Bank competition and financial system stability in a developing economy: does bank capitalization and size matter?

Chileshe, Patrick Mumbi

Bank of Zambia

June 2017

Bank competition and financial system stability in a developing economy: does bank capitalization and size matter?

By

Chileshe Mumbi Patrick[1]

pchileshe@boz.zm

Bank of Zambia

Research Division

Box 30080

Lusaka

BoZ Working Paper 5/2017

[1] *The Author is a Research Economist at the Bank of Zambia. However, the contents and conclusions contained in this paper does not represent the official position of the Banks Board, Management and Staff but entirely that of the author.*

Abstract

This study investigates the effect of bank competition, bank size, diversification and capitalization on risk taking behavior of commercial banks using panel data from Zambia. In addition, the study investigates the effect of capitalization and bank size on the bank competition-stability nexus. The empirical analysis is performed in two stages. In the first stage, time varying bank-specific Lerner Index is estimated. Then this measure of market power as well as other control variables are regressed on measures of bank soundness such as credit risk and overall stability (Z-Score and ZROE). Using a quarterly panel data of Zambian Banks covering the period Q1 2005 to Q4 2016, in general results from the study show that there is a positive relationship between market power and bank stability. In particular, results show that an increase in market power reduces a banks credit risk while it increases overall bank stability. These results are consistent with the 'concentration-stability' hypothesis common in some empirical literature. Furthermore, bank size and capitalization are associated with improvement in bank stability while lack of income diversification reduces bank stability. Finally, results of this study also indicate that larger and well-capitalized banks with market power are more stable than smaller and less capitalized ones.

Policy implications for supervisory authorities in Zambia and other developing countries can be drawn from this study. First, there is need for supervisory authorities in Zambia to tread carefully with regard to enhancing competition in the banking sector as the results clearly indicate that it can have negative effects on financial stability. Secondly, results in this study render support to the use of stringent capital requirements under the Basel II and Basel III. Finally, it would be prudent for supervisory policies to include income diversification regulations thresholds among the commercial banks.

Keywords: Panel Data, Lerner Index, Stability, Non-Performing Loans, Z-SCORE, ZROE

JEL Classification: E43, G21, L22

1.0 Introduction

In the wake of the 2009-2010 Global Financial Crisis (GFC), issues pertaining to financial system stability have gained prominence among policymakers and academics. One key concern of policymakers and researchers has been to understand factors that affect financial system stability to guide policy formulation and implementation. In particular, scholars and policy makers have focused their efforts on the role that bank competition plays in financial system stability as well as bank specific factors, which could impact this relationship such as size, capitalization and liquidity.

The impact of bank competition on financial system stability remains one of the most researched and discussed topics (Beck, De Jonghe and Schepens, 2013; Soedarmono, Machrouh, and Tarazi, 2013; Tabak, Fazio, Cajueiro, 2012; Agoraki, Delis and Pasiouras, 2011). However, so far both theoretical and empirical evidence provide contradicting conclusions. On one hand, the 'competition-stability' or 'concentration-fragility' view argues that enhanced bank competition improves financial system stability due to its effects on lowering lending rates thereby reducing probability of default and consequently systemic risk (Boyd and De Nicolo, 2005; Tabak et al., 2012). In addition, higher loan rates may lead to moral hazard as borrowers increase their investment in risk projects with a view to enhance their ability to repay loans (Tabak et al., 2012). On the contrary, the 'competition-fragility' or the 'concentration-stability' view states that more bank concentration enhances financial system stability. This view argues that banks in concentrated markets earn higher profit margins, thereby creating a buffer from crisis and reducing their incentives to invest in risk assets (Tabak et al., 2012; Agoraki et al., 2011; Hellmann, Murdock, and Stiglitz, 2000). Further, in a competitive market, managers are under pressure to make a return for their shareholders, which could prompt them to take in more risk assets in an effort to improve returns (Keeley, 1990; Tabak et al., 2012), may increase systemic risk. Hence, any adverse shock to the system could trigger a chain reaction in which all banks exposed to the first risky bank may go bankrupt. This is because in a competitive market environment, all banks are price takers and hence relatively small in relation to the whole market, no bank would be willing to provide liquidity to a bank in trouble resulting in a contagion. Another argument in support of the 'concentration-stability' view is that competitive markets worsens the adverse-selection problem, that is in the presence of many banks screening costs increases thereby enhancing the probability of bad borrowers obtaining credit and consequently decreasing loan portfolio quality (Broecker, 1990; Nakamura, 1993; Shaffer, 1998; Tabak et al., 2012).

Additionally, there has been an increased interest from academics and policymakers alike on the role that bank level factors such as bank size, capitalization and income diversification play in enhancing financial system stability. The interest in factors affecting financial system stability have become more pronounced in the wake of the GFC which

gave rise to a new set of stringent financial regulations under the Basel III accord, especially for larger banks. Among other objectives, the Basel III places stringent regulations on systemically important banks, forcing them to use a larger fraction of their capital in operations with a view to reduce both the exposure to contagion and risk taking behavior (Tabak et al., 2012; Basel Committee on Bank Supervision, 2010). The main concern of bank regulators is the 'too big to fail' (TBTF) syndrome among banks, because of larger banks' perceived systemic importance. It is believed that larger banks are likely to expose themselves to greater risk taking activities because they believe that authorities are going to bail them (moral hazard) out thereby increasing financial system instability. Hence, empirical evidence on the determinants of financial system stability is of greater importance to policy makers as they implement the new regulations under the Basel III accord.

The aim of this paper is to extend the literature on the bank competition-financial system stability nexus from the perspective of a developing economy. Specifically, it explores the relationship between financial system stability and bank competition as well as the role that bank specific factors play in this relationship. In addition, the study explores the role that the economic environment play in explaining financial system stability.

A study on a developing country, such as Zambia, is important for many reasons. First, Zambia like many other developing undertook a number of economic and financial sector reforms under the sponsorship of Bretton-wood institutions with implications for competition. Specifically, Zambia liberalized its financial system by relaxing entry restrictions resulting in increased private sector participation and removal of interest rate controls with the aim of enhancing competition of the sector. Second, Zambia has had some episodes of extreme financial stress in the last two and half decades, among them is the collapse of nine banks in the period 1995 to 2001 and recently the placing under receivership of Intermarket Bank Corporation. These episodes of financial system instability entail the need for well-formulated supervisory policies and a regulatory regime based on comprehensive empirical research. Thirdly, Zambia and many other countries are required to implement the stringent measures under the Basel III accord. These measures include new regulations on bank capital and optimal liquidity requirements as well as enhanced regulations for systemically important banks. Finally, literature review revealed that there is no comprehensive study on factors affecting financial system stability, more so the role of bank competition on financial system stability.

The structure of paper is as follows: section 2.0 provides review of theoretical and empirical evidence; section 3.0 provides an overview of Zambia's financial sector; section 4.0 provides a methodology, describing the variables and the empirical methodology employed; Section 5.0 gives and discusses empirical results; and section 6.0 provides concluding remarks and empirical evidence.

2.0 Literature Review

2.1 Theoretical Literature

Theoretical literature provides contrasting predictions regarding the relationship between bank competition and financial stability. These contrasting theoretical views belong to two categories, namely; i) the traditional 'franchise-value hypotheses or 'competition-fragility' view; and ii) the 'concentration-fragility' view.

The traditional 'charter-value' hypothesis, first proposed by Keeley (1990), suggests that increased competition among banks makes them more prone to risk taking thereby increasing their vulnerability. Specifically, the 'charter value hypothesis' argues that banks with greater market power have higher charter values because of the monopoly profits that they are able to earn (Atkins, Li, and Rusticus, 2016). Increased charter values from monopoly profits deter banks from risk-taking behavior and consequently lower the probability of bank failure. In other words, increased competition erodes charter values of banks, which, in turn forces them to take on risky assets to maintain the franchise value (Hellmann et al., 2000; Allen and Gale, 2000; Keeley, 1990). Apart from the charter value channel, greater competition leads to greater fragility through other channels. One such channel is the effect that competition has on bank supervision, which, is often presented through the idea that concentrated banking systems are easier to supervise resulting in more stability (Allen and Gale, 2004; Beck, 2008). Another channel occurs through the relationship between bank competition and payment systems proposed by Saez and shi (2004). According to this channel, excessive competition can deplete excess liquidity in the banking sector such that in the period of a shock the potential for pooling interbank liquidity is undermined leading to reduced stability. Finally, the third channel occurs through the negative effect that competition has on portfolio diversification. Specifically, banks when faced with increased competition tend to invest in similar high yielding assets with a view to protect their charter values. Mishkin (1999) develops a theoretical model, which shows that higher market share allows for better risk diversification in loan portfolio, which helps to mitigate bank losses in periods of economic downturns.

In recent years, the traditional 'charter value hypothesis' or 'competition-fragility' view has been challenged by the 'competition-stability' view, which states that increased market power can reduce banks' stability (Boyd and De Nicolo, 2005). According to this view, increased market power increases the probability of bank failure because of risk shifting process due to the presence of informational asymmetry problems: moral hazard and adverse selection. Stiglitz and Weiss (1981) develops a theoretical model which shows that lack of competition can easily result in moral hazard and adverse selection, which, in turn can reduce banks' loan portfolio quality. Specifically, higher interest rates charged by banks enjoying monopoly power can negatively influence the quality of agents accessing loans (by increasing the share of agents with bad record of repayment-adverse selection)

thereby increasing non-performing loans. Further, higher loan rates can cause borrowers to engage in riskier ventures that have higher returns for them to cover the high cost of borrowing (moral harzard). A model developed by Koskela and Stenbacka (2000) show that price competition among banks leads to lower interests and hence the level of investments that consequently improves economic performance and reduces the probability of default. Others have also argued that concentrated banking systems are likely to be unstable due to regulatory inertia. One part of this theory mentions "too-big-to-fall" (TBTF) policy as the reason explaining 'concentration-fragility' hypothesis. The reason behind the TBTF hypothesis that regulators are likely to help systemically important banks in order to limit the effects of a shock. However, since larger banks know that they are likely to be bailed out by authorities are more prone to risk taking which makes the system less stable. Furthermore, the idea of saving with systemically important banks can also influence depositors of a bank to become less interested in monitoring the bank they save with (Mishkin, 1999; Beck, 2008). Finally, those in support of the 'competition-stability' hypothesis argue that concentrated banking systems are more difficult to monitor and regulate because a large proportion of these banks engage in more complex products, which are often difficult for regulators to monitor (Beck et al., 2006).

2.2 Empirical Literature

There are three categories of empirical literature on the role of bank competition on financial system stability. First, most early studies supported the 'concentration-stability' or the 'franchise-value' view (Broecker, 1990; Keeley, 1990, Agoraki, Delis and Pasiouras, 2011). Another category of studies support the 'concentration-fragility' hypothesis (Boyd, De Nicolo and Jalal, 2006; Soerdarmono et al., 2013; Schaeck et al., 2009). Lastly, the latest set of studies seem to suggest that there is non-linearity in the relationship between bank competition and financial stability (Berger et al., 2009; Tabak et al., 2012; Beck et al., 2013). In particular, banking systems that are more competitive or more concentrated tend to be more stable than those with average levels of competition are.

Empirical evidence from studies in the period prior to the 2000s are mostly in support of the 'concentration-stability' or 'charter-value' hypothesis. Specifically, using USA data Brocker (1990) finds evidence in support of the 'concentration-stability' hypothesis by finding a negative relationship between number of banks and average banks' credit quality. A study by Keeley (1990) provides further evidence by showing that increased competition in the US banking industry following deregulation eroded bank charter values thereby making banks to take more risk. Finally, a recent study by Agoraki et al. (2011) using a bank-level panel data of Central and Eastern European countries utilizing the Lerner Index as measure of bank competition and non-performing loans (NPLs) as well as Z-score as measures of bank risk taking finds evidence in support of the 'charter-value' hypothesis. Specifically, they find that there is a significant negative relationship between

NPLs and the Lerner Index implying that an increase in market power reduces bank risk taking behavior. In addition, they find that bank capital, stringent regulations, bank size and favorable economic performance reduces bank risk-taking behavior. Using the Z-score, the study finds a positive significant relationship with market power implying concentrated market systems are associated with stable banking systems.

In a study of the US cross-sectional data and an international panel data of Banks, Boyd et al. (2006) finds evidence in support of the 'competition-stability' hypothesis. Specifically, their results show that a higher degree of bank competition is associated with improved financial system stability. Further, their study provide evidence to suggest that bank competition is associated with higher willingness to lend. However, the only drawback of this study is that it uses Hirschman-Herfindarl Index (HHI) that ignores firm behavior in determining profitability.

Using duration and logit analysis using a bank-level cross-sectional data from 45 countries, Schaeck et al. (2009) also find evidence in support of the 'Competition-stability' hypothesis. Specifically, they find that competition (measured by H-statistic) reduces the likelihood of a crisis and increases time to crisis thereby rejecting the notion that competitive banking systems are susceptible to systemic risk. The findings are still significant with correct sign even after incorporating a measure of concentration indicating that concentration is not a correct measure of competition. In addition, they find that real interest rates, poor terms of trade and inflation reduces the survival time of banks while economic growth improves soundness of the financial system.

Occurrence of financial crisis may also affect the competition-stability nexus. A study by Soedarmono et al. (2013) investigates the role that financial crises play in modifying bank competition and consequently bank risk taking behavior. The study uses bank-level panel data from 11 Asian countries with Lerner Index as measure of market power while they use standard deviations of return on equity and Assets as measures of risk taking while bank insolvency is measured by Z-scores. The results indicate that market power has positive effect on banks volatility measures indicating that market power increases bank risk taking behavior. In addition, market power to have positive effect on bank insolvency. Finally, they find that although a higher Lerner index reduces bank ratios it had no destabilizing effects on financial stability during the 1997-1999 Asian financial crisis. Specifically, higher market power in banking has a negative impact on risk taking and positive impact on bank solvency. Hence, they conclude that higher degree of market power is associated with financial system instability but the opposite is true during a financial crisis.

A study by Berger et al. (2009), undertakes a test of the opposing views of 'concentration-stability' and 'concentration-fragility' using firm level data from 30 developed countries. Their results support both views. Specifically, they find that banks with higher degree of

market power bear more loan risk portfolio in support of the 'concentration-fragility' hypothesis as well as that Banks with more market power enjoy less overall risk exposure that is in support of the 'concentration-stability' view. In addition, they find that larger banks carry significantly less non-performing loans while foreign owned banks are more fragile. Furthermore, better economic performance is associated with less bank fragility.

Similar to Berger et al. (2009), Tabak et al. (2012) tests evidence of 'Competition-Stability' and 'Competition-fragility' views as well as the role bank size and capitalization play in this relationship using bank-specific panel data from 10 Latin American countries. Using a Boone Index as a measure of competition, they find that Banks operating under high and low competition level are less fragile than under average competition. In addition, results that higher loan loss provision increases bank stability while bank capitalization has the opposite effect. Further, they find that bank liquidity and size improves financial system stability. Hence, they conclude that there is non-linearity effect of competition on risk taking behavior.

Beck et al. (2013) investigates the role country specific factor play in explaining the competition-stability nexus. Using a panel data of US banks, results indicate that there is significant positive relationship the Lerner index and bank soundness indicators. That is an increase in bank competition increases banks' risk taking behavior and consequently undermining financial system stability. Similar to Berger et al. (2009), they find that credit risk and non-interest income improves bank stability. More importantly, they find that higher bank competition is more harmful to stability in countries where i) information sharing systems are effective, ii) stock market are liquid, iii) deposit insurance is more generous, and iv) stricter financial regulations. Hence, they conclude that country level factors may help to explain the contradicting effects of competition on financial stability.

3.0 Stylized facts about Zambia's banking sector

Prior to 1990, Zambia's financial sector consisted of only three local private banks with minimal market share. Foreign and government owned banks dominated the banking sector taking up a larger share of the market. However, economic liberalization reforms undertaken by government with the support of Bretton-wood institutions included a package of financial sector reforms. As part of the reforms, it was recognized that a well-functioning and competitive banking system was cardinal for the overall development of the country (Simpasa, 2013). Accordingly, Zambia liberalized its financial system by relaxing entry restrictions resulting in increased private sector participation and removal of interest rate controls with the aim of enhancing competition as well as fostering efficiency in the sector.

Following removal of entry restriction, the structure of Zambia's financial sector significantly changed. The early years of financial sector reforms saw a progressive entry of new banks in the sector reaching 19 in 1995 from only 12 banks in 1989 (Brownridge,

1996). However, this positive result was reversed during the mid-1990s banking crisis, which saw the collapse of more than 8 banks (Simpasa, Nandwa, and Nabassaga, 2014). The banking sector crisis of the mid-1990s created a scope for more prudential reforms that resulted in a more robust regulatory framework (GRZ, 2004; Simpasa *et al*., 2014).

Another result of financial reforms of the early 1990s was the entry of new foreign owned banks into the banking sector. As at the end of 2012, there were a total of 13 foreign-owned banks, four privately owned banks, and 2 banks with a government stake. In an effort to improve efficiency, the Government of the Republic of Zambia partially privatised the Zambia National Commercial Bank, the largest domestic bank, through offering a stake to a foreign bank (Rabobank) and offloading part of its shareholding on the Lusaka Stock Exchange to the private sector. Although government and other Zambian shareholders have a majority stake in the bank, management rights are with foreign shareholders (45%). In totality, there are 19 commercial banks operating in Zambia with a combined asset size equivalent to 30% of GDP (Simpasa *et al.,* 2014).

Although there has been an increase in the number of commercial banks in Zambia's banking sector, it remains highly concentrated. The 4-firm concentration, a basic measure of market structure indicates that Zambia's banking sector is not competitive as it shows that four largest banks control nearly two-thirds of all market segments (see Table 1 below). In addition, nearly all the four banks have a foreign ownership stake in them. This state of affairs poses a danger to the effectiveness of monetary policy transmission in three important ways. Firstly, foreign ownership not only exposes the financial sector to external shocks facing parent companies but also these banks can use liquidity from parent banks to circumvent tight monetary policy in the host economy and hence render monetary policy ineffective. Secondly, high levels of concentration in the banking sector could undermine the effectiveness of monetary policy through sluggishness in the adjustments of interest rates in response to changes in monetary policy (Couttareli and Kourelis, 1994; Massarongo, 2012). Finally, most foreign banks may have policies regarding credit extension, which is dependent on the policies in foreign countries (Simpasa *et al.,* 2014).

Table 1: 4-Firm Concentration Ratio Since 1998

	1998	2000	2002	2004	2006	2008	2010	2012	2013	2014	2015	2016
Loans	80.9	78.3	76.2	75.5	73.6	75.7	62.9	66.4	65.6	62.6	62.3	61.7
Deposits	75.5	78.0	74.9	73.8	66.9	67.3	65.7	61.7	60.2	57.9	60.1	59.8
Assets	77.8	74.7	64	70.8	63.5	67.3	62.9	61.5	57.9	55.5	57.0	58.1
Bonds and Securities	58.9	58.6	69.8	71.5	60.7	62.2	64.9	66.7	62.1	54.8	59.8	60.1

Source: Computations by Author Using BOZ Database, 1998-2016

Since 1998, a reflection in the level of competition has been most evident in the loans segment followed by the deposits while the assets segment and Bond/securities segment has remained static over the last ten years. Similarly, banking activities have increased over time, as depicted by the composition of the banks' consolidated balance sheet (see Table 1 above). Furthermore, there has been an increase in the banking activities in the country as indicated by the consolidated balance sheet which has shown that the level of assets and liabilities have increased from only 1.5 billion kwacha in 1998 to over 49.6 billion in 2014 (See Table 2 below).

Table 2: Consolidated Balance Sheet of the Commercial Banks in Zambia

	1998		2002		2006		2010		2012		2014	
	k' mn	Share	k' mn	Share	k' mn	Share	k' mn	Share	k' mn	Share	k' mn	Share
Liquid Assets	308.5	20.8	1,752.3	37.5	4,491.3	42.1	10,446.7	43.1	12,759.9	36.1	21,762.1	43.9
Total Loans	499.8	33.7	947.7	20.3	3,866.6	36.2	9,219.4	38.0	16,667.4	47.1	21,665.0	43.7
Foreign Assets	445.0	30.0	1,226.4	26.2	1,718.4	16.1	2,426.0	10.0	4,440.2	12.5	6,952.0	14.0
Other assets	230.0	15.5	723.0	15.5	598.9	5.6	2,150.2	8.9	1,512.7	4.3	2,275.4	4.6
LIABILITIES												
Deposits	1,006.0	67.8	3,257.5	69.7	7,886.5	73.9	17,296.6	71.3	25,214.3	71.3	34,942.5	70.4
Other Borrowed Funds	15.0	1.0	59.8	1.3	150.5	1.4	540.2	2.2	931.7	2.6	1,176.0	2.4
Foreign Funds	40.0	2.7	96.5	2.1	673.0	6.3	2,339.9	9.7	310.8	0.9	1,997.7	4.0
Shareholder Capital	161.0	10.9	573.7	12.3	1,029.3	9.6	2,208.4	9.1	3,960.5	11.2	7,273.9	14.7
Others	261.0	17.6	688.8	14.7	935.9	8.8	1,857.4	7.7	4,962.9	14.0	3,606.2	7.3
Assets=Liabilities	1,483.0	100.0	4,676.3	100.0	10,675.2	100.0	24,242.4	100.0	35,380.2	100.0	49,602.6	100.0

Source: Computations by Author Using BOZ Database, 1998-2014

Over the review period, the commercial banks have increased the share of liquid assets (notes and coins, deposits at the Central Bank and holding of securities), although they showed a decline in 2012 and replaced by loans. Specifically, as at the end of 1998 liquid assets accounted for slightly less than 21% of the banking system's total assets against approximately 34% in loans. By the end of 2010, the share of liquid assets in total assets had reached 43.1% while the total loans and advances accounted for 38%. However, by the end of 2012 the share of liquid assets dropped to 36% while loans and advances grew to 47.1%. At end 2015, total loans and advances fell to 43.7%. The rebound in the share of loans follows banks' increased exposure to the private sector following marked improvements in macroeconomic performance, underpinned by low inflation and strong economic growth, *especially after the 2007-2010 global economic crisis* (Simpasa *et al*., 2014). Although there has been a sustained increase in the level of credit extended to the private sector, it remains low even by regional standards. The increase in credit extended to the private sector could be due to a fall in yield rates on government securities.

In terms of foreign assets, Table 2 shows that before 2006 commercial banks acquired large amounts of foreign assets to hedge against high inflation and a rapidly depreciating domestic currency. However, as conditions have improved, the proportion of claims on

foreign financial institutions in total assets by Zambian banks has significantly decreased, reaching 16% in 2006 and then 10% in 2010 and then edging slightly upwards to 12.5% in 2012.

On the liabilities side, deposits account for more than two-thirds of the banks' sources of funds. Although the bulk of deposits are attributed to the private sector, some large banks also hold substantial amounts of government deposits, which provide a buffer against swings in private sector deposits. On the other hand, shareholders' capital has remained relatively stable over the years, roughly around 9-10% of total liabilities. This level of capitalisation reflects the robustness of the regulatory framework instituted in the aftermath of systemic bank failures in the mid-1990s.

In the continued effort to strengthen the banking sector and improve its resilience to external shocks, the Bank of Zambia (BoZ) increased regulatory capital further in April 2012 and introduced a tiered structure (GRZ, 2012). The minimum capital requirement for local banks was set at K104 billion (US$20 million) while that for foreign banks was set at K520 billion (US$100 million). Before the revision, minimum capital for all banks was K12 billion (approximately US$2 million). It was expected that the new capital requirement would attract additional resources into the industry and encourage lending to the private sector.

4.0 Methodology

4.1 Econometric model and estimation strategy

In this study, to examine the relationship between risk taking behavior and competition, the model to be estimated include bank specific factors and business cycle variables from the various studies reviewed in the literature (Beck et al., 2006; Tabak et al., 2012; Kasman and Kasman, 2015; Berger et al. 2009; Soedarmono et al., 2013). In this regard, the general model used in this paper is given by:

$$Risk_{it} = f(competition_{it}, Bank\ Specific\ Variables_{it}, Macroeconomic\ Variables_{t}) \dots \dots 1$$

In the above model subscripts i and t refers to bank and quarter, respectively. The model sets the relationship between bank risk and competition, controlling for bank specific variables and macroeconomic variables. Further, to investigate the effect of size and capitalization on the relationship between bank competition and Risk variables interaction terms between these variables and measures of market are introduced. Specifically, the following model is estimated:

$$Risk_{it} = \alpha_0 + \beta_1 Risk_{it-1} + \beta_1 LI_{it} + \beta_2 LI_{it}{}^{2}_{it} + \sum_{i=1}^{n} \gamma_i LI_{it} * X_{it} + \sum_{j=1}^{n} \theta_j X_{jit} + \sum_{j=1}^{n} \delta_j E_{jit} + v_{it} + \varepsilon_{it} \dots \dots \dots 2$$

$Risk_{it}$ refers to credit risk or Z-score/ZROE, which are measures of credit risk and bank-stability, respectively. On the other hand, LI represents the Lerner Index, which is our measure of bank competition. The method used to estimate the measures of bank risk (credit and overall bank risk) as well as market power are discussed in section 4.2. Furthermore, X_{it} represents a vector of bank specific variables such as a measure of size (log of total assets), capitalization (ratio of bank capital to total assets), and a measure of diversification (ratio of non-interest income to total income). Finally, E_{jit} represents economic environment variables among them is inflation, price of copper, lending rate and level of real GDP. Economic variables are included to take into account the effects of business cycle environment. In addition, the first lag of the dependent variable is added to take care of persistence in bank risk.

An important aspect in panel data analysis is the choice between fixed and random effects model. Fixed effects models assume that the unobserved individual effects are correlated with the variables included in the model while the random effects model does not (Hansen, 2002:135). This is because a choice of either fixed or random effect model has its own limitations. For example, Greene (2012:301) notes that fixed effects model is costly because it leads to loss of degrees of freedom compared to the random effects model. However, the fixed effects model has one important advantage over the random effects model. This is because there is little justification in treating the unobserved individual effects to be uncorrelated with the other variables as in the random effects and hence, the random effects may suffer from inconsistency due to this correlation. Hence, to decide on which of the approach to use the Hausman's Specification test is used.

4.2 Data and descriptive statistics

Bank-specific data for this study is obtained from the Bank of Zambia database of prudential returns submitted monthly by all commercial banks undertaking their operations in Zambia for the period Q1 2005 to Q4 2016. The prudential returns include income statements and balance sheets of all the 19 commercial banks operating. Banks also categorized as domestic and foreign ownership because in Zambia capital requirements are different between the two ownership types. In Zambia, there are 14 foreign owned banks and 5 domestic banks. Furthermore, data on domestic economic environmental variables are obtained from the central statistical office (CSO) and the International Monetary Fund (IMF) database. The descriptive characteristics of the variables are presented in table 3 below:

Table 3: Descriptive Statistics of Model Variables

Variable	Definition	Mean	Median	Standard Deviation
Variables in the Translog Equation				
TA	Total Assets (in K' millions)	1,731,511.00	945,075.00	2,113,501.00
TC	Total Costs (in K' millions)	47,662.40	22,822.50	58,086.33
wl	Price of Labour	0.013040	0.011161	0.010739
Wf	Price of borrowed funds	0.036288	0.019026	0.052365
wk	Price of Capital	0.545222	0.389562	0.491119
RISK	Ratio of Non-Performing Loans to gross Loans	0.090708	0.062385	0.103163
Variables in the Bank Stability and Credit Risk Equations				
Independent Variables in the Bank Soundness Equations				
Business_model	Ratio of Non-Interest Income to total Income	0.35024	0.350937	0.193679
TA	Total Assets (in K' millions)	1,731,511.00	945,075.00	2,113,501.00
Capitalization	Ratio of Bank Capital to total assets	0.152958	0.115231	0.117069
Adj_Lerner	Estimated Bank Specific Lerner index	0.284938	0.446105	1.931672
GDP	Quarterly Real GDP in billions	30914.24	30826.8	13001.09
ALR	Average Lending Rate	24.41566	25.2	5.247323
Cop	Copper prices in US dollars	6621.498	7069.2	1570.08
Exchange Rate	Nominal Exchange Rate (ZMW/USD)	5.711169	5.031867	2.081713
Inf	Annual Inflation	8.820737	7.658451	2.923791
Dependent Variables in the Bank Soundness Equations				
Z-score	Z-score based on ROA from a four-quarter period rolling window	53.46353	34.45018	66.56441
Z_ROE	Z-score based on ROE from a four-quarter period rolling window	50.46318	33.05339	53.32519
NPL_ratio	Ratio of Non-Performing Loans to gross loans	0.091055	0.062621	0.103208
SDROA	Standard deviation of ROA for four-quarter period rolling window	0.007396	0.004105	0.013396

Source: Computations by the Author

4.2.1 Measures of bank competition

In this study, bank competition is proxied by the Lerner index, which is commonly used in banking research, as a measure of competition or market power. The Lerner Index captures the ability of a firm to charge the price above marginal cost as percentage of the price and ranges between 0 and 1. In case of perfect competition, the Lerner Index is 0 while it is 1 in pure monopoly. The Bank specific time-variant Lerner Index is as follows:

$$Lerner_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \dots\dots\dots\dots\dots 3$$

where P_{it} is the price of the bank $i's$ output and MC_{it} is the marginal cost. We computed P_{it}, as the ratio of the total operating income (interest and non-interest revenues) to the total assets.

The Lerner Index as specified in equation 1 above assumes implicitly both profit and cost efficiency and fails to consider that banks may fail to exploit pricing opportunities arising from their market power (Koetter, Kolari, and Spierdijk, 2012; Kasman and Kasman, 2015; Clerides, Delis, and Kokas, 2013). Hence they argue that the traditional Lerner Index does

not correctly measure the true market power. In this regard, they suggest an efficient adjusted Lerner Index which is specified as follows:

$$Adjusted\ Lerner_{it} = \frac{\pi_{it} + tc_{it} + -MC_{it} * q_{it}}{\pi_{it} + tc_{it}} \dots\dots\dots\dots\dots 4$$

To estimate the time-variant bank specific marginal cost, the study utilises and adapts a method employed by Simpasa (2013) as well as Chileshe and Akanbi (2016). The method uses an estimate of a trans-log cost function estimated with three inputs, namely; labour, fixed assets and borrowed funds and one-output (total assets). Specifically, the translog function estimated is as follows:

$$\ln tc_{it} = \alpha_0 + \beta_1 lnY_{it} + \sum_{j=1}^{3} \beta_j lnW_{jit} + \frac{1}{2}\left[\alpha_{yy}(lnY_{it})^2 + \sum_{j=1}^{3}\sum_{m=1}^{3} \beta_{jm} lnW_{jit} lnW_{mit}\right] + \sum_{j=1}^{3} \beta_{YJ}\, lnY_{it} lnW_{it} + v_{it} + u_{it} \dots\dots\dots\dots\dots 5$$

Where TC is total cost, Y is output (total assets), and W is a vector of input prices (price of labour, price of borrowed funds and price of physical capital)[2]. V represents the standard noise and u captures the inefficiency. Further, following in Turk-Ariss (2010) as well as Kasman and Kasman (2015) the total costs and prices of funds as well as labor are scaled by the price of physical capital to reduce the likelihood of heteroscedasticity. An important aspect in estimating panel data models as one above is the choice between random and fixed effects model. In order to choose the correct approach the Haussman test is utilized.

To obtain the time-variant bank specific marginal cost, equation 3 is differentiated with respect to Y:

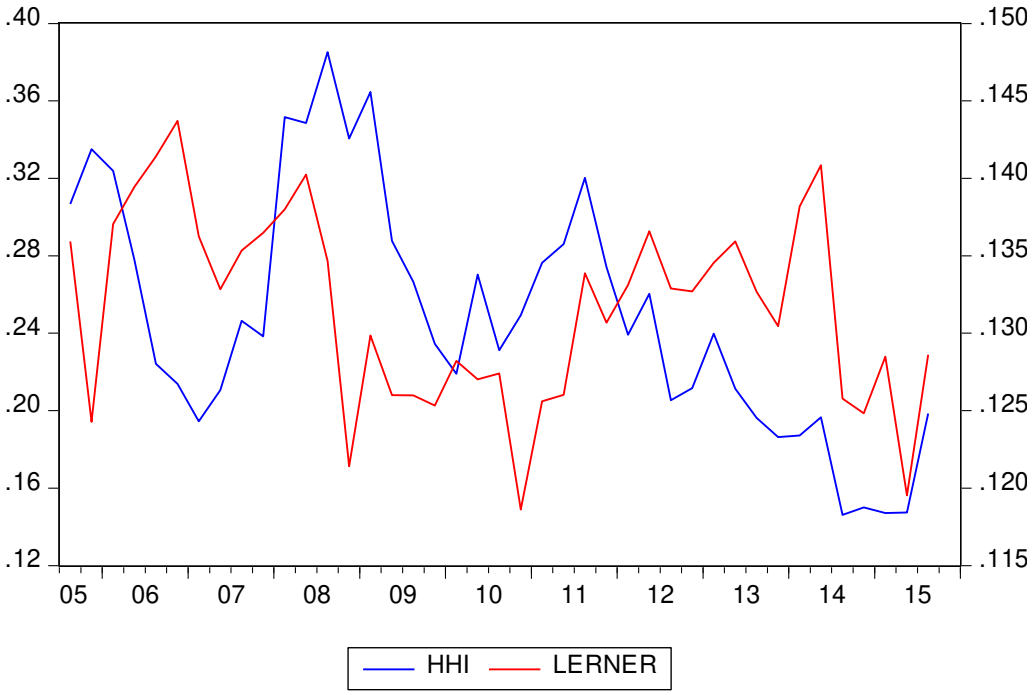
$$MC_{it} = \frac{\partial tc_{it}}{\partial Y_{it}} = \frac{tc_{it}}{Y_{it}}\left[\beta_1 + \alpha_{yy} lnY_{it} + \sum_{j=1}^{2} \beta_{yj} lnW_{jit}\right] \dots\dots\dots\dots 6$$

Using the MC equation above and the price of output (approximated by total operating income divided by total assets), the bank specific-time varying Lerner Index given in formulas in equations 3 and 4 is estimated.

[2] The price of labour is calculated as the ratio between personnel expenses and total assets; price of physical assets measured as ratio of total non-labour costs to fixed assets while the price of borrowed funds is calculated as a ratio of total interest expenses to total borrowed funds.

The results for the translog function in equation 5 are reported in table 4 below. The results reported in table 4 below present reasonable parameter estimates, with normalised input prices and scale variables carrying the expected signs significant at the 1% level of significance. In addition, to take care of the cost consequences of non-performing loans on a banks' books it is added as one of the independent variables; RISK has the expected significant sign. Estimates of average Lerner index tracks to the Hirschman-Herfindarl Index (HHI) (see figure 1 below).

Figure 1: Evolution of the HHI and Lerner Index



Source: Computations by the Author using estimates

Table 4: Fixed effects estimation of the Translog Total Cost Function

Dependent Variable: $ln(TC)$			
Variable	Parameter Estimate	T-Statistic	P-Value
$\boldsymbol{Intercept}$	1.12482	1.81278	0.0703*
$\boldsymbol{ln(TA)}$	1.09405	13.27394	0.0000***
$\boldsymbol{ln(wl)}$	0.80436	12.90145	0.0000***
$\boldsymbol{ln(wf)}$	0.23855	3.94587	0.0001***
$\frac{1}{2}\boldsymbol{(ln(TA))\text{^}2}$	-0.02029	-2.74425	0.0062***
$\frac{1}{2}\boldsymbol{(ln(wl))\text{^}2}$	0.09498	3.35495	0.0008***
$\frac{1}{2}\boldsymbol{(ln(wf))\text{^}2}$	0.02728	4.34250	0.0000***
$\frac{1}{2}\boldsymbol{ln(wf) * ln(wl)}$	-0.01671	-0.93912	0.3480
$\boldsymbol{ln(TA) * ln(wl)}$	-0.00615	-5.06021	0.0000***
$\boldsymbol{ln(TA) * ln(wl)}$	0.038001	7.43584	0.0000***
$\boldsymbol{Risk}$	0.26273	5.36747	0.0000***
Diagnostics			
No Cross-sections	No. of Observations	Weighted R^2	P-value
19	788	0.987	0.0000***
Haussmann's Test Results: $Chi_{Square} Test\ Statistic = 58.394\ ; P - Value = 0.000\ ***$			

*Source: Computations by the Author: Significance Level: *p<0.10, **p<0.05, ***p<0.01*

4.2.2 Bank Stability Measures

Regarding bank stability, this study uses two different measures of risk exposure indicators are utilized as dependent variables to proxy credit risk and bank stability. Specifically, the volume of non-performing loans as ratio of total loans (NPLs) is used as a measure of credit risk while the Z-score is used as a measure of bank stability. The Z-score is a widely used measure of bank stability in the literature and it measures the number of standard deviations by which bank returns would have to fall from average to deplete equity capital (Kasman and Kasman, 2015). In other words, how many standard deviations in return on assets a bank is from insolvency. The Z-score is computed as follows:

$$Z_{it} = \frac{ROA_{it} + E/TA_{it}}{\sigma_{(ROA)it}} \dots\dots\dots\dots 5$$

Where ROA is return on assets, E/TA is the equity to total asset ratio, and σ_{ROA} is the standard deviation of the return on assets. In this study, a four-quarter rolling time window is used to compute the standard deviation to allow for time variation in the denominator of the Z-score. A higher Z-score imply a lower probability of insolvency and vice-versa, thereby providing a more direct measure of soundness compared to other measures. As

already stated, the study also uses the Z-score based on the average return on equity (ZROE) to capture bank insolvency risk.

$$ZROE_{it} = \frac{1 + ROE_{it}}{\sigma_{(ROE)it}} \ldots\ldots\ldots 6$$

Where ROE_{it} is bank i return on equity at time t while the

Credit risk is another major source of banking system risk. Available literature has shown that there is a positive relationship between bank's credit risk and NPLs. In this regard, if a rise in NPLs is not controlled it can lead to banking failure with devastating implications on the economy, especially for systemically important banks. Hence, NPL is an important prudential indicator that should be watched by regulators in evaluating banking system stability. In this regard, this study also uses NPL ratio as a measure bank credit. In this study, credit risk is measured by:

$$CRISK_{it} = \frac{NPL\_Ratio_{it}}{1 - NPL\_Ratio_{it}}$$

This transformation is used to change the variable's support from the unit interval to the real number line.

5.0 Empirical results and discussions

In this section, attention is turned to discussing the effect of bank competition on risk taking behavior among banks as well as determining how bank size and capitalization changes this relationship. Available literature suggests that larger banks in concentrated markets have higher profit margins, which is why these banks may appear to have sound balance sheets (Hellman et al., 2000; Allen and Gale, 2000; Agoraki et al., 2011). In addition, under competition large banks and those with higher capitalization maybe pressured by their shareholders to take on more risk to ensure a higher return.

5.1 Credit risk and bank competition

In our analysis credit risk, is proxied by the Non-Performing Loans Ratio (NPL). Literature has shown that one key source of financial system risk is the size of non-performing loans in the Banking sector (Agoraki et al., 2011). Table 3 below presents the results with Non-Performing Loans as a dependent variable. Results presented in table 3 three are reasonable and consistent with theoretical and empirical literature. Results of the Haussman test suggest that the fixed effects approach is used.

Results reported in table 5 below, show that the coefficient of the linear term is negative while that of the quadratic term is positive and significant at 1% and 5% respectively. This result is consistent with U-sharp pattern (Agoraki et al., 2011; Tabak et al., 2012), which suggests that an increase in market power leads to a decline in credit risk, consistent with

the ‘concentration-stability’ hypothesis, but only up to a certain level. After this threshold, an increase in market power leads to an increase in credit risk in line with the ‘concentration-fragility’ hypothesis as suggested by Boyd and De Nicolo (2005).

In addition, table 5 shows that bank size and the level of capitalization has significant negative effect on non-performing ratio or credit risk as expected. The negative association between size and credit risk is in line with literature, which suggests that portfolio diversification and possibly better risk management skills at larger banks play a better role in mitigating credit risk (Jimenez, Lopez, and Saurina, 2010). This is confirmed by the positive effect of lower diversification on credit risk. In addition, the positive effect of bank capitalization in mitigating credit risk could be explained by the fact that bank capital is a risk averse source of funding compared to liabilities.

With regard to business cycle variables, table 5 shows that higher copper prices on the international market has a negative association with domestic credit risk while higher lending rates have the opposite effect, significant at 5% and 10% respectively. The positive effect that the level of copper prices has on credit risk is expected in the sense that Zambia’s economic performance is highly dependent on the extraction and exportation of copper. Hence, higher copper prices are associated with better economic performance thereby improving the ability of borrowers to service their loans. The positive association between lending rates and credit risk maybe due to the burden that higher interest rates place on borrowers thereby making it hard for them to service their debt. However, economic performance and inflation was found to have the correct sign but insignificant.

Table 5: Credit Risk, Bank Competition, Size, Capitalisation and Economic Environment

Dependent Variable: $Credit\ Risk\ (\frac{NPL\_Ratio}{1-NPL\_Ratio})$			
Variable	Parameter Estimate	T-Statistic	P-Value
$\boldsymbol{Intercept}$	0.06417	2.10371	0.0357**
$\boldsymbol{Credit\ Risk(-1)}$	0.82084	32.74077	0.0000***
$\boldsymbol{Lerner}$	-0.04481	-2.58317	0.0100**
$\boldsymbol{Lerner^2}$	0.00146	2.31927	0.0207**
$\boldsymbol{Size}$	-0.10515	-4.19232	0.0000***
$\boldsymbol{Capitalisation}$	-0.03929	-2.27529	0.0232**
$\boldsymbol{Diversification}$	0.00454	1.75744	0.0793*
$\boldsymbol{Log(GDP)}$	-0.00276	-1.58900	0.1125
$\boldsymbol{Lending\ Rate}$	0.00854	1.76880	0.0703*
$\boldsymbol{Inflation}$	0.00732	-1.06996	0.2850
$\boldsymbol{log(copper)}$	-0.00392	-2.013881	0.0444*
$\boldsymbol{Size * Lerner}$	0.01444	4.88307	0.0000***
$\boldsymbol{Capitalisation * Lerner}$	0.00934	2.050411	0.0407**
Diagnostics			
No Cross-sections	No. of Observations	Weighted R_Square	P-value
19	769	0.887	0.0000***
Durbin Watson Test Statistic			2.065
Haussmann's Test Results: $Chi_{Square} Test\ Statistic = 34.894\ ; P - Value = 0.000\ ***$			

*Source: Computations by the Author: Significance Level: *p<0.10, **p<0.05, ***p<0.01*

Finally, to investigate the role size and bank capitalization play in the bank competition-credit risk nexus, our model includes interactions of the Lerner Index and measures of size and capitalization. The interaction terms of both size and capitalization with the Lerner Index are positive implying that an increase in both size and capital reduces the effect of market power on credit risk. In other words, as bank size increases the effect of a banks' market power on credit risk reduces. This effect is similar to bank capitalization. This finding imply that the positive effect bank market power on financial system stability diminishes as the size of the bank increases and bank capital rises.

5.1 Overall bank stability and bank competition

In this sub-section, results of the effect bank competition on overall bank stability. Table 6 below, show estimations of equation 1 in which two measures of overall bank stability

(Z-Score and ZROE) are regressed against a series of explanatory variables. A positive coefficient imply that the variable in question helps to improve a banks' overall stability or it is directly proportional to overall bank stability. On the other hand, a negative coefficient imply that the variable in question is inversely proportional to bank stability. Before estimating the econometric models using panel data, it is important to test for fixed or random effects. Results of the Haussmann test in table 6 indicate that random effects model is rejected in favor of the fixed effects model.

The results in table 6 below indicate that there is significant positive relationship between the Lerner Index and the two measures of bank insolvency (Z-Score and ZROE). In other words, increase in bank competition, which erodes a banks' ability to raise price above marginal cost, increases banks' risk taking activities resulting in more bank-fragility and hence detrimental to financial stability. This finding is similar to findings from other studies that support the 'competition-fragility' hypothesis (Broecker, 1990; Keeley, 1990; Agoraki et al., 2011; Berger et al., 2009). Since both the Lerner Index and its square have a positive coefficient, the U-sharp hypothesis is rejected. It important to note that adding control variables does not change the significance nor the sign of the coefficient on Lerner Index.

With regard to other bank specific control variables, the results show that there is significant positive relationship between capital ratio (lower leveraged) and bank soundness. This result is similar to findings by Agoraki et al. (2011), Kasman and Kasman (2016) and Tabak et al. (2012) and supports the conventional view that higher levels of bank capitalization will help to reduce overall bank risk by placing banks in a better position to absorb losses resulting from adverse shocks. This result also renders support to stricter capital regulations under Basel II and Basel III as a safeguard against excessive risk taking. Although, the coefficient on bank size has the correct sign it is not significant. Finally, the coefficient on diversification indicator is negative and significant. This result implies that banks with a diversified source of income are able to withstand adverse shocks on other sources of income thereby improving overall bank soundness. This result is similar to findings by Kasman and Kasman (2015) but contrary to those by De Haan and Poghosyan (2012a, 2012b).

Further, in addition to bank specific factors economic environment variables are also introduced as control variables in the model. Results in table 6 below show that there is a positive significant relationship between the level of economic performance and bank solvency. This result is consistent with results by Soerdarmono et al. (2013) and it implies that an increase in economic activity improves the level of bank soundness due to its effects on bank earnings. In addition, the results show that higher copper prices on the international market helps to improve the risk bank insolvency. This is consistent with findings by Chileshe et al. (2016) which shows that positive shocks to commodity prices, especially that of copper, has a significant effect on Zambia's macroeconomic

performance. Hence, higher copper prices on international markets could imply an improvement in domestic economic activity thereby improving bank earnings. With regard to lending rates, the results indicate that there is a significant negative association between ZROE but insignificant for Z-Score. This result imply that rising interest rates worsens the quality of the loan book due to increase in the size of non-performing loans as more borrowers fail to service their loan obligations due higher interest payments. In addition, higher interest rates on loans lowers the demand for borrowing thereby reducing the interest earnings on new loan issues and consequently resulting in lower bank net interest income. Finally, the coefficient on inflation has the expected sign but is insignificant.

In addition to assessing the effect of bank competition on bank soundness, another objective of the study was to assess the effect of bank size and capitalization in this relationship. Hence, interaction terms between the measure of market power and measures of bank insolvency are added to the model. The coefficient of the interaction term between the Lerner Index and capitalization is positive and significant while that on the interaction of the Lerner Index and size is positive but insignificant. This indicates that banks that are better capitalized and have more market power, enjoy even better overall bank soundness. Therefore, this implies that collusive banking markets are positive for overall bank stability, especially for banks with higher levels of bank capitalization. This result is similar to findings by Tabak et al. (2013).

Table 6: The effect of competition on overall bank stability

	Dependent Variable: ZROE/100			**Dependent Variable: Z-SCORE/100**		
Variable	Coefficient	T-statistic	P-value	Coefficient	T-statistic	P-value
$Intercept$	-1.130	-1.885	0.060*	-1.340	-2.242	0.025**
$Lagged\ Dependent$	0.574	16.266	0.000***	0.654	18.276	0.000***
$Lerner$	0.086	2.919	0.004***	0.120	3.266	0.001***
$Lerner^2$	0.037	2.419	0.029**	0.077	3.461	0.001***
$Size$	0.020	0.435	0.663	0.034	0.791	0.429
$Capitalisation$	0.852	2.919	0.000***	1.174	9.472	0.000***
$Diversification$	-0.040	-1.850	0.065*	-0.018	-0.549	0.583
$Log(GDP)$	0.170	2.087	0.037**	0.128	6.554	0.000***
$Lending\ Rate$	-0.077	-3.648	0.000***	-0.274	-1.288	0.198
$Inflation$	-0.148	-1.157	0.248	-0.028	-0.219	0.827
$log(copper)$	0.020	0.634	0.526	0.053	2.278	0.018**
$Size * Lerner$	0.095	1.348	0.178	0.095	1.299	0.195
$Capitalisation * Lerner$	0.303	6.137	0.000***	0.572	4.425	0.000***
Diagnostics						
	No. Cross-Sections		19	No. Cross-Sections		19
	No. of Observations		769	No. of Observations		769
	Weighted R_Squared		0.579	Weighted R_Squared		0.647
	P-Value		0.000***	P-Value		0.000***
	Haussmann's Test		Chi^2=41.356 P-Value=0.00	**Haussmann's Test**		27.165 0.00
DW Test Statistic	1.959			1.897		

Source: computations by the author

*Significance Level: *p<0.10, **p<0.05, ***p<0.01*

6.0 Conclusions and policy implications

The main objective of this paper was to investigate whether bank competition reduces or increase credit risk and overall bank stability using a quarterly panel data of Zambian banks covering the period Q1 2005 to Q4 2016. In addition, the study investigates the effect of bank size, diversification and capitalization on credit risk and bank soundness. Thereafter, the role that bank size and capitalization play in the competition-stability nexus is evaluated. To achieve the objectives of this study, we estimated a time varying bank specific Lerner Index using a translog function. The average Lerner Index estimated over the period is 0.28 similar to estimates by Chileshe and Akanbi (2016) as well as that by Simpasa (2013).

Using panel data approaches, results showed that the relationship between credit risk and market power is U-sharped. This result supports both 'concentration-stability' and 'concentration-fragility' hypothesis. On the contrary, using measures of overall bank

stability the U-sharp hypothesis is rejected. Specifically, the results indicate that an increase in market power increases overall bank soundness. In general, results in this study indicate that increasing bank competition reduces financial system stability in line with 'concentration-stability' hypothesis.

Further, results showed that bank size and capitalization have significant positive effect on both credit risk and overall bank soundness. The positive effect of bank size on bank stability is in support of literature, which suggest that larger banks have better risk management skills that play a critical role in mitigating credit risk. On the other hand, the favorable effect of bank capital on bank stability is in with the argument that banks which rely more on shareholder capital to finance their operations are more risk averse compared to those who rely on liabilities. Finally, results showed that income diversification is critical in improving bank stability. In particular, the results showed that lower levels of income diversification is negatively associated with bank stability and positively with credit risk. This result confirms the importance of portfolio diversification to bank stability. It is expected that a bank with well-diversified portfolio is likely to better withstand adverse shocks on earnings from one of its income sources compared to a less diversified bank, resulting in more stability.

With regard to economic environment, results in general showed that economic performance has a positive effect on overall bank stability and negatively associated with credit risk. These results are expected and in line with literature, which suggests that improved economic performance enhances the revenue generation of commercial banks through higher demand for loans while at the same time it increases the ability of borrowers to service their loans. The favorable effect of higher economic activity on bank stability is confirmed by the negative effect of copper prices on the international market on credit risk while it has a positive effect on overall bank stability. However, the finds that there is positive association between credit risk and negative association with overall bank stability. This implies higher interest rates on credit leads to bank instability maybe because it increases the probability of default.

Finally, results indicate that the interaction terms of measures of size and bank capital have significant positive coefficient with regard to credit risk and overall bank stability. These results imply that larger and well-capitalized banks with market power are more stable than smaller undercapitalized ones.

A number policy implications can be drawn from the results of this study. First, the favorable effect of market power on bank stability implies that there is need for supervisory authorities in Zambia and similar countries to be wary of rushing to increase competition in the sector as it may lead to increased risk taking among the banks. In addition, results suggests that it would be prudent for authorities to propose merger of smaller banks to enhance their market power and consequently their stability. Second, implementing

stringent capital regulations under the Basel II and Basel III especially is critical for further enhancing financial stability. Third, it would be prudent for regulatory authorities to introduce income diversification thresholds for commercial banks aimed at safeguarding banks against adverse shocks on some income sources. Finally, it would be prudent for authorities to enhance monitoring of commercial banks during periods of economic downturns.

References

Agoraki, F., Delis, M. D., Pasiouras, F., 2011. *Regulations, competition and risk taking in transition economies,* Journal of Financial Stability vol. 7: 38-48.

Allen, F., Gale, D. 2000. *Comparing financial systems.* MIT press, Cambridge, MA.

Basel Committee on Banking Supervision, 2010. *Basel III: A global regulatory framework for more resilient banks and banking systems.*

Basel Committee on Banking Supervision, 2005. *Basel II: International convergence of capital measurements and standards. A revised framework.*

Beck, T., Dermirguc-Kunt, A., Levine, R. 2006. *Bank concentration, competition and crisis, first result,* Journal of Banking and Finance vol. 30, 1581-1603.

Beck, T., 2008. *Bank competition and financial stability: Friend or foes?* World Bank Policy Research WP 4656.

Beck, T., De Jonghe, O., and G. Schepens, 2013. *Bank competition and stability: Cross-country heterogeneity,* Journal of Financial Intermediation 22(2), 218–244.

Berger, A., Klapper, L., Turk-Ariss, R. 2009. *Bank competition and financial stability*, Journal of Financial Services Research Vol. 21, 849-870.

Boyd, J.H., De Nicolo, G. 2005. *The theory bank competition and risk taking revisited*. Journal of Finance vol. 60(3), 1329-1343.

Boyd, J.H., De Nicolo, G., Jalal, A. 2006. *Bank competition, risk taking and asset allocations*, IMF WP no. 06/143.

Broecker, T., 1990. *Credit worthiness tests and interbank competition*, Econometrica vol. 58, 429-452.

Brownridge, M. 1996. 'Financial Policies and the Banking System in Zambia', IDS Working Paper No. 32/1996 available at https://www.ids.ac.uk/files/Wp32.pdf

Clerides, S., Delis, M. D., Kokas, S. 2013. *A new dataset on bank competition in national banking markets,* department of Economics WP 08, University of Cyprus.

Couttarelli, C., and Kourelis, A.1994. 'Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy', IMF Working Papers No. 94/39.

Greene, W. H. 2012. Econometric Analysis 7th ed. Boston: Pearson.

Hansen, Bruce. 2002. Econometrics, Available on-line http://www.ssc.wisc.edu/

Hellmann, T. F., Murdock, K. C., Stiglitz. J. 2000. *Liberalization, Moral Hazard in Banking, and Prudential Regulation: Are Capital Requirements Enough?* American Economic Review vol. 90(1), 147-165.

Jimenez, G., Lopez, J., Saurina, J. 2010. *How does competition affect bank risk taking?* Journal of Financial Stability vol. 9, 185-195.

Keeley, M. C. 1990. *Deposit insurance, risk and market power in banking*, American Economic Review vol. 80, 1183-1200.

Koetter, M., Kolari, J. Spierdijk, L. 2012. *Enjoying the quite life under deregulation? Evidence from adjusted Lerner indices from the US Banks*, Review of Economic Statistics vol. 64, 462-480.

Massarongo, F. 2012. An analysis of the effectiveness of monetary policy in Sub-Saharan Africa developing Countries: The Case of Mozambique. MA dissertation. University of London: United Kingdom.

Nakamura, L.I., 1993. *Loan screening within and outside customer relationship*, WP no. 93/15, Federal Reserve Bank of Philadelphia.

Sáez, L., Shi X., 2004. *Liquidity Pools, Risk Sharing, and Financial Contagion*, Journal of Financial Services Research 25(1), 5-23.

Schaeck, K., Cihak, M., Wolfe, S. 2009. *Are more competitive banking systems more stable?* Journal of Money, Credit and Banking, vol. 41,711-734.

Shaffer, S., 1989. *Competition in the US banking industry,* Economic Letters vol. 29, 321-323.

Simpasa, A., Nandwa, B. and Nabassagwa. T. 2014. *Bank lending channel and the Monetary Transmission Mechanism in Zambia: Evidence from Bank-level data*, AFDB working paper no 211.

Stiglitz, J.,Weiss, A. 1981. *Credit rationing with imperfect information*. American Economic Review vol. 71, 393-410.

Soerdarmono, W., Machrouh, F., Tarazi, A. 2011. *Bank market power, economic growth and financial stability: Evidence from Asian banks*, Journal of Asian Economics vol. 22, 460-470.

Turk-ariss, R. 2010. *On the Implications of Market Power in Banking: Evidence from Developing Countries*, Journal of Banking and Finance vol. 34(4), 765–775.