect of GDP growth shock (a unit standard deviation increase of ~2 percentage points) on the average banks is positive and significant (β_4), showing that higher economic productivity supports the average bank's lending activity.

When we consider the role of capitalization from the interaction terms in Column (1) and (3), we observe that banks with higher capitalization (than their peers) are less sensitive to monetary policy given the positive and significant coefficient on the interaction term i.e when the CBR increases (reduces), the response of banks' to a tightening (expansion) stance is weaker for higher capitalization levels. In the same breath, weakly capitalized banks (negative XCAP) are more sensitive to monetary policy. This is consistent with literature on banks' asymmetric response to monetary policy given their capitalization (Kishan & Opiela (2000), Gambacorta and Mistrulli (2004), (Sáiz et al. (2018)). A possible mechanism at work here is that capitalization allows a bank to maintain balance sheet activity in the face of policy shifts (Gambacorta & Shin (2018)), and in the same vein, cushion the bank's net operating profitability from liquidity shifts in the sector.

However, when this role of capitalization in banks' monetary policy response is assessed by peer group, it is observed that it is specific to the Small bank peer group, where the interaction coefficient is positive and significant (+0.015). Additionally, in

Column II and IV, a disaggregated assessment of the association between lagged GDP shocks and lending activity reveals that the LTA of large-higher capitalized banks is more sensitive to GDP shocks. Large, weakly capitalized banks (negative XCAP) are less able to take advantage of positive economic shocks to their increase lending activity on similar footing. Though insignificant, it is observed that small, higher capitalised banks (positive XCAP) are less sensitive to GDP shocks (negative interaction coefficient)

The role of capital in how banks in these particular groups respond to shocks is statistically significant even after controlling for other bank-specific characteristics such as liquidity and asset quality. Though not the focus of this study, the analysis shows that bank liquidity (proxied by the loan-to-deposit ratio; bank is more liquid if normalized ratio is negative) plays a role in how banks respond to monetary policy, specifically when it is actioned through bank reserves, which drain bank liquidity. The interaction between the change in reserves (Column III and IV) and the loan-to-deposit ratio is negative and significant (10%) showing that banks with a negative XLTD (normalized loan-to-deposit ratio, more liquid) are less sensitive to monetary policy contraction/ expansion. This is consistent with empirical literature including Kashyap & Stein (2000) and Gambacorta (2005) who find that liquid banks[9] are able to better protect their loan portfolios from tight policy stances.

Table III: Asymmetric Effects of Interbank Market Liquidity on Growth of Net Operating Income

This table presents coefficient estimates from dynamic panel data model using the Arellano-Bover/Blundell and Bond System GMM. The dependent variable is the Net Operating Income Growth of banks from annual financial statement data from 2001 to 2021. The change in the interbank spread is measured as percentage points. Column II interacts the change in the Interbank spread with the Peer Group, Capitalization and the 2015-2019 Dummy, where Vol=0 represents years outside of this range, and Vol=1 represents years falling in this range. The estimated coefficient on the GDP shock variable is interpreted as the effect of a unit standard deviation shock to the independent variable. P-values are provided in parentheses. *** indicates significance at 1%, ** indicates significance at 5% and * indicates significance at 10%

	I	II
L1. Net Operating Income Growth	-0.061	-0.057
	(0.283)	(0.303)
L1. Δ Interbank Spread	-0.351**	-0.416*
	(0.043)	(0.051)
L1.GDP Shock	4.139**	4.096**
	(0.014)	(0.015)

9. Both studies measure the liquidity of US banks using the ratio of securities to total assets. The latter study includes interbank lending as liquid assets that can be drawn on by banks.

	I	II
L1.Capitalization	0.057	0.056
	(0.501)	(0.512)
L1.NPL Ratio	-0.064	-0.062
	(0.341)	(0.364)
L1. Loan to Deposit Ratio	-0.053*	-0.054*
	(0.075)	(0.071)
L1.Inflation	1.104***	1.112***
	(0.000)	(0.000)
L1.Treasury Bill Rate (3M)	-0.704	-0.820*
	(0.152)	(0.086)
L1.GDP Shock * L1.Capitalization	0.0706	0.068
	(0.390)	(0.397)
Vol=0 * L1. ΔInterbank Spread * L1.Capitalization	0.015**	
	(0.011)	
Vol=1 * L1. ΔInterbank Spread * L1.Capitalization	-0.069	
	(0.148)	
Vol=0 * Large * L1. ΔInterbank Spread * L1.Capitalization		0.031
		(0.431)
Vol=0 * Medium * L1. ΔInterbank Spread * L1.Capitalization		0.024
		(0.741)
Vol=0 * Small * L1. ΔInterbank Spread * L1.Capitalization		0.014***
		(0.001)
Vol=1 * Large * L1. ΔInterbank Spread * L1.Capitalization		-0.472***
		(0.000)
Vol=1 * Medium * L1. ΔInterbank Spread * L1.Capitalization		0.093
		(0.489)

	I	II
Vol=1 * Small * L1. Δ Interbank Spread * L1.Capitalization		-0.101*
		(0.082)
_cons	11.67**	12.43**
	(0.025)	(0.016)
N	27	27
Sargan test of overid. Restrictions (p-value)	0.144	0.117
Arellano-Bond test for AR(1) (p-value)	0.036	0.036
Arellano-Bond test for AR(2) (p-value)	0.226	0.205

p-values in parentheses "* $p<0.10$, ** $p<0.05$, *** $p<0.01$"

From Column I, the change in the interbank spread is associated with a baseline (normalized capital at mean value = 0) decline in the average banks' net operating income growth in the next period. The interaction terms in Column I provide a nuanced view depending on the capitalization and the period. It is observed that outside of the 2015-2019 period, banks with higher capitalization than their peer average in the sample experience a smaller decline in net operating income growth, given the positive and significant coefficient on the interaction term (0.0147). However, the insulation does not translate to 2015-2019 with critical banking sector developments. In a detailed analysis that considers the size of the bank, it is seen that this insulation is particularly significant for small banks in the sample. Higher capitalization cushions small banks from the negative effect of higher interbank spreads on net operating income growth.

5.0 Conclusion and Policy Implications

The focus of this study is the role that capitalization plays in banks' response to monetary policy, economic shocks and shifts in interbank liquidity. Consistent with empirical literature capitalization is important in the transmission of monetary policy. Particularly, small banks with higher capitalization are less sensitive to monetary policy. Large banks with higher capitalization, are more sensitive (positive interaction) to GDP shocks. Capitalization not only supports the lending activity of small banks, but also insulates them from the negative effect interbank market illiquidity (higher interbank spreads) has on the growth of net operating profitability. The role of capital does not extend to the 2015 to 2019 cycle in the Kenyan banking sector. Also, closely related to capitalization, it is also observed that liquidity in the form of lower loan-to-deposit ratio is crucial in how banks respond to a increase in reserves at the central bank which drain funding liquidity. An overarching theme exists, that the role of capitalization depends on the nature of the shock, the size/ peer group of the bank and the period.

The policy and bank-level implications from the present study are two-fold.

Firstly capital/funding structure is an important consideration to get a clearer picture of the role that banks play in the transmission of monetary policy, especially for small banks. Here, we are looking at peer group whose total asset base has doubled between 2011 and 2021, underscoring the significance of their increasing tangibility in the credit market. Ultimately, there is also a seeming tension between - on the one hand - the funding stability and insulation afforded to smaller banks by higher capital (especially when the interbank market is relatively illiquid) and - on the other hand – their role in the effective transmission (and desired effect) of expansionary/contractionary policies via the banking sector.

Second, in the same theme, the results from this study reveal that deeper insights and asymmetries lie across the peer groups as well. The role of capital differs depending on the type of shock, and most importantly, the size of the bank. For banks and policy makers, this calls for a critical acknowledgement of the tailored roles capitalization and related requirements, both present and future, play in different banks.

References

1. Alper, C. E., Clements, B., Hobdari, N., & Porcel, R. M. (2019). Do Interest Rate Controls Work? Evidence from Kenya. *IMF Working Paper WP/19/119*.

2. Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, Vol. 58*, No. 2, 277-297.

3. Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics, Volume 68, Issue 1*, 29-51, *https://doi.org/10.1016/0304-4076(94)01642-D*.

4. Barr, M. S. (Performer). (2022, December 01). *Why Bank Capital Matters.* American Enterprise Institute, Washington, D.C. , USA.

5. Basel Committee on Banking Supervision (BCBS). (2011). *Basel III: A global regulatory framework for more resilient banks and banking systems.* Basel, Switzerland: Bank of International Settlements.

6. Begenau, J., & Stafford, E. (2021). Limits to Bank Deposit Market Power. *Harvard Business School Working Paper,* No. 22-039.

7. Berger, A. N., & Bouwman, C. H. (2013). How does capital affect bank performance during financial crises. *Journal of Financial Economics, Vol 109*, 146-176, *http://dx.doi.org/10.1016/j.jfineco.2013.02.008*.

8. Bernanke, B. S., & Blinder, A. S. (1988). Credit, Money, and Aggregate Demand. The American Economic Review, 78(2). *The American Economic Review, Vol 78* (2), 435–439. *http://www.jstor.org/stable/1818164.*

9. Bernanke, B., & Lown, C. S. (1991). The Credit Crunch. *Brookings Papers on Economic Activity, Vol. 22*, issue 2, 205-248.

10. Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics 87*, 115–143.

11. Budnik, K., Affinito, M., Barbic, G., Hadj, S. B., & Chretien, E. (2019). The benefits and costs of adjusting bank capitalisation: evidence from euro area countries. *ECB Working Paper Series* No 2261.

12. Central Bank of Kenya (CBK). (2021). *Bank Supervision Annual Report.* Nairobi, Kenya: Central Bank of Kenya.

13. Central Bank of Kenya. (2015, August). Press Release: *Dubai Bank Limited. Retrieved from Central Bank of Kenya: https://www.centralbank.go.ke//images/docs/media/2015/DubaiBankpressrelease.pdf*

14. Central Bank of Kenya, Capital Markets Authority. (2015, October). Press Release on Imperial Bank Limited (In Receivership). Retrieved from Central Bank of Kenya: *https://www.centralbank.go.ke/images/docs/media/Press%20Releases/Joint_Press_Release_CBK_and_CMA_-_Imperial_Bank.pdf*

15. Cohen, B. H., & Scatigna, M. (2016). Banks and capital requirements: Channels of adjustment. S56-S69, https://doi.org/10.1016/j.jbankfin.2015.09.022: *Journal of Banking & Finance, Volume 69*, Supplement 1.

16. Disyatat, P. (2010). The bank lending channel revisited. Bank for International Settlements, Monetary and Economic Department, *Working Papers No 297*.

17. Drechsler, I., Savov, A., & Schnabl, P. (2017). The Deposits Channel of Monetary Policy. *The Quarterly Journal of Economics, Volume 132*, Issue 4, 1819–1876, *https://doi.org/10.1093/qje/qjx019*.

18. Flannery, M. J. (1989). Capital regulation and insured banks choice of individual loan default risks. *Journal of Monetary Economics, Volume 24*, Issue 2, 235-258, *https://doi.org/10.1016/0304-3932(89)90005-6*.

19. Furfine, C. (2001). Bank Portfolio Allocation: The Impact of Capital Requirements, Regulatory Monitoring, and Economic Conditions. *Journal of Financial Services Research, Volume 20*, 33–56, *https://doi.org/10.1023/A:1011147609099*.

20. Furfine, C. H. (2001). Banks as Monitors of Other Banks: Evidence from the Overnight Federal Funds Market. *The Journal of Business, Vol. 74*, No. 1, 33-57, *https://doi.org/10.1086/209662*.

21. Gambacorta, L. (2005). Inside the bank lending channel. *European Economic Review Volume 49*, Issue 7, 1737-1759, *https://doi.org/10.1016/j.euroecorev.2004.05.004*.

22. Gambacorta, L., & Marques-Ibanez, D. (May 2011). The bank lending channel: Lessons from the crisis. *Bank for International Settlements (BIS) Working Papers No 345.*

23. Gambacorta, L., & Mistrulli, P. E. (2004). Does bank capital affect lending behavior? (Bank capital and lending behaviour: empirical evidence for Italy). *Journal of Financial Intermediation, Volume 13*, No. 4, 436-457, *https://doi.org/10.1016/j.jfi.2004.06.001*.

24. Gambacorta, L., & Shin, H. S. (2018). Why bank capital matters for monetary policy? *Journal of Financial Intermediation, Volume 35*, Part B, 17-29, *https://doi.org/10.1016/j.jfi.2016.09.005*.

25. Halvorsen, J. I., & Jacobsen, D. H. (2016). The bank-lending channel empirically revisited. *Journal of Financial Stability*, 95-105, *http://dx.doi.org/10.1016/j.jfs.2016.10.004*.

26. Kashyap, A. K., & Stein, J. C. (2000). What Do a Million Observations on Banks Say about the Transmission of Monetary Policy? *The American Economic Review, Vol. 90*, No. 3, *https://www.jstor.org/stable/117336*.

27. Kim, K. (2017). A Price-Differentiation Model of the Interbank Market and Its Application to a Financial

Crisis. *Finance and Economics Discussion Series (FEDS)*, https://doi.org/10.17016/FEDS.2017.065.

28. Kishan, R. P., & Opiela, T. P. (2000). Bank Size, Bank Capital, and the Bank Lending Channel. *Journal of Money, Credit and Banking, Vol. 32*, No. 1, 121-141, https://doi.org/10.2307/2601095.
29. Kishan, R. P., & Opiela, T. P. (2006). Bank capital and loan asymmetry in the transmission of monetary policy. *Journal of Banking and Finance, Volume 30*, Issue 1, 259-285, https://doi.org/10.1016/j.jbankfin.2005.05.002.
30. Lepetit, L., Saghi-Zedek, N., & Tarazi, A. (2015). Excess control rights, bank capital structure adjustments, and lending. Journal of Financial Economics 115, 574-591, http://dx.doi.org/10.1016/j.jfineco.2014.10.004.
31. Li, L., Loutskina, E., & Strahan, P. E. (2019). Deposit Market Power, Funding Stability and Long-Term Credit. *NBER Working Paper 26163*, DOI 10.3386/w26163.
32. Lindquist, K.-G. (2004). Banks' buffer capital: how important is risk. *Journal of International Money and Finance, Volume 23*, Issue 3,, 493-513, https://doi.org/10.1016/j.jimonfin.2004.01.006.
33. Meh, C. s., & Moran, K. (2010). The role of bank capital in the propagation of shocks. *Journal of Economic Dynamics & Control Volume 34*, Issue 3, 555–576, https://doi.org/10.1016/j.jedc.2009.10.009.
34. Nguyen, T. P., & Dinh, T. T. (2022). The role of bank capital on the bank lending channel of monetary policy transmission: An application of marginal analysis approach. *Cogent Economics & Finance*, 10:1, , DOI: 10.1080/23322039.2022.2035044.
35. Nickell, S. (1981). Biases in Dynamic Models with Fixed Effects. *Econometrica, Vol.* 49, No. 6 .
36. Osoro, J., & Muriithi, D. (2017). The Interbank Market in Kenya: An Event-Based Stress Analysis Based on Treasury Bill Market. *European Scientific Journal Vol.13*, No.16, 127 - 145.
37. Osoro, J., & Santos, R. (2020). Chapter 5: *Banking in East Africa: Recent Trends and Developments. In E. D. European Investment Bank, Banking in Africa: financing transformation amid uncertainty.* Luxembourg: European Investment Bank.
38. Peek, J., & Rosengren, E. S. (1997). The International Transmission of Financial Shocks: The Case of Japan. *The American Economic Review, Vol. 87*, No. 4, 495-505, https://www.jstor.org/stable/2951360.
39. Romer, C. D., & Romer, D. H. (1990). New Evidence on the Monetary Transmission Mechanism. *Brookings Papers on Economic Activity.*
40. Sáiz, M. C., Azofra, S. S., Olmo, B. T., & Gutiérrez, C. L. (2018). A new approach to the analysis of monetary policy transmission through bank capital. *Finance Research Letters Volume 24*, 95-104, https://doi.org/10.1016/j.frl.2017.07.021.

41. Steven, R., & Oliver, O. (2022). Flooded Through the Back Door: The Role of Bank Capital in Local Shock Spillovers . *Journal of Financial and Quantitative Analysis Vol. 57*, No. 7 , 2627-2658, doi:10.1017/S0022109022000321.

42. Thakor, A. V. (2014). Bank Capital and Financial Stability: An Economic Trade-Off or a Faustian Bargain? *Annual Review of Financial Economics, Vol. 6*, 185-223, *https://doi.org/10.1146/annurev-financial-110613-034531*.

43. Van den Heuvel, S. J. (2002). Does Bank Capital Matter for Monetary Transmission? *Federal Reserve Bank of New York, Economic Policy Review*.

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