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# **Bank Capital-Credit Supply Threshold Analysis: Evidence from Kenya and Tanzania**

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# Bank Capital-Credit Supply Threshold Analysis: Evidence from Kenya and Tanzania

By Samuel Tiriongo and Hillary S. Mulindi\*

## Abstract

*The study sought to examine the optimal capital threshold needed to support sustainable lending, while leaning on perspectives from Kenya and Tanzania. In this pursuit, dynamic panel model and fixed effects panel threshold models were developed using annual bank-level data from commercial banks in Kenya and Tanzania over the period 2011 – 2024. The results reveal cross-country differences in the capital – lending nexus. In Tanzania, the capital channel is muted, and credit supply appears to be shaped more by liquidity conditions and funding structures than by regulatory capital. In Kenya, by contrast, capital interacts meaningfully with monetary policy. That is, well-capitalised banks adjust their lending more strongly in response to policy tightening. Moreover, the lack of evidence for a nonlinear capital effect in either country suggests that banks may be operating around a “neutral” capital zone, where marginal changes in capital adequacy do not substantially affect lending. In conclusion, bank lending in Tanzania and Kenya is shaped more by structural factors; hence, effective policy must adopt a nuanced approach that goes beyond the simplistic view of ‘more capital is better’ and instead considers the interplay of capital, liquidity, funding stability, monetary policy, and bank-specific characteristics.*

\* Samuel & Hillary are researchers at the Kenya Bankers Association. The Usual Disclaimer Applies.

# 1.0 Introduction

**B**anks play a pivotal role in the economy by intermediating financial resources and allocating them to the real sector (Smith, 2019). Literature typically associates capital positions with banking lending (see for instance Bernanke *et al.*, 1991; Hancock & Wilcox, 1994; Peek & Rosengren, 1995; Noss & Toffano, 2014; and Kolcunová & Malovaná, 2019), via credit supply and facilitation of various financial transactions; as banks serve as both agents and catalysts for economic activity. However, the extent to which banking activities, particularly credit supply, are influenced by bank capital levels remains largely unexplored in the East African context. This gap is significant, given that the East African region operates within a bank-led financial system where banks are the primary source of finance.

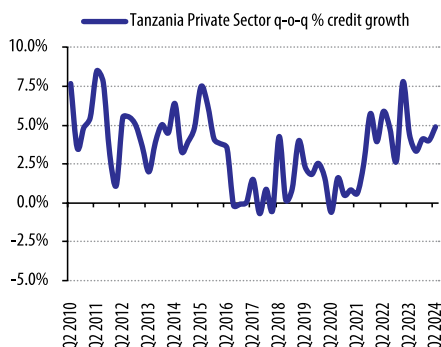
Elsewhere, the relationship between bank capital and lending has been widely studied (World Bank, 2016; Steffen, 2014 and Aiyar *et al.* 2014a & 2014b), with empirical evidence suggesting that capital levels significantly influence lending behavior (Gambacorta & Shin, 2016). A comparative analysis of private sector credit growth in Kenya and Tanzania depicts somewhat interesting trends. For instance, **Figure 1a** shows that Tanzania records a steady and sustained growth, reflecting consistent expansion in private sector credit. Since 2021, Tanzania's rapid growth in private sector credit has been supported by an accommodative monetary policy intended to bolster economic recovery. Specific regulatory measures implemented by the Bank of Tanzania (BoT) in July 2021, such as the TZS 1.0 trillion special loan facility for on-lending to productive sectors at rates below 10% and the reduction of statutory minimum reserves for banks lending to agriculture, provided significant impetus for credit expansion. Improved business conditions and recovery in activities like construction, trade and manufacturing further sustained this momentum.

In contrast, **Figure 1b** shows that in Kenya, the path is more volatile, marked by fluctuations with periods of slowdown followed by recovery, indicating differing financial sector dynamics. Kenya experienced a sharp fall in credit growth, with lending to the private sector contracting by 1.4% annually by December 2024. This steep fall was primarily caused by a tight monetary policy stance, characterized by the Central Bank Rate (CBR) being raised to 13.0% to anchor inflation expectations. The resulting high lending rates, coupled with exchange rate valuation effects from the appreciation of the Shilling, which reduced the value of foreign currency-denominated loans, significantly dampened credit demand.

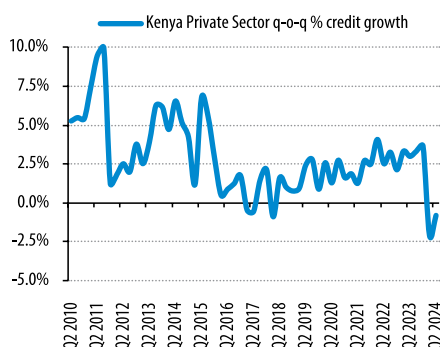
## Chapter 01

**Figure 1: Growth in credit to the private sector, Kenya versus Tanzania**

**(a) Tanzania**



**(b) Kenya**



Source: Bank of Tanzania

While this divergence in the credit growth path in Kenya and Tanzania points to differentiations in market conditions, monetary policy paths pursued and capital adequacy requirements, even with appropriate market conditions and a strong monetary policy signal, a lack of adequate capital disables a bank's ability to lend. In this regard, estimating an optimal capital-credit supply threshold is necessary to determine the optimal capital levels required to sustain sustainable credit growth in the two countries. Such insights would aid banks and policymakers in optimizing capital buffer requirements, thereby balancing financial stability with the need to sustainably support economic growth via bank lending.

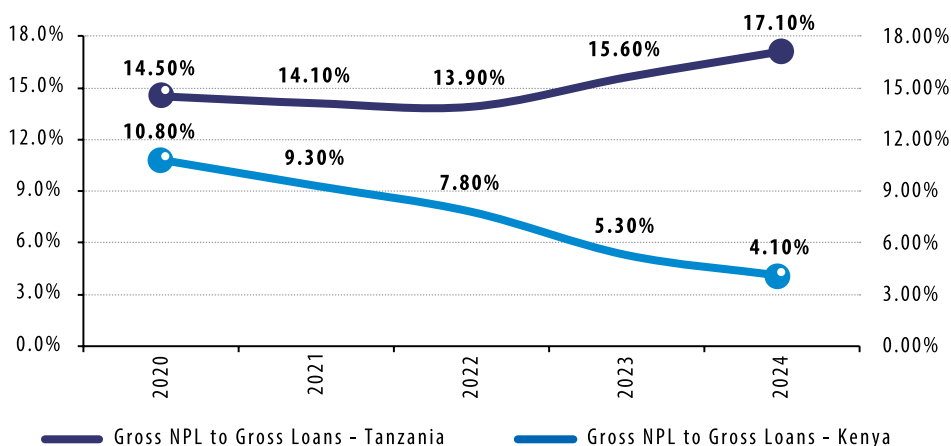
Additionally, drivers of changes in capital positions are important to appreciate. Data presented in **Figure 2** clearly shows divergence in the level and trend of the ratio of Gross non-performing loans to Gross loans in both countries, Kenya's Gross non-performing loans to Gross loans ratio rose to 15.6% in 2023 and

reached 17.1% by December 2024. This deterioration is attributed to a challenging operating environment and delayed repayments from both public and private sectors, particularly in the Trade, Manufacturing, and Real Estate sectors. In contrast, Tanzania successfully reduced its Gross non-performing loans to Gross loans ratio from 10.8% in 2020 to 4.1% by 2024, moving well below the 5% regulatory benchmark. This improvement was driven by an enhanced business environment that allowed firms to honour obligations and stringent regulatory enforcement. The Bank of Tanzania (BoT) mandated that banks implement NPL reduction strategies, improve underwriting standards using credit reference bureau reports, and enhance loan recovery operations.

Meh & Moran (2008) highlight that significant asset write-downs can substantially reduce bank capital, triggering a "credit crunch" where banks scale back lending, making external financing more difficult for businesses. Since banks operate as both lenders

and borrowers, raising funds to support their lending activities, capital adequacy becomes a critical pillar in determining their ability to sustain credit supply.

**Figure 2: Trends in Gross NPL to Gross Loans - Kenya versus Tanzania**



Source: Bank of Tanzania and Central Bank of Kenya

Against this backdrop, this paper seeks to examine the optimal capital threshold needed to support sustainable lending, drawing any parallels or convergence between Kenya and Tanzania. As such, the paper is structured as follows: Section One presents the introduction; Section Two reviews both theoretical and empirical literature on bank capital and credit supply; Section Three outlines the data, variables, and methodology; Section Four discusses the findings; and Section Five concludes with key policy implications.

## 2.0 Review of Literature

**The theories underpinning the bank lending behaviour presents the dichotomy of the demand versus supply-side credit market imperfections.**

The failure of the logic of the Modigliani-Miller (MM) irrelevance theorem of capital structure in 1958 has become a basis for the development of most theories on bank lending behaviour.

According to the MM theory, bank lending decisions are independent of their financial structure in a perfect market condition. As a bank will always be able to find investors willing to finance any profitable lending opportunities, the level of bank capital is irrelevant to lending and thus to the monetary policy transmission mechanism (Modigliani & Miller, 1958).

Building on MM theory's failure, Heuvel (2002) explains the Bank Capital Channel thesis (the model); incorporating risk-based capital requirements of the Basel Accord and an imperfect market for bank equity. Under this approach, bank lending depends on the institution's financial structure, lending opportunities and market interest rates. When equity is sufficiently low, because of loan losses or some other adverse shock, the bank will reduce lending because of capital requirements and the cost of issuing new equity. Even when the capital requirement is not binding, the model shows that a low capital bank may optimally forgo profit lending opportunities in the current period to lower the risk of capital inadequacy in the future.

Besides capital adequacy regulations and an imperfect market for bank equity, the model also incorporates the banks' maturity transformation exposing them to interest rate risks. A consequence of this is that a monetary tightening raises the short-term interest rate and lowers bank profits. Unless the bank can substantially reduce dividends, this will result over time in lower bank capital and, given the MM theory's failure, less lending. Thus, monetary policy affects the supply of bank loans through its effect on bank equity. This dynamic effect- the bank capital channel- amplifies the standard interest rate channel of monetary policy transmission.

Empirical evidence reveals that changes in capital requirements affect lending by a regulated bank only when bank equity is relatively expensive to raise and when regulatory requirements are binding constraints (Calomiris & Wieladek, 2014). If a bank experiences capital shock

## Chapter 02

from losses or a change in regulation, they tend to consider the trade-off between the marginal costs of issuing equity and the marginal cost of cutting back on lending. Earlier, Kiley and Sim (2010) had argued that banks respond to capital shock through a mix of financial disintermediation and recapitalization.

Better capitalized banks were also observed to be willing to supply more loans (Francis & Osborne, 2010; European Banking Authority, EBA 2015; Michelangeli & Sette, 2016), which is especially true during times of crisis (Foglia *et al.*, 2010). However, in some scenarios, solvent banks may nevertheless refuse to lend. Gambacorta *et al.* (2016) established that weakly-capitalized bank may improve their solvency by cutting credit exposures. Suppose the banking system as a whole is weakly capitalized; in that case, there may even be some apparent tension between the monetary policy imperative of unlocking bank lending (which entails expanding credit) and the supervisory objective of ensuring the soundness of individual banks (which entails cutting back credit). More generally, empirical evidence shows that in economic systems underpinned by relationship-based lending, adequate bank capital allows financial intermediaries to shield firms from the effects of exogenous shocks (Gobbi & Sette, 2015; Bolton *et al.* 2016); akin to the measures banks took to support borrowers during the COVID-19 pandemic in many countries across both developed and developing economies.

Analysis by Agur (2010) on the trade-off between financial stability and credit rationing – that arises when capital requirements are increased shows that capital requirements have a more substantial impact on the real economy when wholesale finance is extensively used. The impact is attributed to the feedback effects between loan rates and funding rates. More specifically, the uninsured financiers – who were used in the model to represent wholesale investors – care about the bank's risk exposures and that higher loan rates would lead to higher funding rates, which amplifies the capital requirements. Darracq *et al.* (2010) assess the effects of introducing risk-sensitive and more stringent capital requirements; showing that a bank capital shock results in an increase in banks' loan deposit margins. This is mainly driven by higher lending rates, which in turn lower loan demand and real activity.

From the foregoing trade-off between enhancing capital requirements and its impact on credit supply, this motivates a threshold analysis to determine optimal levels for market (banks) and policymakers consumption. The choice of Kenya and Tanzania, besides providing case studies for other emerging frontier economies, invites an opportunity to analyse two countries with shared banks spread out via organic cross-border movements, shared aspirations of convergence in monetary policy and trade relations in a custom-union. Some of these features would typically underpin country-specific idiosyncrasies.

# 3.0 Data, Variables and Methodology

## 3.1 Data

**T**his study uses audited annual financial statements of commercial banks from both Tanzania and Kenya, over the period 2011 – 2024. Specifically, Amount of Loans, Assets, Deposits, Loan-to-Deposit Ratio and Capital. Moreover, macroeconomic data on GDP growth, inflation, and the monetary policy rate were obtained from the Central Bank of Kenya, the Kenya National Bureau of Statistics, the Bank of Tanzania, and the National Bureau of Statistics of Tanzania.

## 3.2 Model Specification

The analytical model was anchored on the approach by [Gambacorta and Mistrulli \(2003\)](#) and [Kashyap and Stein \(1995\)](#) to address the study objectives<sup>1</sup>. **Equation 1** is adopted as the baseline specification:

$$\Delta \ln L_{it} = \alpha + \beta_j \Delta \ln L_{it-1} + \delta_j X_{it-1} + \tau_j \Delta MP_{t-1} + \omega_j \pi_{t-1} + \gamma_j y_{t-1} + \varphi_j \vartheta_{it-1} + \varepsilon_{it} \dots \dots \dots (1)$$

Where  $L_{it}$  is the amount of loans at bank  $i$ , at time,  $t$ , and  $\Delta \ln L_{it}$  is the private sector loan growth rate.  $\Delta \ln L_{it-1}$  is the lagged loan growth rate, and is included to capture the dynamic adjustment of bank loan growth to some target path,  $X_{it}$  is the measure of capital,  $X_{it}^2$  is the squared term of bank total capital, which included to test for the existence of a threshold-effect beyond which excess bank capital is either beneficial or harmful to loan growth.  $\Delta MP_{t-1}$

<sup>1</sup> In order to test the existence of asymmetric behaviour across banks due to differences in bank capital, following the approach by Gambacorta and [Mistrulli \(2003\)](#) we adopt the following measure:

$$X_{it} = \frac{EC_{it}}{A_{it}} - \left( \sum_i \frac{\sum_t EC_{it}}{N_t} \right) / T$$

Where captures the excess capital, measured as the difference between bank's capital position and the minimum regulatory capital, while is the bank's total assets. The excess capital indicator, , computed is normalized with respect to the average across all the banks in the respective sample in order to obtain a variable that sums to zero over all observations which ensures that the monetary or real GDP interaction terms are zero, for an average banks and therefore its coefficients can be interpreted as either the average monetary policy or real GDP effect.

is an indicator of monetary policy.  $\pi_t$  and  $y_t$  is the inflation rate and real GDP, respectively. Inflation and real GDP are included to control for the loan demand effects and facilitate the analyses to incorporate the cyclicity of loan demand along the business cycles.  $\theta_{it}$  is the bank-specific characteristics which are included as control variables, and they include loan-to-deposit rate and log of total assets which are liquidity and size indicators, respectively. These variables enter the dynamic regression in their lagged terms to mitigate against any possible endogeneity in

the estimation.

The baseline framework was then extended to include, threshold terms (i.e. the squared term of excess capital). The other extensions incorporated is the interaction terms, that is an interaction of excess capital and monetary policy or real GDP indicator, and all bank-control variables to avoid the endogeneity bias (Kashyap and Stein, 1995). Thus, the baseline specification is extended in two ways as captured in **Equation 2** and **Equation 3**.

$$\Delta \ln L_{it} = \alpha + \beta_j \Delta \ln L_{it-1} + \delta_j X_{it-1} + \eta_j X_{it-1}^2 + \tau_j \Delta MP_{t-1} + \omega_j \pi_{t-1} + \gamma_j y_{t-1} + \varphi_j \theta_{it-1} + \varepsilon_{it} \dots \dots \dots (2)$$

$$\Delta \ln L_{it} = \alpha + \beta_j \Delta \ln L_{it-1} + \delta_j X_{it-1} + \delta_j X_{it-1}^2 + \varrho_j X_{it-1} \Delta MP_{t-1} + \Gamma_j X_{it-1}^2 \Delta MP_{t-1} + \tau_j \Delta MP_{t-1} + \omega_j \pi_{t-1} + \gamma_j y_{t-1} + \varphi_j \theta_{it-1} + \Pi_j \theta_{it-1} \Delta MP_{t-1} + \varepsilon_{it} \dots \dots \dots (3)$$

### 3.3 Model Estimation strategy

The estimation of the equations (1) – (3) was based on the dynamic Generalized Method of Moments (GMM). The GMM approach was preferred on account of its five advantages in comparison to other panel models. First, the standard models of panel analysis, namely pooled ordinary least square regression model, random-effect model and the fixed-effect model provide parameter estimates which are biased and inconsistent due to the presence of lagged dependent variable or potential endogeneity problem created by explanatory variables (Nickell, 1981; Harris & Mátyás, 2004).

In this study specifically, a key empirical concern in the capital–lending relationship is endogeneity,

arising from simultaneity and reverse causality. For instance, while higher capital may enable banks to lend more, rapid loan expansion could erode capital buffers if credit quality deteriorates. Furthermore, omitted factors such as risk appetite or managerial quality could influence both capital and lending. The dynamic nature of credit markets also means that past lending patterns influence current lending decisions. On this account, had the study adopted pooled OLS regression model, the coefficient estimate on the lagged dependent variable would be overestimated because the lagged dependent variable has positive association with the effects in dynamic panel model (Hsiao, 2014). While fixed effects estimator yields underestimated coefficients due to the unobserved bank specific effects (Nickell, 1981).

Thus, system GMM estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1998) removes the biases generated by standard panel models, such as pooled OLS and fixed-effect models. Second, system GMM estimation gives efficient and consistent estimates even if explanatory variables are not strictly exogenous and if heteroskedasticity and autocorrelation within individuals exist. Third, system GMM technique tackles endogeneity problems and fixed effects, in addition to removing dynamic panel bias (Nickell, 1981). Addressing the endogeneity problem via the application of the first-difference GMM approach, with instruments sourced from the lagged independent variables, can generate biased and inconsistent estimates because of omission of potential information which likely captures the relation between levels and the relation between levels and first differences (Ahn & Schmidt, 1995).

Fourth, the system GMM estimator is more efficient than difference GMM estimation as it uses a system which combines regressions of levels and first differences. The system-GMM approach allows using more instruments as the original equation in

levels is instrumented with lagged first differences of the variables while first differenced equation is instrumented with the lagged levels of the variables. Moreover, first differences are assumed to be instruments, but uncorrelated with the fixed effects (Roodman, 2009). Furthermore, system-GMM estimation provides better results than difference GMM when the data is unbalanced panel because difference GMM magnifies the gaps (Roodman, 2009b). Finally, the system-GMM estimator is more efficient when the number of time periods is small as well as the persistence in dependent variable highly correlates with the autoregressive term which is close to unity (Blundell & Bond, 1998).

The GMM estimator's consistency depends on two specification tests, namely Hansen/sargan test for over-identifying restrictions and a serial correlation test in the error terms. Firstly, the Hansen test of the over-identification restrictions is used to detect if the model is well specified or not by analyzing the overall validity of instruments which should not be correlated with the error term.<sup>2</sup>

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2 Failure in rejection of the null hypothesis of Hansen test would suggest that the instruments are not correlated with the disturbances and are valid. This implies the model is correctly specified. In the test of serial correlation, the null hypothesis which states that there is no first-order serial correlation [AR (1)] should be rejected whereas null hypothesis which states that there is no second-order serial correlation [AR (2)] in the disturbances should not be rejected.

## 4.0 Results and Discussion

**T**able 1 presents the estimation results of the baseline (Model 1), threshold (Model 2) and interaction (Model 3) specifications using the dynamic panel GMM estimator.

**Table 1: Dynamic GMM Results for Tanzania and Kenya**

|                                          | Tanzania             |                      |                      | Kenya                |                      |                      |
|------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                                          | Model 1              | Model 2              | Model 3              | Model 1              | Model 2              | Model 3              |
| Lagged Loan Growth                       | -0.119<br>(0.130)    | -0.118<br>(0.131)    | -0.120<br>(0.130)    | -0.307***<br>(0.118) | -0.311***<br>(0.116) | -0.307***<br>(0.117) |
| Capital                                  | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   |
| Capital <sup>2</sup>                     | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   | -0.000<br>(-0.000)   |
| Monetary Policy Rate                     | -0.010<br>(0.014)    | -0.010<br>(0.015)    | -0.010<br>(0.014)    | -0.015<br>(0.013)    | -0.009<br>(0.014)    | -0.015<br>(0.013)    |
| Inflation                                | -0.015<br>(0.017)    | -0.016<br>(0.017)    | -0.015<br>(0.017)    | 0.006<br>(0.021)     | 0.005<br>(0.021)     | 0.006<br>(0.020)     |
| GDP Growth                               | 0.036<br>(0.035)     | 0.034<br>(0.034)     | 0.047<br>(0.043)     | -0.003<br>(0.004)    | -0.002<br>(0.004)    | -0.005<br>(0.006)    |
| Loan-to-Deposit Ratio                    | -0.767***<br>(0.251) | -0.764***<br>(0.253) | -0.765***<br>(0.250) | -0.246**<br>(0.118)  | -0.242**<br>(0.120)  | -0.247**<br>(0.118)  |
| Assets                                   | -0.397**<br>(0.170)  | -0.398**<br>(0.170)  | -0.395<br>(0.170)    | -0.352***<br>(0.096) | -0.339***<br>(0.096) | -0.353***<br>(0.096) |
| Monetary policy *<br>Capital interaction |                      | -0.000<br>(-0.000)   |                      |                      | -0.000**<br>(-0.000) |                      |

|                           | Tanzania            |                     |                     | Kenya               |                     |                     |
|---------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|                           | Model 1             | Model 2             | Model 3             | Model 1             | Model 2             | Model 3             |
| Capital * GDP interaction |                     |                     | -0.000<br>(-0.000)  |                     |                     | -0.000<br>(-0.000)  |
| Constant                  | 6.078***<br>(2.310) | 6.093***<br>(2.310) | 5.990***<br>(2.281) | 6.782***<br>(1.725) | 6.517***<br>(1.732) | 6.827***<br>(1.724) |

**Significance:** \*\*\* 1%, \*\* 5% and \* 10%. Standard Errors in parenthesis.

For Tanzania, loan growth is primarily driven by bank-specific factors. The loan-to-deposit ratio is strongly negative, underscoring the critical role of funding structures in constraining credit supply, while bank size is also negatively associated with loan growth, suggesting that smaller banks tend to expand lending more aggressively than their larger counterparts. The coefficient on lagged loan growth is negative but statistically insignificant, thus implying that lending dynamics are less path-dependent. Moreover, the linear and squared capital terms, along with their interactions with monetary policy, GDP growth and inflation, do not appear to significantly explain variations in loan growth. This muted capital effect points to the existence of a “neutral zone” in which additional capital buffers yield diminishing returns for credit expansion, with liquidity conditions and funding composition exerting greater influence than regulatory capital per se.

In contrast, Kenya presents a more nuanced pattern. The coefficient on lagged loan growth is negative and statistically significant, indicating mean reversion in lending, that is, periods of rapid credit expansion are typically followed by slower growth. Among bank-specific controls, a higher loan-to-deposit ratio is

associated with reduced loan growth, while bank size again indicate that smaller banks expand lending more aggressively than their larger counterparts. The linear and squared capital terms are individually insignificant, pointing to no direct effect of capital levels on lending. However, once capital is interacted with the monetary policy rate, the coefficient turns negative and significant. This implies that although capital generally supports bank lending activities, which is consistent with prudential regulatory frameworks that set minimum capital adequacy ratios (CAR) to safeguard depositors and limit excessive risk-taking, its positive influence on credit supply is dampened during periods of monetary tightening. Better-capitalized banks possess greater loss-absorbing capacity and regulatory headroom, making them both more willing and able to expand credit, but this capacity is not fully transmitted under restrictive macro-financial conditions.

In conclusion, the results reveal important cross-country differences in the capital - lending nexus. In Tanzania, the capital channel is muted, with credit supply appears to be shaped more by liquidity conditions and funding structures than by regulatory capital levels. In Kenya, by contrast, capital interacts



meaningfully with monetary policy. That is, well-capitalised banks adjust their lending more strongly in response to policy tightening, underscoring the importance of the bank-lending channel in a relatively more developed financial system. Moreover, the lack of evidence for a nonlinear capital effect in either country suggests that banks may be operating around

a “neutral” capital zone, where marginal changes in capital adequacy do not substantially affect lending. This clearly shows that lending in the two countries is driven more by structural factors such as funding composition, market size, and monetary policy interactions than by capital thresholds per se, as is the case with most advanced economies.

## 5.0 Conclusion and Policy Implications

**T**his study provides evidence that bank lending in Tanzania and Kenya is driven more by structural factors such as funding composition, market size, and monetary policy interactions than by capital thresholds per se, as is the case with most advanced economies. Consequently, effective policy requires a nuanced approach that goes beyond “more capital is better” and considers the interplay between capital, liquidity, funding stability, monetary policy, and bank-specific characteristics.

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