Determinants of Banks Private Sector Credit Supply in Tanzania

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Abstract

What determines the supply of private sector credit is an issue of policy and research interest in Tanzania. Using the Autoregressive Distributed Lag (ARDL) framework, this paper examines relevant factors influencing the supply of private sector credit by banks after the liberalization of the financial sector in Tanzania. The results revealed that a model with real private sector credit as the dependent variable was superior to the alternative model, and real short term lending rate was statistically a superior regressor compared to the real overnight bank lending rate. Moreover, it was found that bank deposits is an unimportant determinant of private sector credit, and that growth and inflation respectively had positive and negative effects on bank credit supply. The results also suggested that real bank credit growth was co-integrated with its determinants over the long run. The results from the analysis imply that policy should focus on policy interventions which promote economic growth, healthy bank balance sheets, and reasonable spread as motivating factors for banks to enhance supply of private sector credit in the country.

***Keywords**: Bank credit supply, Private sector, Bounds Co-integration test, Tanzania.*

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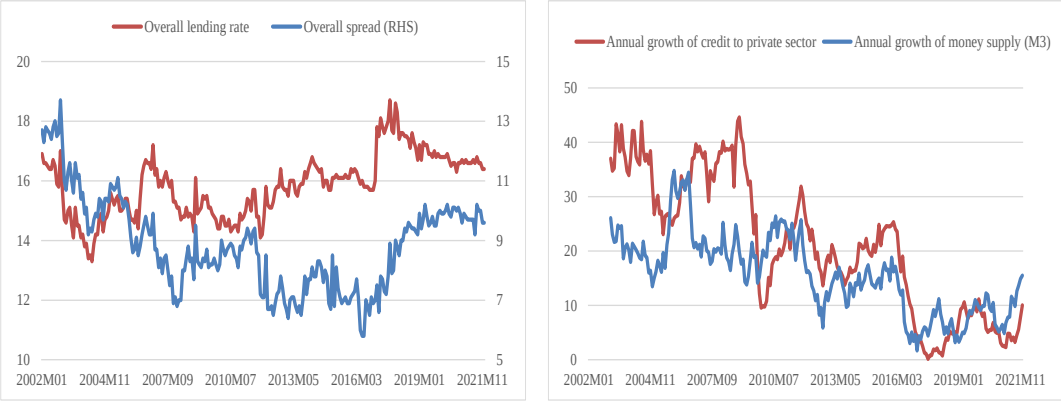
1. Introduction

Over the years, there have been a myriad of empirical assessments of various aspects of financial intermediation in developing countries (Beck et al., 2008). However, in Tanzania, the question of determinants of bank credit supply to the private sector has continued to remain a subject of interest in pedagogical and policy-oriented research (Kilindo, 2020). The growth of private sector credit in

Tanzania's economy is quite low compared to regional and emerging economies; importantly, the gap is widening over time. Back in the late 1990s and the mid-2000s, its standing was very much reasonable (Figure 1), with banks making relatively deeper contribution to the growth of the economy. Over the past 5 years, however, the growth of the private sector credit has shrunk even in absolute terms (Mwankemwa and Mlamka, 2022). The obvious inference from the trends is that the overall environment for private sector credit growth in Tanzania appears to have deteriorated over time, and banks in the country are not effectively performing their core function, i.e. channelling depositors' savings into loans for creditworthy businesses and individuals. Of course, the intensification of the financial crisis in the fourth quarter of 2011 had a considerable impact on bank funding at that time, with an incipient risk of disorderly deleveraging and hence an adverse impact on the banks' lending rates (BOT, 2019). This assessment is supported by increases in lending rates between 2012 and 2015, which indicated both a tightening of credit standards and decreased growth in credit to the private sector (Figure 1). While sub-dued money and credit growth may in part reflect an on-going correction of excess liquidity and past excesses in credit supply by banks, the speed of the adjustment observed since 2016 is a cause of concern with regard to the drivers of the private sector credit supply in Tanzania.

Figure 1: Developments in private sector credit condition in Tanzania: 2002 – 2021 (Per cent)



Source: Bank of Tanzania

Beck et al. (2008) concluded that there is a widespread understanding amongst policy makers that firms which operate in developing countries have challenges in accessing finance because of market imperfections. It is due to this reason that informal finance as well as development banks are set up to provide loans to cash strapped firms operating in developing countries. By the same token, Égert et al. (2006) posited that financial systems in developing economies are characterized as being predominantly bank based with about 85% of the financial sector's assets being bank assets with little or no capital market development, particularly, corporate bond and stock market segments. This implies that, in developing economies, commercial bank credit plays the role of being the main source of financing alongside foreign direct investment (FDI). It would therefore not be an exaggeration to conclude that credit is the bedrock upon which businesses are formed, jobs are created, the economy grows and the overall well-being of the citizens of a country is enhanced. On the contrary, the phenomenon of loose and even too stringent credit conditions, particularly in a bank based financial system, is not an exception in developing countries, as such conditions adversely affect economic performance. Accordingly, optimal bank credit supply demands for knowledge on the supply and demand determinants of bank credit supply (Maksomovic et al, 2004). In addition, commercial banks in developing economies fail to realize economic gains that come in the form of reduced costs from the exploitation of economies of scale. The opposite is true for developed economies where firms highly rely on equity finance. According to Chakraborty and Ray (2006), for countries with better developed financial systems, agency problems are resolved, and firms have an opportunity to borrow at cheaper rates and can subsequently invest more. In addition, well developed financial systems afford developing countries the benefit of being able to transition from the traditional agrarian sector to modern industrial activities by mobilizing funds for large investments.

The purpose of this paper, first, is to analyse the determinants of bank credit to the private sector during the years after the liberalization of the financial sector in 1991. In this engagement the analysis seeks to identify policy and policy determinants of bank credit supply. This is important for policy in view of the importance of bank credit for economic growth and development, on the one hand; and, the interest rate and credit channels of monetary policy transmission, on the other hand (Sacerdoti, 2005; Kishan and Opiela, 2000). Second, the analysis was also motivated by limited empirical studies on determinants of bank credit supply in Tanzania. A previous study by Kilindo (2020) only focused on macroeconomic determinants of bank credit. Moreover, a panel data study by Cihak and Podpiera (2005) was not specific on Tanzania. Besides, the previous

studies were not on bank credit supply but on competition between domestic and foreign banks in Kenya, Tanzania and Uganda.

The paper proceeds as follows. Section 2 motivates empirical analysis by dwelling on the evolution of bank credit supply to the private sector in Tanzania over the period 2001-2021. Relevant literature is reviewed in Section 3, and Section 4 presents the methodology of the study. Empirical results are presented in Section 5, and Section 6 gives conclusions.

2. Literature Review

In theory, bank credit supply to the private sector is determined by a set of factors internal and external to banks (Barajas et al., 2010; Amidu, 2014). The internal determinants include, among others, availability of reserves (funds), bank size, capitalization, access to long term funds, legal powers to enforce debt contracts, and borrowers' information (Djankov, McLiesh and Shleifer, 2005; Guo and Stepanyan, 2011; Cecchetti, 1999). Larger banks have high potentials for lending because: they are more diversified, have larger pools of funds available, have access to larger and more creditworthy corporate borrowers, and have more resources for the development of advanced credit risk management and evaluation systems" (Constant and Ngomsi, 2012; Berger and Udell, 2006). To advance credit it, ceteris paribus, requires a good lending capacity, from deposits mobilized and other sources of reserves (Misra, 2019; Constant and Ngomsi, 2012).

The non-bank-based determinants of bank's private sector credit supply include stance of monetary policy, financial structure, institutional, internal and external shocks (Baum et al., 2009; Jappelli and Pagano, 2002; La Porta et al., 1997). In the context of the traditional theory of monetary policy transmission mechanism, bank private sector credit is determined by the short term interest rate. Monetary policy actions that cause a decrease in interest rate lead to expansion in credit supply, and vice versa. In contrast, the credit channel suggests that the increase (decrease) in interest rates decrease (increase) credit worthiness and consequently access to bank credit by the private sector, particularly small borrowers (Myers, 1977; Diamond and Rajan, 2002; Bernanke and Blinder, 1988).

Apart from the monetary policy effects, commercial bank credit supply to the private sector may, in theory, be affected by macroeconomic environment, among others, economic growth, inflation, enforceability of debt contracts, legal systems governing banks, economic and political risks, type of tax regime, etc. Specifically, economic growth strengthens "consumer confidence and business

sensitivity, boosting consumption and investment and the need for their financing" (Hoffmann, 2004; Calza et al., 2001). On the supply side, economic growth increases reserves from deposits that augment lending capacity and profitability of the banks. Profitability, as a measure of return on equity (RoE) again triggers bank credit expansion. McDonald and Schumacher (2007) also argue that banks would lend if debt contracts were enforceable; else they would either shirk from lending due to moral hazard, adverse selection and associated high monitoring costs that engender loss of profit from unenforceable loan recovery or invest in low risk-low-return financial assets, for example, government papers (Nkusu, 2003). Thus, as maintained by Djankov et al. (2005), poorly functioning legal system, may be unable to sustain an effective lending channel based on ex-post creditor rights, and may depend on information sharing for their credit markets to function.

Empirical studies in developing countries carry evidence on diverse and sporadic determinants of bank credit supply to the private sector. In Asia, panel data based studies by Sarath and Van Phan (2015) established that deposits, liquidity and non-performing loans were the most important and theory consistent bank based (internal) determinants of bank credit supply. In addition, such studies found that government bond rate, economic growth and inflation were also theory consistent external determinants of bank credit supply. Similarly, a panel data study by Sharma and Gounder (2012), which covered some Island countries in the Pacific, found that the bank based factors, including deposit rate, assets, and size of the banks were important positive determinants of credit supply. The study also found that economic growth was a positive determinant of bank credit supply, and that both lending rate and inflation had negative effects on lending by the banks in the Pacific Island countries.

In sub-Saharan Africa (SSA), several country specific studies have established diverse internal and external determinants that bear influence on credit supply to the private sector. In Ghana, a study by Adekele and Awodumi (2018) established that the bank credit supply over the long run was positively determined by exchange rate, net foreign liabilities, and real GDP. Over the short run, Adekele and Awodumi (2018) found that bank credit was negatively determined by external factors, including inflation, money supply, net foreign liabilities, and reserve requirement. A study by Baoko et al. (2017), which was also conducted in Ghana, found that bank credit supply over the short and long run periods was positively determined by bank deposits as an internal factor, and factors external to the bank were broad money supply, real lending rate, and inflation. Unlike Adekele and Awodumi (2018), the study unexplainably found that the effect of inflation on bank credit was positive over the short run. Moreover, a study in

Ghana by Ladime et al. (2013) also found that bank lending was positively and significantly determined by both factors internal and external to the banks, including bank size, capital structure, the central bank lending rate, and exchange rate.

Furthermore, Amidu (2014) established that credit supply by banks in Ghana was determined by bank-based factors (bank size and liquidity) and external factors (money supply and economic activities). The study also found that bank-based factors impacted positively on the supply of credit by the banks. Katusiime (2018) also found that bank credit supply was determined by inflation and its volatility, the nominal exchange rate and credit demand inertia (one-period lagged bank credit). Among others, the study found the important role of interest rates and economic growth in explaining bank credit supply in Uganda. In Ethiopia, a study by Assefa (2014) found that bank credit supply over the long run was positively determined by bank-based factors, especially deposits, and also by external factors, which included real lending rate, inflation and credit demand inertia (one-period lagged credit). Over the short run, the study found bank credit was only determined by an external factor, namely money supply but not deposits, which is a bank specific factor. Also, a study by Abuka and Egesa (2000) concluded that income was one of the important determinants of bank credit growth in the East African Community (EAC) countries, including Kenya, Tanzania and Uganda.

In sum, the literature surveyed reveals existence of several important determinants of bank credit supply in developing countries which, for the sake of convenience in the impending analysis, are clustered here into four categories: a) bank based (internal) factors, including size, capitalization, liquidity, volume of deposits, and non-performing loans; b) policy factors, including discount rate, the statutory minimum reserve ratio, and the real lending rate; c) macroeconomic (external) factors that include inflation, economic growth, public sector credit, exchange rate, regulatory and legal framework for debt enforcement, sophistry of financial system, national politics, culture (Rajan and Zingales, 2003; Garretsen et al., 2004; Djankov, McLiesh and Shleifer, 2005); and d) internal and external shocks. Noteworthy, the regressands (dependent variables) used in previous studies differed across studies: they included credit to GDP ratio, credit to total assets ratio, loans and advances to total assets ratio, level of bank credit, and growth of real bank credit. The diversity of regressands and regressors (dependent variables) make results informing but not comparable within and across countries. The incomparability of the results is complicated by the

diversity that characterizes the methods of data analysis put to use. They include error correction model (ECM), Generalized Method of Moments (GMM), Two Stage Least Squares (2SLS) and autoregressive distributed lag (ARDL) bounds test method. The diversity of models and estimation methods, let alone the sample size and data type, differs notably. The analysis here is based on quarterly time series data fitted by the ARDL model. Implicitly, the results from this specific study on Tanzania serve to add to the existing literature on the supply-side studies on determinants of bank credit in developing market economies.

3. Methodology

3.1 The Estimation Model

The investigation into the determinants of commercial bank credit supply to the private sector in Tanzania is based on a model that reads as:

$$bc_t = (X_{i-t}, Y_{j-t}, Z_{k-t}, D_1, D_2) \quad \text{..... (1)}$$

where bc_t is bank credit to the private sector, measured either as a ratio of the GDP (cr) or in its real growth rate (cg). Given the literature reviewed, bc_t is determined by policy variables (X_i: i = 1, 2, …., N), bank based factors (Y_j: j = 1, 2, …, M), macroeconomic fundamentals (Z_k: h =1, 2, …, h), monetary policy shocks (D_1), and the global financial shock (D_2) over the sample period (T). Given the literature surveyed, the available data and macroeconomic fundamentals in Tanzania, the elements of X_i are two: real short-term lending rate (r_L) and real over-night inter-bank lending rate (r_{ov}). Both are measured by their respective values net of one-period lagged inflation rate, which is commonly used as a proxy for expected inflation. The effect of either rate on bank credit supply is indeterminate[1]. However, high cost of lending, ceteris paribus, may have a positive effect on bank credit supply if borrowers "are willing to and able to pay more premium", which is an additional cost over the lending rate (Ladime et al., 2013). Bank size (b_s) is the only bank-based factor in (Y_j) which was measured by real growth rate of total domestic deposits of the commercial banks, including savings, demand, and time deposits[2]. In fact, according to Mbowe (2015), private

[1] According to literature, the discount rate and statutory reserve ratio are other elements that could enter the estimation model.

[2] The Non-Performing Loans (NPLs), which constitute one of the determinants of bank creditin the literature, are often raised as one of the banks' hesitation to lend to the private

deposits dominate banks' funding in Tanzania; they were over two-thirds over the period 2001-2012. Accordingly, the bank size is expected to have a positive effect on bank credit supply.

The set of macroeconomic variables (Z_K) is constituted by inflation (π) and real rate of economic growth (g). Inflation, which is expected to have a negative effect on bank credit supply, is measured as the first difference of the natural logarithm of consumer price index (CPI) in Tanzania. The CPI was also used to deflate the nominal variables. Economic growth is measured as the first difference of the natural logarithm of real GDP, and its effect on bank credit supply is expected to be positive. A negative effect on bank credit supply is expected from the global financial crisis (D_1) over the period 2007– 2008 and shifts in monetary policy regime (D_2) during the sample period. Either shift variable was assigned a unit for event and zero otherwise.

3.2 Data Types, Sources and Reliability

The analysis is based on quarterly time series data for the period 2002: I - 2021: IV. The data in level, which were transformed by natural logarithm, were obtained from two main sources: a) the annual and quarterly reports of the Bank of Tanzania (BoT) and b) the National Bureau of Statistics (NBS) in Tanzania. EViews (Version 10) was used to estimate the models and also carry out the relevant diagnostic tests. Noteworthy, the measures of variables used in the analysis: a) serve to capture better the macroeconomic environment in Tanzania during the sample period, b) aim to build a body of knowledge on the subject matter, and c) target to provide a basis for comparing results with those obtained in previous studies in developing countries and beyond. Table 1 reveals that the median credit ratio (cr) was smaller than its mean, and its quarter-to-quarter supply ranged from 2.36 to about 14.89 per cent.[3] Table 1 also shows that the median real lending rate (r_L) and deposits rate (r_D) were 15.36 per cent and 2.51 per cent, respectively; and the median nominal interest rate spread ($i_L - i_D$) was 12.33 per cent, that is about two times the nominal deposit rate calculated at 3.10 per cent.

sector in Tanzania (Abuka and Egesa, 2007). Nonetheless, the variable was excluded in the analysis mainly due to lack of data.

[3] According to Mbowe (2015), the annual average bank credit to the private sector over the period 2001-2012 wasless than that which was obtained in most SSA countries, among others, Kenya; and large corporations dominate the banks' loan portfolio of which a third was in foreign currency.

Notably, the quarter-to-quarter median real rates of economic growth (g) and inflation (π) were about -0.24 per cent and 1.61 per cent, respectively. The statistics in Table 1 reveal that the variables were marginally skewed mostly to the left for having the median values larger than the mean values. Nonetheless, all the variables had significant kurtosis, more notably the real 91-day Treasury bill rate, mainly due its characterization by some outlier rates, caused by high inflation rates in mid-1990s. In general, the descriptive statistics in Table 1 show that most variables in the estimated model were not normally distributed. The correlation coefficients in Table 2 suggest existence of negative relationship between the bank credit ratio (cr), over-night (r_{Ov}), short-term real lending rates (r_L), growth of bank deposits (gd), and economic growth (g). A positive correlation was notable between the bank credit ratio, bank size (bs) and both real treasury bills rate (r_{TB}) and inflation (π). Notable, the correlation between the bank size and the credit ratio was very high (0.92). Moreover, the growth rate of bank credit ratio was negatively correlated with all proxy measures of monetary policy (over-night interbank rate, and both lending and treasury bills rates). The results also reveal that the bank credit growth rate was negatively correlated with bank size, economic growth, and inflation. Only growth in bank deposits was positively correlated with the growth in bank credit.

Table 1: Descriptive Statistics, 2002: I – 2021: IV

Variable	Mean	Med.	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Jarque - Bera	Obs.
cr	8.07	7.35	14.89	2.36	3.92	0.16	1.46	12.01***	116
cg	2.48	2.88	36.38	-28.46	9.22	-0.38	5.58	34.92***	116
r_L	16.70	15.36	39.74	6.91	6.37	1.33	4.88	51.26***	116
r_D	4.63	2.51	26.95	-5.94	6.94	1.27	4.03	36.10	116
$i_L - i_D$	12.06	12.33	5.22	26.86	-1.50	5.62	35.68	5.17	116
r_{OV}	-1.71	-1.44	7.56	-14.98	3.72	-0.65	3.87	8.44**	83
r_{TB}	-2.78	-1.61	32.18	-47.09	6.89	-1.42	21.52	1696.17***	116
gd	2.03	2.35	22.85	-19.21	5.13	-0.22	6.75	69.11***	116
bs	15.34	15.39	17.41	12.68	1.44	-0.18	1.80	7.55***	116
g	1.77	-0.24	22.01	-16.08	6.59	0.91	3.92	19.93***	116
π	2.62	1.61	16.08	-3.78	3.69	1.08	4.17	29.05***	116

Table 2: Correlation Matrix of the Variables of the Estimation Model, 2002:I –2021:IV

Variable	cr	cg	$r_{ov}r_{TB}\_91$		r_L	gd	bs	g	π
cr	1.00								
cg	-0.15	1.00							
r_{ov}	-0.02	-0.02	1.00						
i_{TB}_91	0.04	-0.04	0.66	1.00					
r_L	-0.31	-0.07	0.46	0.58	1.00				
gd	-0.28	0.38	0.12	0.10	0.21	1.00			
bs	0.92	-0.24	-0.04	0.02	-0.23	-0.27	1.00		
g	-0.22	-0.29	-0.05	0.01	0.13	-0.28	-0.13	1.00	
π	0.04	-0.54	0.01	0.06	-0.09	-0.49	0.03	0.47	1.00

Among others, the negative correlation between real economic growth and both credit ratio and bank credit growth are inconsistent with theory.

3.3 Estimation Methods

The long-run relationship between the variables in equation (1) was investigated by using (bounds) Autoregressive Distributed Lag (ARDL) co-integration technique. The technique was preferred for two main reasons, aside many others. One, it attends to potential simultaneity problem in theories and some growth regressions with variables in equation (1), among others, inflation and economic growth, and also financial sector development and economic growth. On the latter, for example, Romer and Romer (1990) specifically note that "movements in lending are largely determined by movements in output" (p. 155). Second, the method is credited for being parsimonious in data; it is good for small sample data points (Pesaran and Shin, 1999; Pesaran, Shin and Smith, 2001). The models estimated were subjected to a battery of tests. The data (in natural logarithm) were subjected to descriptive analysis; the estimation model was investigated for specification errors and heteroskedasticity.

4 Unit Root and Co-Integration Test

4.1 Unit Root Test

Though it is not a prerequisite in ARDL co-integration tests, ADF (Augmented Dickey- Fuller) technique was used to test the null hypothesis that the regressors were integrates of order zero, that is, I (0), against the alternative hypothesis that they were I (1).

Table 3: ADF Unit Root Test Results

Variables	ADF Test (with Intercept)		ADF Test (with Intercept and Trend)	
	Level	First Diff.	Level	First Diff.
cr	-0.68	-3.56***	-2.52	-3.57***
cg	-4.67***	-	-4.67***	-
r_L	-1.21	-15.97***	-2.56	-15.90***
r_S	-2.13	-21.38***	-1.13	-21.67***
r_O	-9.44***	-	-9.40***	-
r_{TB}	-3.90***		-5.203***	
m_2	-2.16	-8.64***	-2.14	-8.61***
dg	-4.00***	-	-3.99**	-
bs	-1.08	-11.54***	-3.55**	-11.52***
g	-2.95	-9.90*	-2.73	-9.99*
π	-2.45	-12.77*	-2.45	-12.81*

Note: The asterisks, ***, ** and *, respectively, stands for critical values at 1%, 5%, and 10% levels of statistical significance.

The ADF results in Table 3 reject the null hypothesis for four variables: growth rate of real bank credit (cg), real overnight rate (r_{OV}), real Treasury bill (91 day) rate (r_{TB}), and the rate of real deposits growth (dg). The alternative hypothesis is accepted in favour of the remaining variables, and no variable was I (2).

4.2 Co-Integration Test

The optimal lag length for the ARDL model was investigated by using AIC, SIC and H-QC. Owing to the use of quarterly data, the initial lag length of the unrestricted ECM estimated was set at eight equivalents to a maximum of two

lags recommended for quarterly time series data (Pesaran and Shin, 1999; Narayan, 2004). The AIC, SIC, and H-QC suggest different optimal lags for the estimation of the preferred models (Table 4). Nonetheless, first, the choice of optimal lag length was based on AIC and the standard error (s.e.) of estimation as they appeared logically consistent. Second, pre-tests based on systematic elimination of insignificant lagged below, and the optimal lag suggested by the AIC and the standard error of estimation (s.e.) improved the explanatory power of the estimated models, which respectively are ARDL (4,4,4,3,2) and ARDL (6, 7, 7, 3, 3).

Table 4: Choice of Lag Lengths of the Estimation Models

(a) Model of Credit to GDP Ratio: cr = f(cr, r_L, dg, g, π), ARDL(4,4,4,3,2)

Lag length	AIC	SIC	H_QC	se	R^2	F-stat.
0	1.93	2.15	2.02	0.61	0.55	16.31
1	1.87	2.22	2.00*	0.58	0.62	11.73
2	1.82	2.30	2.02	0.56	0.66	10.05
3	1.81	2.40	2.05	0.54	0.70	8.76
4	1.80*	2.51	2.09	0.53*	0.73	7.84
5	1.84	2.67	2.18	0.54	0.74	6.69
6	1.92	2.87	2.31	0.55	0.74	5.52
7	1.88	2.94	2.31	0.54	0.77	5.44
8	1.93	3.12	2.41	0.55	0.78	4.74

(b) Model of Credit Growth : cg = f(cg,r_L, dg, g, π), ARDL(6,7,7,3,3)

Lag length	AIC	SIC	H_QC	se	R^2	F-stat.
0	7.14	7.34	7.22	8.34	0.59	22.55
1	6.89	7.20*	7.01	7.19	0.71	21.24
2	6.78	7.21	6.96*	6.70	0.76	18.51*
3	6.74*	7.29	7.00	6.47*	0.79	15.87
4	6.79	7.43	7.05	6.52	0.80	13.32
5	6.84	7.62	7.15	6.57	0.81	10.81
6	6.81	7.71	7.17	6.40	0.83	10.12
7	6.76	7.79	7.18	6.20	0.85	9.72
8	6.80	7.93	7.26	6.25	0.86	8.64

Note: *The most optimal lag structure per each criterion.

Table 5 presents F-statistics obtained by the ARDL (4, 4, 4, 3, 2) and ARDL (6, 7, 7, 3, 3) of normalized equations that were respectively estimated for the ratio of bank credit to the GDP and real growth rate of bank credit.

Table 5: Estimated F-Statistics by ARDL Co-integration Test

Model 1: Private sector credit to GDP ratio

Implicit Equations	F-statistics	Status
cr| cr, r_L, dg, g, π	1.97	Not co-integrated
dg|cr, r_L, dg, g, π	2.45**	Co-integrated
g|cr, r_L, dg, g, π	4.26***	Co-integrated
r_L |cr, r_L dg, g, π	2.82**	Co-integrated
π|r_L, π, cr, dg, g	2.17*	Co-integrated

Model 2: Private sector credit growth

Implicit Equations	F-statistics	Status
c| cg, r_L, dg, g, π	5.87***	Co-integrated
dg| cg, r_L, dg, g, π	1.46	Not co-integrated
g| cg, r_L, dg, g, π	2.78**	Co-integrated
r_L | cg, r_L dg, g, π	2.40***	Co-integrated
π|r_L, π, cg, dg, g	0.91	Not co-integrated

	Critical values		
Bound	1%	5%	10%
Lower bound, I(0)	3.233	2.476	2.129
Upper bound, I(1)	4.760	3.746	3.289

Note: (i) The asterisks, ***, ** and *, respectively, stand for critical values at 1%, 5%, and 10% levels of statistical significance.

(ii) Critical values are from Narayan (2005) for k = 4 (with a constant and trend) and over 80 observations.

Table 5 shows that all, except one of the estimated F- statistics for Model 1 in Table 5, were larger than the 10 per cent upper bound critical values. Similarly, the results show that all, except two of the F-statistics estimated for normalized equations for credit growth model, were above the critical F-statistics. However, the hypothesis of co-integration was rejected for bank credit to GDP model because the F-statisic (1.97) was statistically insignificant and below the lower bound values at 10 per cent test level. In contrast, the F-statistic (5.87) estimated for the bank credit growth model was statistically significant and above the upper bound critical value at 1 per cent test level. Accordingly, the hypothesis of no co-integration (αi = 0) was accepted for the bank credit to GDP ratio model and accepted for bank credit growth model. Accordingly, real bank growth model was preferred and used in the analysis hereafter because its results may not be spurious and meaningless but robust and useful for policy inference.

Estimation of the long and short multipliers by the conditional ECM with optimal lag lengths excluded the two dummy variables (D_1 and D_2) proven "irrelevant" in pre-test estimations[4]. The pre-tests also established that the growth rate of money supply and the 91-treasury bills rate were poor proxies for monetary policy. In this regard, ceteris paribus, real short-term and overnight bank lending rates are the preferred proxies of monetary policy used in the analysis.

4.3 Long run Impact Multipliers

Table 6 shows that the estimated elasticities of the real short-term lending and the overnight bank lending rate with respect to the supply of bank credit over the long run were negative and statistically insignificant at the conventional test

[4] Incidentally, the drop of D_2 from the analysis is supported by the argument by Murinde (2010) that financial crisis lacked effect in economies with banks and stock markets not largely integrated in the global markets. It is also likely the crisis was aborted by the Bank of Tanzania that also establisheda Department of Financial Sector Stability in 2009 whose main role is to monitor the financial systemdue regard being to provide preventive measures and policies to moderate the risk of financial instability

levels[5]. It is noteworthy that, even though both elasticities were statistically insignificant, the negative sign was consistent with theory: a contractionary (expansionary) monetary policy would reduce (increase) credit supply to the private sector. However, the sizes of both elasticities suggest that the responsiveness of bank credit supply to the short term and overnight lending rates was very inelastic, in fact less than 0.5. Accordingly, the estimated interest rate elasticities suggest that both short term and overnight lending were poor intermediate targets of monetary policy over the long run, seemingly due to under development of its supportive institutional and macroeconomic environment in Tanzania.

Table 6: ARDL Long run Impact Multipliers

Variable	Model 1		Model II	
	Coefficient	**t-Statistic**	**Coefficient**	**t-Statistic**
Real short-term rate	-0.10	-0.57		
Real overnight rate			-0.25	-0.48
Growth of real deposits	1.15	2.69***	-1.30***	-4.04
Economic growth	0.11	0.14	0.64	1.06
Inflation	-0.28	-0.54	-1.11	-1.70

Note: The asterisks, ***, ** and *, respectively, stands for critical values at 1%, 5%, and 10% levels of statistical significance.

Noteworthy, the negative and insignificant short term and overnight lending interest rate elasticities obtained for Tanzania are inconsistent with, among others, the positive elasticity estimated by Iossifov and Khamis (2009) in a study which covered 43 developing countries. Nonetheless, the results are consistent with findings obtained for Uganda by Kahusian (2018), Amidu (2014) for SSA, Baoko et al. (2017) for Ghana, and Assefa (2014) in a study on Ethiopia. However, in a cross country study of SSA countries, Amidu (2014) found a negative effect of interest rate on bank credit over the long run. Long run elasticity of the real growth rate of total domestic deposits, which is a proxy for bank size, was positive and statistically significant at 1 per cent in the model, estimated with the real short term lending rate (Model I); and it is negative and statistically significant at the 1 per cent test level in the model, estimated with the real overnight lending rate (Model II). The established significance of bank size in explaining bank credit growth in Tanzania over the long run is similar to that

[5] In the context of Cecchetti (1999), banks in Tanzania are not very sensitive to policy induced changes in interest.

obtained by Amidu (2014) for SSA countries and its sub-regions, including EAC, Economic Community of West African States (ECOWAS), and Southern African Development Community (SADC); and Sharma and Gounder (2012) in a study on Island countries in the Pacific Ocean. However, while Kwakye (2012) found that growth of deposits was not an important determinant of bank credit supply in Ghana, Baoko et al. (2017) found it was negative but with respect to the credit to GDP ratio. The estimated coefficients of the real rate of economic growth were positive as expected but both were statistically insignificant at the conventional test levels. Noteworthy, however, the positive effect of economic growth on bank credit growth, on the one hand, differed, with the negative effect obtained by Djankov et al. (2005) in a cross-country study of 113 developing and developed economies. On one hand, the result is consistent with positive effect of economic growth on bank credit established by, among others, Guo and Stepanyan (2011), Ibrahim (2009), Katusiime (2018), Sharma and Gounder (2012), Imran and Nishat (2013), Abuka and Egesa (2007), Amidu (2014), Thaker et al. (2016), and Azira et al. (2018).

The elasticity of inflation in both models was negative and statistically insignificant at the conventional test levels[6]. The finding is similar to that obtained by Amidu (2014) in the case of SSA countries, Chirwa and Mlachila (2004) in Malawi, Beck and Hesse (2006) in Uganda, and Sharma and Gounder (2012) in a study on Island countries in the Pacific Ocean. Notable also, Djankov et al. (2005) found that the effect of inflation on bank credit was negative, especially in richer countries. Nonetheless, some studies found a positive effect of inflation on growth of bank credit supply to the private sector over the long run, for example Kichicha (2008) in Malaysia, Imran (2011) in Pakistan, Guo and Stepanyan (2011) in some emerging economies, and Katussiime (2018) in a study on Uganda, and Akinlo and Oni (2015) in a study on Nigeria.

4.4 Short Run Impact Multipliers

Table 7 presents results of the restricted ECM, respectively with real short term lending rate (Model I) and real overnight bank lending rate (Model II). Specifically, the results show the short run elasticity of the two, three and four quarter lagged real short term lending rate were negative and, respectively, statistically significant at the 1, 5 and 10 per cent test levels, the latter two having positive signs. The estimated interest rate elasticities suggest that the

[6] A positive relationship has been established between inflation and credit demand in many studies. Risk-averse consumers may increase their precautionary savings because inflation increases uncertainty regarding future income growth (Harron and Azim, 2006).

responsiveness of the short term lending rate was larger than that of the overnight lending rate, implying a larger impact of the former on the growth of bank credit supply to the private sector in Tanzania, at least during the sample period. The results in Table 7 show that only one period lagged growth in real deposits had the expected positive sign when real short-term lending rate was used as a policy variable (Model I). Besides, the results show none of the estimated interest rate elasticities of lending was statistically significant at the conventional test levels. Notable also is that all the real overnight lending interest rate elasticities had unexpected negative signs; and that for two and their period lags were statistically significant at the 5 per cent test level.

Furthermore, the results show that the one and two period lagged effects of real economic growth on bank credit growth over the short run were positive as expected and were, respectively, statistically significant at the 5 per cent and 1 per cent test levels. Also, the two and three period lagged effect of credit growth on bank credit growth were positive and statistically significant at the 5 per cent test level when the real over-night lending rate was a policy variable. The finding that economic growth enhances growth of credit to private sector is consistent with that obtained by some of the previous studies, among others, Sharma and Gounder (2012) in a study on six island countries in the Pacific Ocean and Imran (2011) in Pakistan. The results, however, differ ones obtained by Akinlo and Oni (2015) in a study on Nigeria.

Moreover, the results were contemporaneous, and the three period lagged inflation rate had the expected negative signs but only the latter was statistically significant (at the 1 per cent test level) when real short term lending rate was the policy rate (Model I). In contrast, all estimated inflation elasticities had negative signs as expected when overnight bank lending rate was a policy variable. However, the contemporaneous elasticity of inflation was statistically significant at the 10 per cent test level. The results in Table 7 also show that the one and three period lagged effects of the lagged real bank credit on bank credit growth when short term lending rate was the policy variable was positive; and it was negative when lagged by two periods. Notably, however, none of the estimated elasticities was statistically significant at the conventional test levels. In contrast, all the estimated elasticities of lagged bank credit growth had negative signs and were statistically significant at the 5 per cent test level.

The estimated coefficients of the one-period lagged error correction terms were negative and unambiguously different from zero at the 1 per cent test level (Table 7). Accordingly, following Banerjee et al. (1998), the sign and significance level of both parameter estimates suggest that growth of bank credit was co-integrated

with its determinants that and at least one way causality existed amongst them over a long run period. The size of the coefficient of the one period lagged error correction term suggests that the speed of adjustment from short run shocks to the long run equilibrium was high: respectively, 85 per cent and 67 per cent of the short-run shocks would be cleared within one quarter period. Notable, the adjustment to equilibrium over the long run was relatively lower in the model with the overnight real lending rate. The results also suggest that the estimated error correction models were powerful. The estimated coefficients of determination (R-squared) were high: both suggest that the regressors, respectively, explained 81 and 75 per cent of the growth in bank credit supply to the private sector in Tanzania during the sample period. Also, the estimated F-statistics, which were statistically significant at the 1 per cent test level, suggest that the model estimated with the real short-term lending rate as a policy variable was more powerful than that estimated with the over-night lending rate as a policy variable. Diagnostics test rejects existence of serial correlation, heteroscedasticity and wrong specification of the estimation models. Specifically, residual diagnostic test by the Breusch-Godfrey Serial Correlation LM Test revealed lack of serial correlation in the models estimated: the estimated F-statistics (Prob. F(31,83), p-value 0.75, and 1.89, Prob. F(2,57)=0.16) were statistically insignificant. Also, the Ramsey RESET tests results for the two model (t-stat. 0.97, F-stat. 0.94 (1, 82), Likelihood ratio 1.31 (0.25) and t-stat. 0.05, F-stat. 0.002, Likelihood ratio 0.003 (0.95) were very statistically insignificant at the conventional test levels.

Table 7: Results of the Error Correction Models

Variable	Lag	Credit growth: Model I		Credit growth: Model II	
		Coefficient	**t-stat.**	**Coefficient**	**t-stat.**
Constant		-0.04	-0.07	0.17	0.32
Real short-term rate	(0)	0.37	0.82		
	(-1)	0.43	1.00		
	(-2)	-2.68	-6.14***		
	(-3)	0.66	1.89*		
	(-4)	0.73	2.74**		
	(-5)	-0.34	-1.46		
Real over-night rate	(-1)			-0.19	-0.86
	(-2)			-0.25	-1.14
	(-3)			-0.43	-2.01*
	(-4)			-0.33	-1.92*
Real Growth of total deposits(0)	(0)	-0.02	-0.11	-0.23	-1.56

Variable	Lag	Credit growth: Model I		Credit growth: Model II	
		Coefficient	t-stat.	Coefficient	t-stat.
	(-1)	0.28	1.22	-0.37	-2.26**
	(-2)	-0.23	-0.84	-0.31	-2.19**
	(-3)	-0.11	-0.38		
	(-4)	-0.45	-1.62		
	(-5)	-0.38	-1.54		
Economic growth	(0)	0.17	0.77	-0.02	-0.13
	(-1)	0.60	2.53**	0.14	0.70
	(-2)	0.90	3.70***	0.43	2.17**
	(-3)	0.35	1.58	0.37	2.07**
Inflation	(0)	-0.32	-0.87	-0.60	-1.94*
	(-1)	1.01	1.62	-0.33	-0.85
	(-2)	0.05	0.08	-0.23	-0.70
	(-3)	-2.98	-4.57***		
Real credit growth	(-1)	0.01	0.07	-0.42	-2.31**
	(-2)	-0.01	-0.06	-0.42	-2.74**
	(-3)	0.10	0.64	-0.21	-1.81**
Error correction term	(-1)	-0.85	-4.33***	-0.67	-3.42***
R-squared		0.81		0.75	
F-statistic		11.36***		9.10***	

Note: The asterisks, ***, ** and *, respectively stands for critical values at 1%, 5%, and 10% levels of statistical significance.

5. Conclusion

This paper sought to investigate empirically the effect of policy, bank level and macroeconomic factors on bank credit supply to the private sector in Tanzania. The study used both bounds ARDL co-integration test and estimation of an ECM by using quarterly time series data for the period 2002: I - 2021: IV. A priori estimation result of the model for real private sector credit growth was superior to that based on credit to the GDP ratio as a regressand. Also, the model estimated with the real short term lending rate was superior to that estimated with real overnight bank lending rate of the commercial banks in Tanzania. More specifically, the results revealed existence of negative relationship between private sector credit growth and the real short term lending rate which was nonetheless not contemporaneous but generally very elastic–suggesting that the bank's real cost of operations drives the supply of private sector credit in the economy.

In addition, bank deposit was a poor determinant of the growth of private sector credit–implying that the supply of private sector credit in the economy does not respond to banks collection of deposits from customers. On the other hand, economic growth exerted the expected positive effect on credit growth over the short run period. Inflation exerted negative and statistically significant effect on real bank credit growth after a three-quarter period. The results also suggest lack of significant inertia of the growth of private sector credit in the model, estimated with short term lending rate, but not in the one estimated with the overnight bank lending rate. In the latter, the parameters estimated were negative and statistically significant at the conventional test levels.

The results bear three main policy implications. One, they suggest that the short term lending rate rather than the overnight bank lending rate is a more important intermediate target of monetary policy in Tanzania, at least during the sample period. Second, insignificance of growth in bank deposits in explaining growth in the bank credit supply to the private sector demand for policy would address excess liquidity in banks that undermine mobilization of financial savings in Tanzania. Third, the results point to the importance of macroeconomic stability and economic growth for increased lending to the private sector by the commercial banks in Tanzania.

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