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Banking Sector Development and Bank Risk-Taking Behaviour: Evidence from Commercial and Non-commercial Banks in Tanzania

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Abstract

This study investigates the effect of banking sector development measured by domestic credit provided by banks to private sector as percentage of GDP on risk-taking behaviour of the banks in Tanzania, measured in terms of bank capitalization ratio. The relationship was observed using annual country-level and bank-level data from commercial and non-commercial banks operating in Tanzania from 2012 to 2021. A system GMM estimation technique was employed in the investigation. Our results found that the effects of banking sector development on bank risk measured in terms of bank capitalization ratio is homogeneous across commercial and non-commercial banks. This means the development in banking sector measured as credit to the private sector by banks percentage of GDP in Tanzania has significant positive effect on bank capitalization ratio. Hence, reduce bank risk of default. Nonetheless, the findings reveal further that the profitability of bank and bank size factors are significant positive and negative respectively in relation to bank capitalization ratio. The results are further robust to bank ownership status dummy variable (DOSF) and for country of originality of the banks (DCOF) used to investigate whether there will be significant change in the result or not. The results of the robustness test indicate that banking sector development has insignificant effects on capitalization ratio when banks categorized as domestic and foreign banks as well as when banks categorized as private and state-owned banks.

Keywords: *Tanzania; Bank Capitalization Ratio; Bank Risk-Taking; Banking Sector Development; Robustness Test*

Background of the Study

The study of the banking sector development and bank risk-taking behaviour originated from the famous finance theory of capital structure developed by Modigliani and Miller (1958) who argued that under perfect market conditions the capital ratio (debt-equity) do not have any effect on bank capitalization. However, Myers and Majluf (1984) opposing the theory and said that the assumption made is in fact untrue because of numbers of factors such as asymmetric information, banking sector development and imperfection of stock and capital market that influencing the bank risk-taking behaviour measured in terms of capitalization ratio. Despite the existence of some literatures on bank risk-taking behaviour measured in terms of bank capitalization ratio. But, very few literatures investigate the effect of banking sector development on bank risk-taking behaviour especially in developing countries. Most of the developing countries are well-known for introducing laws and regulatory reforms to develop the banking sector to enable bank to have better risk management practice that may help them to operate with adequate capitalization ratio. These reforms including interest rate deregulation, privatization of state-owned banks among other reforms (Murinde, 2012; Etudaiye-Muhtar & Ahmad, 2015). Tanzania as one of those developing countries it implemented several banking sector reforms since 1964 after independence. For example, the major reforms in banking sector of 2021 in Tanzania aiming at improving the banking sector through financial inclusion and bank risk management practice to enable banks operating with adequate capitalization ratio. Based on Ozili (2017), following the banking sector reforms in the country some of the objectives of the reforms seemed to be achieved. One of the expectations of the reforms is to ensure banks have better risk management practice to operate with adequate capitalization ratio to reduce probability of bank default that may lead to financial distress in the banking sector (Tran & Nguyen, 2020; Abbas et al., 2021). However, according to our knowledge, literatures that investigates the effect of development in the banking sector on bank risk-taking behaviour specifically for developing countries is scarce and have ambiguous result. For instance, Abdulhamid et al. (2019); Etudaiye-Muhtar et al. (2017) found that banking sector development reduce banks' risk-taking while Vithessonthi (2014a) observes that there is positive effect of banking sector development on banks' risk-taking behaviour in Southeast Asia region. Because of the ambiguity of results and scarcity of research on banking sector development and bank-risk taking behaviour in developing countries, this contribute to the main motivation for this study which examine the effect of banking sector development on bank risk-taking behaviour measured in terms of capitalization ratio in Tanzania to find more evidence for developing countries.

We measured banking sector development as domestic credit provided by banks to private enterprises as percentage of GDP. According to World Bank development indicators, the larger the percentage of the credit facility provided by banks to private enterprises indicate the banking sector development and financial sector development in general as a result it increases bank capitalization ratio and reduce banks risk-taking (Wang & Luo, 2019; Tran & Nguyen, 2020). The literature which is closely similar to this is that of Abdulhamid et al. (2019) and Abbas et al. (2021). Though, we improved the study for not conducting in many countries and alternatively we concentrated in specific country (Tanzania). Concentrating in one country such as Tanzania as attested by Fan et al. (2012); Kirch and Terra (2012) enable to carry out detailed examination of essential institutional variables which are not easy to undertake in the studies involving cross-country. We make distinction between commercial banks and non-commercial banks because we want to test if the effect is the same or not between the two categories of banks. The study does not include Islamic banks because their risk-sharing nature and other unique contracts is quite different from conventional banks (Abdulhamid et al., 2019).

The study makes a great contribution. Firstly, it adds to the literature of banking and finance and extends the related work of Etudaiye-Muhtar et al. (2017) who examined the effect of financial market development measured in terms of banking sector development on bank capitalization ratio in eight emerging and frontier market economies in Africa (Botswana, Egypt, Ghana, Kenya, Morocco, Nigeria, South Africa and Tunisia). Despite the existence of this literature for which it involves only Kenya from

East Africa region. To the best of our knowledge this study has not been conducted for banking sector in Tanzania and the remaining countries in East Africa.

Secondly, this study goes beyond banking sector development to include macroeconomic variables such as inflation and GDP that are also not within the control of the bank but are put in place by economic policy makers. Therefore, the study examined the effect of inflation and economic growth measured by GDP on the capitalization ratio of the banks in Tanzania. Moreover, the study went further for looking the impact of most essential bank-specific factors (bank profitability and size of bank) on bank risk-taking behaviour measured in terms of bank capitalization ratio. Thirdly, to understand the relationship between banking sector development and bank risk-taking behaviour measured as bank capitalization ratio is very important, specifically for regulatory authorities (banks supervisor) as banks required to compete with challenges such as information asymmetry, high transaction costs, illiquidity of the markets and difficulty in accessing external capital (Ojah & Kodongo, 2014; Murinde, 2012). The banking system in Tanzania where banks operate in such challenging environments may have higher probability of deteriorating due to capital erosion than in other countries where the matters are less serious. Hence, the results obtained from the study provide necessary information to regulatory authorities on regularly improving regulatory quality to adhere necessary changes in banking sector in order to have effective control of the bank risk management practice that may help banks to operate with adequacy capitalization ratio. Fourthly, the study reassures regulatory authorities (banks supervisor) that the reforms of banking sector in Tanzania are in the right directions, if they seem to improve bank risk management practice and increase bank capitalization ratio.

Fifthly, the results of the study assure the prospective and existing investors on stability in the banking sector in Tanzania that can be attained through the maintenance of better risk management practice by banks, which also allow banks to have adequate capitalization ratio. This also could lead to investors (foreign and domestic) having high level of confidence in the banking sector, which in turn can improve the economy of a county and minimize the risk of capital flight issues (Narayan & Narayan, 2013).

Brief Literature Review and Hypothesis

The positive effect of the banking sector development on the economic growth in Tanzania has long been emphasized in the study of Fille (2013); Kapaya (2021) and others. Despite its significance, relatively few research such as Etudaiye-Muhtar et al. (2017) has been conducted to clarify the effect of banking sector development on bank risk-taking behaviour measured by bank capitalization ratio in developing countries. But it does not include Tanzania. This issue is important, as banking sector development can have positive as well as negative effect. The previous literatures argue that banking sector through financial reforms can reduce bank risk-taking behaviour and increase bank capitalization (Abdulhamid et al., 2019); (Vithessonthi & Tongurai, 2016). For instance, banking sector reforms in Southeast Asia after the Asian crisis (1997) reduced bank risk-taking and improve bank efficiency (Williams & Nguyen, 2005), whereas the findings of Vithessonthi (2014a) indicates that bank risk-taking behaviour increases after the regular reforms of the banking sector hence weakened bank capitalization ratio. Some of these reforms including interest rate deregulation, privatization of state owned banks. On the other hand, reforms directed at strengthening the banking sector can fail if they weaken market discipline (Abdulhamid et al., 2019). The lack of clarity on the possible effect of banking sector development inspire us to examine the association between bank risk-taking behaviour measured in terms of bank capitalization ratio and banking sector development in a commercial and non-commercial banks in Tanzania. We proxied bank risk-taking behaviour as bank capitalization ratio measured in terms of capital adequacy ratio and hypothesize that developed banking sector implies less bank risk-taking behaviour. Weaken banking sector development implies high bank risk-taking behaviour. Banking sector

development was measured as the ratio of bank credit to the private sector as percentage of GDP. The choice of the variables will be explained in more detail in the data and methodology section.

Hypothesis 1: Banking sector development influencing bank risk-taking behaviour

In showing the importance of the size of banks on bank risk-taking behaviour, Laeven et al. (2016) believe that because of the "too big to fail" hypothesis the size of bank matter, large banks have behaviour of taking high risk which results into less capitalization since they engage in more market-based banking activities which result to ease access of capital immediately when needed. This is also supported by Philip et al. (2014); Konishi and Yasuda (2004). In the contrary, Gropp and Heider (2010) found that bank size is the important factors that influencing bank capitalization ratio but did not find evidence supporting the assertion that bank size positively linked to the bank risk-taking behaviour. Hence, it does not reduce capitalization ratio as found in the work of Brei and Gambacorta (2016); Philip et al. (2014). Meanwhile, they found that banks' risk-taking behaviour depends negatively on the size of bank, which is also inconsistent with the findings of Abbas et al. (2021) in USA. They argued that this might be caused by the notion that larger banks are clearly known to the investors and the market in general. Hence, they find very easier to obtain equity finance. Moreover, Tran and Nguyen (2020) found bank risk-taking behaviour negatively influencing by bank size. These findings indicate there is varying effect among literatures on the relationship between bank size and bank risk-taking behaviour.

Hypothesis 2: Large banks are positively linked with the bank risk-taking behaviour

Inflation (INFF) and economic growth (EGF) used as control variables of this study, they are important macroeconomic variables because they specify the degree of economic stability of the country. Inflation was measured in terms of annual rate of change of consumer price index. High rate of inflation increases the real value of tax benefit of debt finance. Thus, during the periods of high inflation, banks tend to have higher leverage ratio and increase their risk-taking behaviour as a result they maintain low capitalization ratio in order to take advantage of the tax deductions (Frank & Goyal, 2009; Hortlund, 2005; Etudaiye-Muhtar & Abdul-Baki, 2020). Therefore, it is expected that a stable or low inflation rate will reduce bank risk-taking behaviour and increase bank capitalization ratio.

Economic growth as another macroeconomic and control variable of the study. It was measured as annual percentage growth rate of GDP and it is expected that the growth in GDP influencing banks to increase their risk-taking behaviour as a result make banks to decrease their capitalization ratio. Banks will have to take more liability during booming economy because of lower probability of loan default which in turns reduce their bank capitalization ratio (Schaeck & Cihak, 2012; Brei & Gambacorta, 2016). Haas & Peeters (2006) argued that recession state of economy worsens the agency problem. Therefore, according to the pecking order theory, the situation results into banks increasing their risk-taking behaviour by increasing the use of debt finance in their capital structure that lower the bank capitalization ratio.

Hypothesis 3: Macroeconomic factors (Inflation and GDP) positively influencing bank risk-taking behaviour.

Data and Methodology

The study employed stratified sampling technique. Saunders et al. (2009) hold that in stratified sampling method the population is categorized into subgroups depending on their characteristics. The present study grouped the banks in to commercial and non-commercial banks based on the Bank of Tanzania (BOT) classification as at June 2021. A population of 46 banks (12 non-commercial banks and 34 commercial banks) were selected to examine the effect of banking sector development on bank risk-taking behaviour measured in terms of bank capitalization ratio. Since there were few numbers of non-

commercial banks in Tanzania that was licenced to carry out banking business as fully fledge banks as at June 2021. This caused the sample space for non-commercial banks to be reduced from 12 to 4 banks.

In order to be free from the effects of many missing data in the study, we dropped 9 banks from a sample of 34 commercial banks to enable to remain with exactly 25 commercial banks that have been in operation for at least 7 years, this indicates we have excluded banks that had been servicing for less than seven years. In addition, the study further excluded 1 commercial bank which is under fully fledge Islamic compliance because theoretically, banks operating under Islamic rules are quite different from those operating under conventional perspective because of their nature in terms of risk-sharing and other unique features in terms of contracts (Abdulhamid et al., 2019). Moreover, structurally, banks under Islamic perspectives are also different from conventional. For instance, Islamic banks are well-capitalized (Beck et al., 2013) and they are in position to exhibit lower risk aversion (Ashraf et al., 2016). Therefore, the total final sample of the banks used in the study was 28 which comprise of 24 commercial and 4 non-commercial banks. The key reason for categorizing banks in to commercial and non-commercial banks is to allow us to examine whether there is different effect of commercial and non-commercial banks on bank capitalization ratio in Tanzania.

In line with previous study, we measured banking sector development as credit to private enterprises as percentage of GDP (Beck et.al., 2008; Alves & Ferreira, 2011; Wang & Luo, 2019; Vithessonthi & Tongurai, 2016; Tran & Nguyen, 2020; Ozili, 2018; Farooq et al., 2018; Chinn & Ito, 2006; Abbas et al., 2021). A well-developed banking sector not only promote the economic performance of the country but also enable growth opportunities of the banks by promoting demand of credit facility from private enterprises. The banks that have capacity of providing more credit to public, automatically increase its capitalization ratio through retained earnings to operate with enough capital required by the regulatory authority. As a result, decrease bank risk of default. This is possible if the banks have better management of risk in place. We expect that the banking sector development may reduce bank risk-taking behaviour by increasing bank capitalization. Therefore, an increase in credit facility to private enterprises as percentage of GDP is expected to reduce bank risk-taking behaviour and increase bank capitalization ratio.

According to the prior studies on bank risk-taking behaviour measured in terms of bank capitalization ratio such as Abdulhamid et al. (2019); Vithessonthi(2014b), we add some few control variables for bank level, these are bank size measured in terms of natural log of total asset and bank profitability measured in terms of return on asset (ROA). Size of bank and bank profitability are also expected to maintain significant positive and negative effect respectively on bank risk-taking behaviour. According to Gennaioli et al. (2013) large banks possess characteristics of less capitalized as proposed by Too big to fail" hypothesis for the following reasons, large bank benefit from economies of scale which helps them to operate with less capitalization ratio and attain better income diversification. Also, large banks have comparative advantages into non-traditional activities as they require significant fixed cost, the proceeding into more non-traditional banking activities cause more leverage and unstable funding. Hence, large banks are expected to be riskier (less capitalized and engage into more non-traditional banking activities). Moreover, profitable banks are expected to reduce bank risk-taking behaviour as well as profitable bank has greater advantage of increasing bank capitalization ratio through retained earnings (Etudaiye-Muhtar et al., 2017; Abdulhamid et al., 2019; Vithessonthi, 2014b; Kleff & Weber, 2008; Philip et al., 2014; Baselga-Pascual et al., 2015). In particular, based on the pecking order theory, bank's profitability is negatively related to the bank risk-taking behaviour. Thus, the more profit a business retains to finance investment, the higher the capitalization ratio and less debt employed in its capital ratio (Alı et al., 2022; Ramjee & Gwatidzo, 2012). In addition, we included some macroeconomic determinants to control for the effects of different macroeconomic situation in the country. The study used two macroeconomic variables which are economic growth measured in terms of GDP and inflation measured as consumer price index as measured by World Bank development indicator database. The data for macroeconomic variables were obtained from World Bank data base.

We performed the following regression specification model to achieve the objectives of the study:

$$BCRF_{i,t} = f\left(BCRF_{i,t-1} + BSDF_t + DOSF + DCOF + XF_t + ZF_t\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots.... (1)$$

Where, BCRF is a Bank capitalization ratio, BSDF is a Banking sector development, DOSF is a dummy variable for banks ownership status that use binary number 1 for private banks and 0 for state owned banks. DCOF is a dummy variable for Country of originality of banks that use binary number 1 for domestic banks and 0 for foreign banks. XF and ZF are macroeconomic and bank-specific control variables respectively.

To include the impact of previous performance of the response variable on present performance (dynamic effects of the regression model). We employed a lagged dependent variable as independent variable. Though, the use of a lagged dependent variable causes an endogeneity problem. Dang et al. (2015); Flannery and Hankins (2013) argue that other panel estimators such as ordinary least squares technique causes biased estimates since bank fixed effects becomes unobservable. Moreover, the degree at which individual fixed effects correlate with the lagged response variable lead to unreliable coefficient of the estimates. In addition, Etudaiye-Muhtar et al. (2017) indicated that the use of generalized least squares technique for random or fixed effects estimator control the unobserved fixed effects, but the technique still introduces endogeneity problem in the regression model since the error term is correlated with the time lagged response variable. In order to account for endogeneity, we employed the panel system generalized method of moments (GMM), proposed by Arellano and Bover (1995); Blundell and Bond (1998). In system GMM, besides the first-differencing of the explanatory variable, we employed time lagged first-differences as instrumental variable in a level regression equation. System GMM increases the efficiency of the estimation technique since it eliminates the problem of weak instruments caused by the first-difference GMM. We employed two-step system GMM as used in the study of Etudaiye-Muhtar et al. (2017); Abbas et al. (2021); Abbas and Masood (2020); Jokipii and Milne (2008, 2011) for estimating regression equations. This estimation technique is well-considered for dynamic panel sets of data that have endogeneity problem, omitted variable bias, serial correlation issues, unobserved panel heterogeneity, unobserved time-invariant fixed effects and measurement errors. Besides, using two-step system GMM technique does not need user to have complete knowledge of data distribution as suggested by Antoniou et al. (2008).

As discussed in the previous paragraph. The banks in this study were categorized in to commercial and non-commercial banks as classified by BOT as at June 2021. It is possible that the impact of banking sector development on bank risk-taking behavior measured in terms of bank capitalization ratio with commercial banks in Tanzania may be quite different from non-commercial banks. To find out if this is the case or not, we performed a robustness test for regression model in equation (1) to ensure that the interpretations of the results are robust based on the classification. While using this equation (1), commercial and non-commercial banks were simply merged in another single regression to investigate the effect of banking sector development on bank risk-taking measured as bank capitalization ratio. This is done so as to avoid performing different regression specification analysis for the two groups of banks. A single dummy variable is employed in a regression where banks classified as commercial banks in Tanzania take the special value of 1 and those categorized as non-commercial banks take the unique value of 0. The statistics coefficient value which is significant for the employed dummy variable (DVCF) indicating that the impact of banking sector development on bank risk-taking measured as bank capitalization ratio is significant different between banks classified as commercial banks and those non-commercial banks in Tanzania. A non-significant statistics coefficient variable would propose otherwise.

The regression specification equation for the robustness tests of the bank's category are modified versions of the equation (1) as shown below:

$$Y_{i,t} = \gamma Y_{i,t-1} + \beta X_{i,t} + DVCF + \mu_i + \eta_t + \varepsilon_{i,t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots......(2)$$

The significant difference of the equation (1) and (2) is that commercial and non-commercial banks dummy variable for classification (DVCF) is used to the independence variables in equation (2) whilst bank ownership dummy variable (DOSF) and Country of originality of the banks dummy variable (DCOF) are not part of the regression model. The dummy variable (DVCF) has given the specific binary value of 1 when the banks are commercial and 0 when otherwise. The rest of variables are the same. The two-step system GMM technique still used to perform the regression estimates as used in the previous equation. Accordingly, we make comparison of the results obtained in a robustness estimation and those revealed from key regression analysis in equation (1). Hence, the findings are robust to see if they possess similar qualitative characteristics. If the findings happen to be similar it shows that the findings revealed in a robustness regression equation and those from the key analysis of the study in equation (1) are relatively consistent.

Findings and Analysis

The descriptive statistics analysis of the data for both dependent and independent variables are reported in Tables 1 below. Beginning with the dependent variable of the study which is bank risk-taking behaviour measured by capitalization ratio (BCRF), the mean value of bank capitalization ratio observed to be 15.77 percent. This ratio is higher compared to the regulatory total bank capitalization ratio of 14.50 percent stated by BOT in Banking and Financial Institutions Regulations of 2014. It indicates that on average banks in Tanzania operating above the minimum required level of capitalization ratio by 1.27 percent. Hence, minimize bank risk-taking. This may be caused by close supervision of the regulatory authority (BOT) to the banks. Based on the definition of bank capitalization ratio used in this study which is (equity to total assets), the values indicate that banks in this study have more assets than equity which is the normal situation for the banks. Though, this signifying the presence of outlier effect because the assets exceed equity for large extent (more than six times). However, following the outlier effect existing the study used robust regression technique for the coefficient of the estimations to avoid the possible effect of outliers resulted from the low level of bank capitalization ratio.

On the other hand, in case of the banking sector development (BSDF) measured by domestic credit facility provided by banks to private sector as percentage of GDP, the average ratio of 12.98 percent is very low compared to the domestic credit facility provided by banks to private sector as percentage of GDP in developed and some emerging market countries. Based on the World Bank development indicator data, USA has 52.33 percent, Germany 83.77 percent, United Kingdom 151.95 percent, India 50.83 percent, Malaysia 116.52 percent, Brazil 59.88 percent and South Africa 62.56 percent mean value of domestic credit facility provided by banks to private sector as percentage of GDP for the time period of 2008 to 2020. This indicates that the banking sector in Tanzania has slightly contributions on minimizing bank risk-taking compared to the banks in Europe and Asia. In addition, the value of standard deviation of all variables in the study is found to be low compared to its mean value, this indicates a small coefficient value of discrepancies of the data. Moreover, the range of deviation between the minimum and maximum value of all variables in the study are found to be relatively logical. Nevertheless, the ratio of mean divided by median is almost one which means the data are normal distributed. In general view, all study variables possess normal distribution behaviour. Hence, variables are suitable to be used for doing analysis. Based on that, the study confirmed the normality of distribution according to the results reported in the Table1.

Table 1: Descriptive statistics

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
BCRF	280	15.77	14.25	6.52	10.91	51.69
BSF	280	12.84	12.84	1.35	9.31	15.98
ROA	280	0.72	0.69	0.02	-2.41	6.20
BSDF	280	12.98	12.85	0.64	12.10	14.47
EGF	280	5.54	5.98	1.48	2.00	6.87
INFF	280	6.00	5.25	3.62	3.29	16.00

Note: BCRF represents bank capitalization ratio, BSF-bank size, ROA-Return on assets, BSDF-banking sector development, EGF-economic growth and INFF represents inflation.

One of the specific objective of this study was to evaluate the degree at which banking sector development influencing bank risk-taking behaviour in Tanzania. In order to do that, regression equation (1) is estimated using two-step system GMM method. Table 2 presents the results of the study regression specification equation for the dependent variable of the study which is bank risk-taking behaviour measured in terms capitalization ratio (BCRF). According to the Table 2 of the study results, it is observed that while other things remain constant, the key explanatory variable of interest in this study (banking sector development) which is represented by (BSDF) is significant at 10 percent level for bank risk-taking behaviour measured by bank capitalization ratio and has a positive statistics coefficient value of 0.2410. This means that banking sector development when measured in terms of domestic credit facility provided by banks to private sector as percentage of GDP in Tanzania has a positive impact on bank capitalization ratio measured by equity to total assets of banks. Therefore, minimized bank risk-taking behaviour.

Nevertheless, the dummy variables employed for the group of domestic and foreign banks and that for the group of private and state-owned banks are observed to be statistically insignificant. Table 2 shows that the coefficient value of the bank ownership status dummy variable (DOSF) is positive 0.0190 and also for Country of originality of the banks (DCOF) is negative 0.0050. This indicates that banking sector development measured by credit to the private enterprises by banks as percentage of GDP has similar effects on bank risk-taking behaviour defined as bank capitalization ratio for all banks classified as domestic and foreign banks as well as for banks classified as private and state-owned banks. Therefore, it signifies both categories of banks have similar risk-taking behaviour.

Table 2: Two-step system GMM regression estimation for the effect of banking sector development on bank capitalization Ratio

BCRF	Coef.	St.Err.	p-value	Sig
Lagged dependent variable				
LBCRF	0.5880	0.1080	0.0000	***
Banking sector development variable				
BSDF	0.2410	0.1330	0.0800	*
Bank-specific variables				
BSF	-0.2700	0.6950	0.0000	***
ROA	0.1880	0.1070	0.0900	*
Macroeconomic variables				
EGF	-0.1480	0.0880	0.1060	
INFF	-0.2920	0.1430	0.0510	*
Dummy variables				
DOSF	0.0190	0.0080	0.3690	
DCOF	-0.0050	0.0370	0.4910	

Test statistics		
(AR1)	-2.570	0.0100
(AR2)	-1.140	0.2560
Hansen test	17.760	0.1870
World Chi^2	5.340	0.0000
Number of groups	28	
Number of observations	252	
Number of instruments	19	

*Note: The Table 2 reports the results of equation (1) using the two-step system GMM estimation method employed STATA 15.0, the coefficients and standard errors that are robust to heteroskedasticity in column wise. The dependent variable is BCRF, independent variables are banking sector development (BSDF), bank size (BSF), Return on assets (ROA), Economic growth (EGF), inflation (INFF), dummy variable for ownership status (DOSF) and dummy variable for Country of originality (DCOF). Arellano-Bond (AR1) and (AR2) in addition to Wald chi-square tests statistics and the Hansen test statistics of over-identifying restrictions which test for the overall validity of the instruments are also part of the Table together with the P-values. Parenthesis *, **, *** represent 10%, 5% and 1% significance level respectively. In addition, the Table reports the number of groups, number of instruments and number of observations.*

Regarding bank-specific factors in Table 2, the size of bank (BSF) is significant at 1 percent level with negative statistics coefficients value of -0.2700. This answer the research objective two of the study which required to understand the extent at which bank size (BSF) influencing bank risk-taking behaviour. Return on asset as represented by (ROA) is another bank-specific control factor which is also significant at 10 percent level for bank capitalization ratio and possessing a positive coefficient of 0.1880. Moreover, in case of macroeconomic variables that influencing bank risk-taking behaviour, the growth in economy (GDP) is observed to have insignificant negative impact for bank capitalization ratio noted by coefficient value of -0.1480, while inflation as another macroeconomic variable seems to possess a significant negative coefficient value of -0.2920 at 10 percent level for the bank capitalization ratio. This shows inflation increase the risk-taking behaviour of banks. This also help to provide answer to the research objective three of the study which required to find the extent at which macroeconomic variables (inflation and economic growth) influence the bank risk-taking. Following the findings in Table 2, the next part of the study provide the implication of results in line with previous literatures under reviewed.

Starting with the first objective which intended to know the extent at which the development in banking sector measured by domestic credit provided by banks to private sector as a percentage of GDP influence bank capitalization ratio in Tanzania. Theoretical literature reviewed such as capital buffer theory shows that in developing countries where the interest rate deregulation and information asymmetry are big challenges that can results bank default rate to be probable high, the banking sector development can have negative effects on bank capitalization ratio if appropriate risk management practices are not taken by banks. This is the reason for capital buffer theory to request banks to maintain extra capital to compensate in the events of capitalization ratio decreasing below the required level when banks face financial problem. However, based on the Vithessonthi (2014a, 2014b), the challenges may result into a diminishing of the capitalization for the banks if no prudence supervision is used to improve interest income associated with the large provision of credit to private sector together with removal of information asymmetry issues. The impact of the domestic credit provided to private sector on bank capitalization ratio observed to be similar with the findings reported in Table 2 which shows that the sample of banks in the study is as proposed by buffer capitalization theory. Therefore, the result supports the theory. This is also indicated by the positive significant coefficient for banking sector development (BSDF) in the Table 2.

The positive impact of banking sector development on bank capitalization ratio is consistent with the findings of Abdulhamid et al. (2019; Etudaiye-Muhtar et al. (2017) who suggest that subsequent some important banking sector development, bank capitalization ratio increases specifically for the reforms aimed at deregulating interest rate, reducing credit allocation restriction, removing ceiling for credit services by banks, improving of better risk management practice and proper bank supervision. They argued that the reforms lead to strengthen the lending ability of the banks that improving the interest earning which results in to reduction of bank risk-taking by not considering taking too much debt finance and prefer to increase the bank capitalization ratio. In a similar context, Poghosyan and Čihak (2011); Wang and Luo (2019) found that banking sector development when there is transparency and dissemination of information related to financial matters would reduce bank risk-taking and positively influencing bank capitalization ratio because it increases credit to the private enterprises by banks. Though, this positive impact may be disturbed if the macroeconomic condition is not good in a country.

Similar to our expectations, it is reported that bank capitalization ratio improved when the banking sector is developed as indicated in Table 2 because risk-taking behaviour of banks reduced. This might be caused by increasing credit providing to private sector that allow banks to increase income from the traditional banking activities which can increase capitalization ratio. In addition, this also might be due to improvement made in financial sector through maintained proper bank risk-taking practice and stringent on bank supervision. The findings of this study also is inconsistent with the study of Vithessonthi (2014a) in Thailand who reported that the banking sector improvement has no impact on bank capitalization ratio.

Although the main purpose of the first objective of this study was to evaluate the effect of the banking sector development on bank risk-taking behaviour measured by bank capitalization ratio, the results of the GMM estimation technique indicates that the control variables of the study which are bank-specific and macroeconomic variables are also very important influencing factors of bank risk-taking behaviour as noted in prior studies. The effect of these variables however is addressed below.

Following the measurement of the bank capitalization ratio which is the ratio of total bank equity to total bank assets. Bank size (BSF), return on assets (ROA), economic growth (EGF) and inflation (INFF) are very important determinants of the bank risk-taking. The negative coefficient value of bank size (BSF) of -0.2700 which is significant at 1 percent level suggests that banks that have total large assets value tend takes additional risk of participating in more non-traditional banking activities, as a result these banks possessing low capitalization ratio because they believe that being huge in banking industry is enough for them to easy increasing the capitalization ratio through issuing new shares when required to do that so as to operate with the level of capitalization ratio required by regulator. In addition, these banks also believe that being too big is very important factor to be supported by Government when they face financial problem to avoid downturn of the country economy. This finding is consistent with the too-big-to fail hypothesis and also in line with prior studies such as Brei and Gambacorta (2016); Yu (2000); Philip et al. (2014). On the other hand, the findings in Table 2 support the pecking order theory through the coefficient and significance level of return on assets (ROA). The positive effect of 0.1880 which is significant at 10 percent level indicates that return on assets improve retained earnings of the banks over time to continuously increasing bank capitalization ratio as an alternative of taking too much risk of engaging in debt financing. The return on assets (ROA) has been used as a proxy for bank profitability, based on Abbas and Masood (2020); Tran and Nguyen (2020), return on assets represents profit generated by bank's assets over the years that can be retained either partly or the whole amount to improve capitalization ratio.

In addition, economic growth (GDP) as macroeconomic factor indicates insignificant impact on bank capitalization ratio while inflation seems to have a significant and negative coefficient of -0.2920 at 10 percent level. The negative statistical coefficient value of inflation which represents the annual percentage variation in the cost to the average consumer for acquiring a basket of goods and services is

consistent with the finance concept that a high inflation time in the economy of the country encourage bank to take high risk of increasing leverage ratio in order to gain advantage of the tax deductions which cause banks to maintain low capitalization ratio (Frank & Goyal, 2009). This findings contrast with Demirgüç-Kunt and Maksimovic (1999) who observed that inflation as a way of controlling stability of locally currency in a country for a long-term debt contract. Therefore, a low inflation state of economy encourages banks to use more debt contracts to increase investment as a result may discourage capitalization ratio of banks. This result is supported with the early findings of Philip et al. (2014).

Because of the non-significance impact of the dummy variable for the country of originality of the banks and for the ownership status of banks as reported in Table 2. Accordingly, the full sample space of banks was not split into two groups containing of domestic and foreign banks and for the private and state-owned banks since they have the similar effect on capitalization ratio. This indicates no need to conduct two extra separate regression model for these two groups of banks which is domestic and foreign; private and state-owned banks.

Post Estimation Test for Validity and Suitability of Regression Model

In order to confirm the validity, suitability and robustness of the study regression specifications model in equations (1). Statistics test for the post-estimation was performed and identify that the results presented in Tables 2 are valid and the models employed are suitable for the estimations. For instance, the test for no serial correlation in AR (2) residuals in Table 2 revealed that the alternative hypothesis has to be rejected and the null hypothesis has to be accepted because the AR (2) coefficients is non-significance. This shows that the second order autocorrelation is not present in the AR (2) residuals. On the other hand, the alternative hypothesis of Hansen statistics used to test whether the statistical instruments introduced in the regression equations (1) are over identified or not revealed that it can be rejected and the null hypothesis can be accepted, this suggesting that the statistical instruments introduced in the regression specification model are free from over identified restrictions. Regarding to the joint statistically significance of the explanatory variables and whether the explanatory variables are good determinants of the response variable, the goodness of fit test represented by Wald chi square statistics indicated an acceptance of the alternative hypothesis and a rejection of the null hypothesis. This signifying that the explanatory variables are good determinants of the response variable because of the significance level of the chi square statistics. Based on these arguments, we may therefore conclude that the regression model specifications and the estimation method employed (two-step system generalized method of moments) is a suitable econometric method for testing the research hypothesis in this study.

Robustness Check for Bank Classification

The study employed stratified sampling technique in which banks are categorized into group of commercial and non-commercial banks as shown in the previous paragraph. Special definite variable known as dummy variable (DVCF) is employed, the variable has the binary number 1 for commercial banks and binary number 0 for non-commercial banks. The variable is used to investigate if there is presence of significant difference in the impact of banking sector development on capitalization ratio for the groups of banks. Another regression specification model which consider the effect of dummy variables are used to investigate the effect as shown in equation (2). The results for the regression specification model for the objectives of the study are as presented in Tables 3.

The coefficient of the estimates presented for the regression specification model of the key research analysis in Table 2 are then compared with the findings of robustness check in Table 3 for each study objectives. After the comparison, it was observed that the results are qualitatively the same despite the presence of very minor changes. This indicating that the coefficient of the estimates reported for the main regression model are robust. The robustness test is established through the existence of insignificance DVCF variable as reported in Table 3 and the positive signs of the main independent variable (BSDF) as reported in Table 2. The insignificance DVCF variable indicates that there is non-

significant difference in the impact of banking sector development on bank risk-taking behaviour measured in terms of bank capitalization ratio for both commercial and non-commercial banks in Tanzania. However, it is noticed that the coefficient value of the estimate for macroeconomic and bank-specific variables differs. Validity check of post estimation for the robustness regression model including Hansen, AR (2) for over identified of instruments variables and Wald Chi- Square test for goodness of fits of the study variables reveal that the regression specification model is valid and is free from spurious results of the coefficient estimates.

Table 3: Robustness check for the effect of banking sector development on bank capitalization Ratio

BCR	Coef.	St.Err.	p-value	Sig
Lagged dependent variable				
LBCRF	0.5720	0.1110	0.0000	***
Banking sector development variable				
BSDF	0.2530	0.1230	0.0710	*
Bank-specific variables				
BSF	-0.2690	0.7940	0.0020	***
ROA	0.1960	0.1020	0.0780	*
Macroeconomic variables				
EGF	-0.1510	0.0650	0.1030	
INFF	-0.2860	0.1330	0.0420	**
Dummy variable for bank classification				
DVCF	0.0020	0.0080	0.5720	
Test statistics				
(AR1)	-2.930		0.0000	
(AR2)	-1.270		0.3110	
Hansen test	16.560		0.1760	
World Chi^2	6.080		0.0000	
Number of groups	28			
Number of observations	252			
Number of instruments	19			

*Note: The Table 3 reports the results of the robustness test equation (2) for the effects of banking sector development on bank capitalization ratio using the two-step system GMM estimation method employed STATA 15.0, the coefficients and standard errors that are robust to heteroskedasticity in column wise. The dependent variable is BCRF, independent variables are banking sector development (BSDF), bank size (BSF), Return on assets (ROA), Economic growth (EGF), inflation (INFF) and dummy variable for bank classification (DVCF). Arellano-Bond (AR1) and (AR2) in addition to Wald chi-square tests statistics and the Hansen test statistics of over-identifying restrictions which test for the overall validity of the instruments are also part of the Table together with the P-values. Parenthesis *, **, *** represent 10%, 5% and 1% significance level respectively. In addition, the Table reports the number of groups, number of instruments and number of observations.*

Table 3 of the study results revealed that the findings reported in Table 2 are robust to commercial and non-commercial banks as specified by the signs of the coefficient value and the level of significance of banks and non-bank-specific determinants. Particularly, the reported estimates of the banking sector development variable revealed to be similar with those reported in Table 2.

Conclusion

Several studies conducted after the capital structure theory of Modigliani and Miller (1958) provide insight in explaining the idea of capitalization ratio decisions. The studies noticed the presence of some factors necessary in determining the bank risk-taking behaviour measured in terms of bank capitalization ratio decisions. These factors can be categorized as bank-specific and non-bank-specific determinants and they comprise largely the banking sector development of the country in which the banks doing business. However, there few studies that investigates the degree at which the measures of development implemented in banking sectors in developing countries contribute to an improvement in the management of the bank's risk-taking behaviour for the purpose of increasing capitalization ratio of banks. The scarcity of bank risk-taking behaviour studies which is measured in terms of capitalization ratio in developing countries specifically for frontier market economies countries such as Tanzania contribute to the basis for the investigation of the specific objectives of this study. Additionally, subsequent the literatures reviewed in this study, it shows that developed countries dominates the empirical evidence for capitalization ratio. This result to the important question on the rationality of generalizing the results from the previous studies in western countries to the banks in frontier market countries such as Tanzania, given that there are critical differences between developed and frontier market countries in terms of banking sector development and economic development as noticed by Antoniou et al. (2008); Narayan and Narayan (2013).

Moreover, based on Kearney (2012) the frontier markets countries provide a good testing ground for examining whether frontier market countries are consistent with the western theories. This is as a results of the unavailability of important data for long time that become available in the recent years. Based on the background above, this study investigates the effect of banking sector development on banks risk-taking behaviour measured by the bank capitalization ratio in 28 banks in Tanzania. The investigations is conducted using the two-step system GMM estimation technique so as to handle problems such as serial correlation, endogeneity problem and unobserved heterogeneity that caused by the nature of dataset in this study.

The first important objective of the study evaluates the impact of the banking sector development measured in terms of domestic credit provided by banks to private enterprises (percentage of GDP) on the bank risk-taking behaviour measured by bank capitalization ratio of commercial and non-commercial banks in Tanzania. The findings from the investigation indicate that an increase in domestic credit provided by banks to the private sector as a percentage of GDP in Tanzania is statistical significant for bank capitalization ratio. This is noticed using a positive coefficient value of 0.2410. Therefore, it minimizes bank risk-taking behaviour. Further examination shows that the effects is applicable for both categories of banks which is commercial and non-commercial banks. Moreover, the results is consistent with the theoretical literature of capital buffer theory on a rise in equity capital through reducing information asymmetry issues and transaction costs that are connected with banking sector development (Fonseca & Gonzalez, 2010). Consequently, the empirical findings observed from investigating the first objective are consistent with findings of prior empirical literature such as Vithessonthi and Tongurai (2016); Kleff and Weber (2008). The improvement in bank capitalization ratio in Tanzania may be caused by the increase in credit facility allocation to private enterprises following the major effort of Government to develop the financial system that lead in to increasing banks interest earning. The improvement in capitalization ratio of banks may also be attributed to development measures especially in banking sector which cause to improve lending standard, banking supervision activities and risk management practice.

The findings from the study show that policies for banking sector development in Tanzania appeared to be effective in increasing the retained earnings and the use of equity capital for the banks, this indicating the equity substitution for debt effects. Hence, it increases bank capitalization ratio. In this regards, the results may reassure regulatory authority for banks supervision that the financial sector reforms specifically banking sector development implemented in Tanzania over the years are in the right direction, this observed through improvement of bank capitalization ratio which also result into stability of banking sector in a country. More specifically, the findings in this study provide strong base for policy makers to continue improving control, monitoring and supervisory guidelines. As a result of the continuous improve, the regulatory authorities should establish an alternative measure necessary to enable banks to provide adequate credit to private sector while regularly removing market constraints through liberalization of lending interest rate, establishment and the use of the credit facility bureau institution or establishment of other mechanisms that will enables easy sharing of information between banks as a lender and borrower. This may help in minimizing moral hazard risk and adverse selection problems resulted from information asymmetry. Also this may help in improving credit to private enterprises and enable banks to operate with adequate capitalization ratio. The proper use of credit bureaus institutions is likely to enhance the lending system of banks through effective analysis and effective monitoring of loan which guarantee banks that they are going to get huge returns from their traditional banking activities, this means if there is no asymmetry of information and interest rate are well liberalized, banks are in position to improve the credit facility allocation to private and household. Hence, increasing the return from interest which also reduce bank risk-taking behaviour for improving bank capitalization ratio using retained earnings. On the other hand, the study is significance to researchers who examining impact of banking sector development on bank risk-taking behaviour measured in terms of bank capitalization ratio specifically in frontier market economies countries. The study also provides empirical evidence for researchers to rely on the results particularly in the presence of the scarce empirical literature from frontier market countries.

This study cannot be completed if it fails to address the limitations of the study. This is common for every study to have some limitations. Firstly, this study used annually published bank accounting data that probably can be manipulated rather than using market-based data which are unavailable during the study because large numbers of the banks in Tanzania as at June 2021 are not listed in Stock Exchange. Secondly, the dataset used in this study were relatively limited to ten years from 2012 to 2021. Based on this limitations, this study fails to investigate the long-run effects of banking sector development on bank risk-taking behaviour measured by capitalization ratio in Tanzania. Relatively the study only investigated the short-run effects. While a country level dataset was available for long period of time, bank-level dataset still limited to the same ten years. Therefore, it was difficult to determine the long-run effects using co-integration analysis. Following the above mentioned limitations, it is recommended that future research have to consider the limitations positively and use them as area for improvement of this study. This including employing annually market-based data to extend this work in the future. It should also consider the long-term impact using co-integration analysis. In addition, it should include relatively large proportion of both commercial and non-commercial banks operating in Tanzania. The future studies should also consider institution features in the examination by including factors such as regulatory quality and even government's effectiveness during the implementation of the financial sector policies. This is because these factors may have great effect on the development of financial sector. By considering the above mentioned limitations and working effectively on them. It is expected that future related study could be improved, the scope of knowledge gathered could also be extended and improved.

Competing Interests

There are no competing interests that exist between author(s).

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