

Banking Industry Competition and Stability in Zimbabwe

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Banking Industry Competition and Stability in Zimbabwe

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Abstract

The study investigates the impact of changes in banking industry competition on the industry's stability in Zimbabwe using a sample of 18 banks for the period 2009-2017. The period of study coincides with an era when the country experienced growth and stability (under full dollarization) after a decade of an economic crisis (prior to full dollarization). First, the study employs a modified version of the Boone (2008) Indicator to establish the evolution of competition. Second, the *ZZ*-score is employed to investigate the nexus between banking industry competition and stability in the country. The study establishes that banking industry competition in Zimbabwe registered a pronounced increase for the period 2009-2012. This was, to some extent, attributed to the banks' aggressive business models that sought to increase client bases by offering loans in order to increase asset bases and profitability. This trend was, however, reversed post-2012, as competition consistently fell between 2013 and 2017, mainly due to falling demand for both personal and business loans and a measured approach by banks in issuing new loans following a rise in non-performing loans (NPLs). The relationship between banking industry competition and stability is strong and competition appears to be good for the country's banking industry. Our findings have potentially important policy implications regarding the design and enforcement of regulations that create the right incentives to safeguard stability, while at the same time conscious of the link between competition and stability. Understanding the dynamics of competition and stability is crucial, not only to banks, bank regulators and policy makers in Zimbabwe, but also to other developing countries, as they have the leverage to shape bank competition to levels that produce desired levels of stability. To banks, competition has implications on their access to finance and stability of the industry.

Key words: Dollarization, Competition, Stability, Boone Indicator

JEL classification: D4, D5, D6, G21

1. Introduction

Zimbabwe's banking industry has, over the past two decades, operated under difficult and unique conditions. For a decade prior to the adoption of full dollarization, the economy experienced high levels of inflation and consequently declining growth.¹ This period also coincided with improved bank supervision and the implementation of new banking legislation that sought to liberalize the industry. These developments, coupled with volatile capital and deposit bases during the hyperinflation period, had a bearing on competition and stability of banks operating in the country during that time. The adoption of full dollarization ushered in a radically new environment, which created both opportunities and challenges for the banking industry. Although the move permitted a return to normal banking, the new environment introduced challenges and risks to the banking industry. In particular, under full dollarization, the central bank is constrained in the use of standard monetary and financial policy instruments, and as such, the apex bank may not be able to shape bank competition to levels that produce desired levels of stability.

Prior to dollarization, some banks were either placed under curatorship and/or liquidated, while post the adoption of dollarization, a number of bank closures, mergers and acquisitions were witnessed. In addition, a number of banks migrated from lower banking classes such as discount and finance houses to commercial banking which ostensibly offered greater scope for business. Two contrasting postulations can be drawn from these developments. Some may argue that bank liquidations, mergers and acquisitions lowered the number of banks (increased concentration) and in the process increased the market power of individual banks and therefore lowered levels of bank competition. On the other hand, the two macroeconomic eras, prior to and post the adoption of dollarization, may have both intensified competition in the country's banking industry as banks competed in deposit and loan markets, against the background of a low deposit base and liquidity challenges. In addition, the increase in the number of commercial banks, through migration from other categories may have resulted in increased competition in the deposit and loan markets, as that is their main line of business.

It is against this background that this study empirically assesses how the evolution of competition impacted on stability in the country's banking industry for the period 2009-2017. This period coincides with a period under which Zimbabwe was under full dollarization. The introduction of banking industry regulation reforms, macroeconomic policies, as well as macroeconomic developments in Zimbabwe under full dollarization created unique challenges and opportunities for the country's

banking sector, when compared to other African countries. In addition, an evaluation of the impact of banking industry competition on the stability of the industry in Zimbabwe is a relatively unexplored issue, particularly under a fully dollarized regime, save for Sanderson et al (2018). As such, this paper seeks to achieve three main objectives, namely, (i) to empirically ascertain the evolution of competition in Zimbabwe's banking industry post the adoption of full dollarization, (ii) to establish the link between the level of competition and stability in the country's banking industry during the same period, and (iii) to infer whether competition, if it exists, is good (if it fosters stability in the country's banking industry) or bad (if it breeds fragility in the industry).

The study employs a modified version of the Boone (2008) Indicator, a fairly new measure of firm competition, to establish the evolution of competition in Zimbabwe's banking industry for the period 2009-2017 using a sample of 18 banks. The study further employs the Z-score to investigate the nexus between banking competition and stability in the country's banking industry. The results show that banking industry competition in Zimbabwe registered a marked increase between the years 2009 and 2012, mainly attributed to the banks' aggressive business models that sought to increase client bases by offering loans in order to increase asset bases and profitability. This trend was, however, reversed post-2012, as competition consistently fell between 2013 and 2017. This was mainly a result of falling demand for both personal and business loans and a measured approach by banks in issuing new loans following the significant rise in NPLs. The relationship between banking industry competition and stability is strong and competition appears to be good for the country's banking industry. The study's findings have potentially important policy implications regarding the design and enforcement of regulations that create the right incentives to safeguard stability, while at the same time conscious of the link between competition and stability. Understanding the dynamics of competition and stability is crucial, not only to banks, bank regulators and policy makers in Zimbabwe, but also to other developing countries, as they have the leverage to shape bank competition to levels that produce desired levels of stability. To banks, competition has implications on their access to finance and stability of the industry.

This paper contributes to extant competition literature in a distinct way in that it adds to the few studies that apply this method to a developing country's banking industry on the grounds that it is an improvement to the generally accepted and widely used concentration measures, such as the Herfindahl-Hirschman Index (HHI). Nevertheless, the study also employs the HHI, for robustness checks. The period of study coincides with an era when the country experienced growth and stability (under full dollarization) after a decade of an economic crisis (prior to full dollarization) thereby presenting an interesting case, different from most African countries' experiences.

The rest of the paper is organized as follows: Section 2 details the structure and evolution of Zimbabwe's banking industry. Section 3 presents an overview of different measures of banking competition, as well as the theoretical and empirical literature on the relationship between banking industry competition and stability. Section 4 explains the econometric methodology, Section 5 presents empirical results and discussion, while Section 6 concludes and proffers policy recommendations.

2. Zimbabwe banking sector: Structure and development

Zimbabwe has all the elements of a modern, well-developed financial sector, including life and general insurance, public and private funds and active capital markets, including the Zimbabwe Stock Exchange (ZSE) and several stockbrokers. As at 31 December 2017, the country had 19 registered deposit-taking institutions comprised of 14 commercial banks, four building societies and one savings bank. Table 1 shows the trend in the country's banking sector architecture for selected years covering the period 2003-2017.

Table 1: Trends in banking sector architecture

Banking Class	Number of Institutions								
	2003	2006	2009	2010-2012	2013	2014	2015	2016	2017
Commercial Banks	16	14	18	17	15	15	13	13	14
Building Societies	5	4	4	4	4	4	4	5	4
Merchant Banks	6	5	4	4	2	1	0	0	0
Savings Banks	1	1	1	1	1	1	1	1	1
Discount Houses	9	6	1	0	0	0	0	0	0
Finance Houses	5	4	0	0	0	0	0	0	0
Total No. of Banks	42	34	28	26	21	21	18	19	19

Source: Reserve Bank of Zimbabwe.

As outlined in Table 1, commercial banks have, over the years, continued to dominate the country's banking industry and the largest five accounts for over 65% of the industry's assets and 82% of commercial banks assets. Of the 19 banks that operated in 2017, six were foreign-owned. As at 31 December 2017, total assets held by the 14 commercial banks were equivalent to almost 50% of gross domestic product (GDP), of which nearly 24% were held by the six foreign-owned banks. Foreign-owned banks accounted for 42% of the market share, while one domestically-owned bank had more than 30%. On average, 50% of banks' income is interest based, while around 40% originates from fees and commissions.

The marked fall in the total number of banks from 42 in 2003 to 28 in 2009, as shown in Table 1, was mainly a result of some banks being either placed under curatorship and/or liquidated. Post the adoption of dollarization in 2009, a number of bank closures, mergers and acquisitions were witnessed, and as such, the total number of banks fell from 28 in 2009 to 19 by the end of 2017. In addition, a number

of banks migrated from lower banking classes such as discount and finance houses to commercial banking which ostensibly offered greater scope for business.

The Reserve Bank of Zimbabwe (RBZ) is responsible for bank regulation and supervision in Zimbabwe. The RBZ Act (Chapter 22:15) empowers the RBZ to supervise banking institutions and to foster stability and proper functioning of the entire financial system. The supervisory and regulatory role is entrusted to the RBZ's Banking Supervision Department (BSD), which supervises the country's banks. The Banking Act and Banking Regulations (Statutory Instrument 205 of 2000) provide for the registration, regulation, continuous monitoring and supervision of persons conducting banking business in Zimbabwe. The RBZ, through the BSD is also empowered to register and supervise asset management companies, micro-finance institutions, building societies and savings banks following the invocation of Section 3 (3) of the Banking Act in March 2005.

For a decade prior to full dollarization, the economy experienced high levels of money supply growth, distorted prices and acute foreign currency shortages. These developments gave rise to high inflation and consequently declining Gross Domestic Product (GDP), as shown in Table 2.

Table 2: Macroeconomic and banking sector developments: 2001-2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
GDP Growth (%)	-3.1	1.4	-8.9	-17.0	-5.8	-5.7	-3.5	-3.7	-17.7
Inflation Rate (%)	55.9	6.7	140.1	431.7	282.4	302.1	1,096.7	24,411.0	231,000,000.0

Source: Ministry of Finance and Reserve Bank of Zimbabwe.

In March 2007, price increases reached hyperinflation levels, defined as the month-on-month inflation that exceeds 50%. By 2008, the country had lost more than 40% of its national output as a result of a sustained period of negative growth. In July 2008, year-on-year inflation peaked at 231 million per cent (see Table 2).

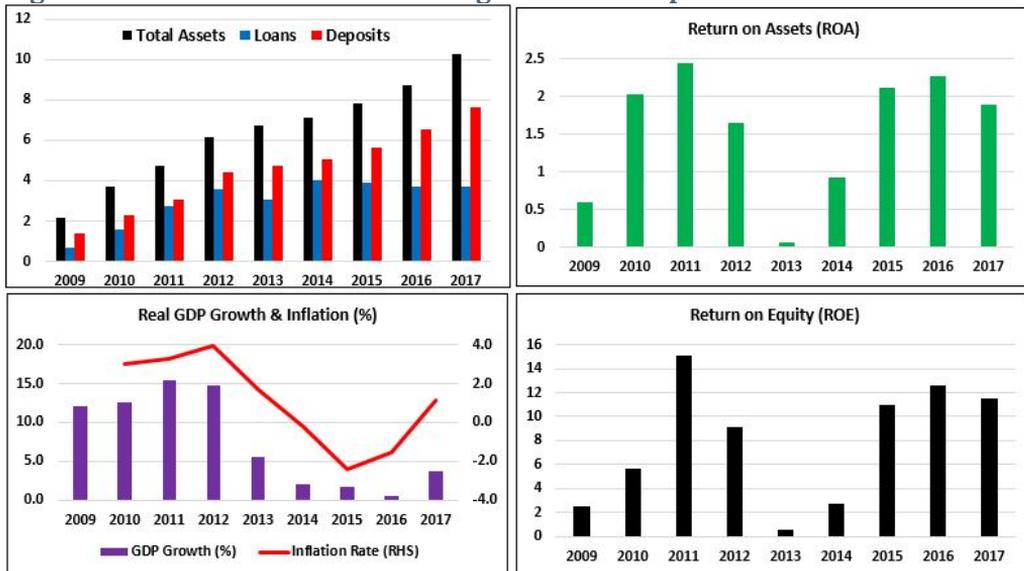
The decade-long deterioration in Zimbabwe's economy adversely affected the health of the country's banking industry through the erosion of liquidity, asset base, profitability and increases in NPLs. This period also coincided with improved bank supervision and the implementation of new banking legislation that sought to liberalize the industry. These developments, particularly volatile capital and deposit bases, had a bearing on competition and stability of banking institutions operating in the country.

The adoption of full dollarization in February 2009 presented a defining moment for the country's banking industry. It ushered in a radically new environment, which created both opportunities and challenges for the banking industry. Although the policy move permitted a return to normal banking, the new environment also introduced some challenges and risks for the banking sector. In particular, under full dollarization, the central bank is constrained in the use of standard monetary and financial policy tools as policy instruments, especially as money supply and interest rate decisions were effectively taken out of the hands of the authorities. As such,

there are virtually no tools at the disposal of the central bank to conduct traditional monetary policy, and hence the apex bank may not be able to shape bank competition to a threshold that produce desired levels of stability.

The country’s banking industry emerged from a period of hyperinflation and economic contraction with very limited capacity to intermediate, and the industry continued to struggle to mobilize foreign currency funding in the early years after 2009. Liquidity constraints limited the rate of growth of credit to the private sector during that period. The profitability, asset base and credit to the private sector of Zimbabwean banks somewhat improved post-2009 following a more favourable economic environment, as shown in Figure 1.

Figure 1: Macroeconomic and banking sector developments: 2009-2017



Source: Ministry of Finance and Reserve Bank of Zimbabwe.

However, small banks became more risk-taking, reaching lower-ended customers, sometimes unbanked, and potentially heightening the volatility to bank income and profitability. In addition, even apparently liquid institutions were reluctant to lend due to challenges of operating without an inter-bank market and the central bank lender-of-last-resort window. Few borrowers were viewed as creditworthy, and banks remained cautious in their lending.

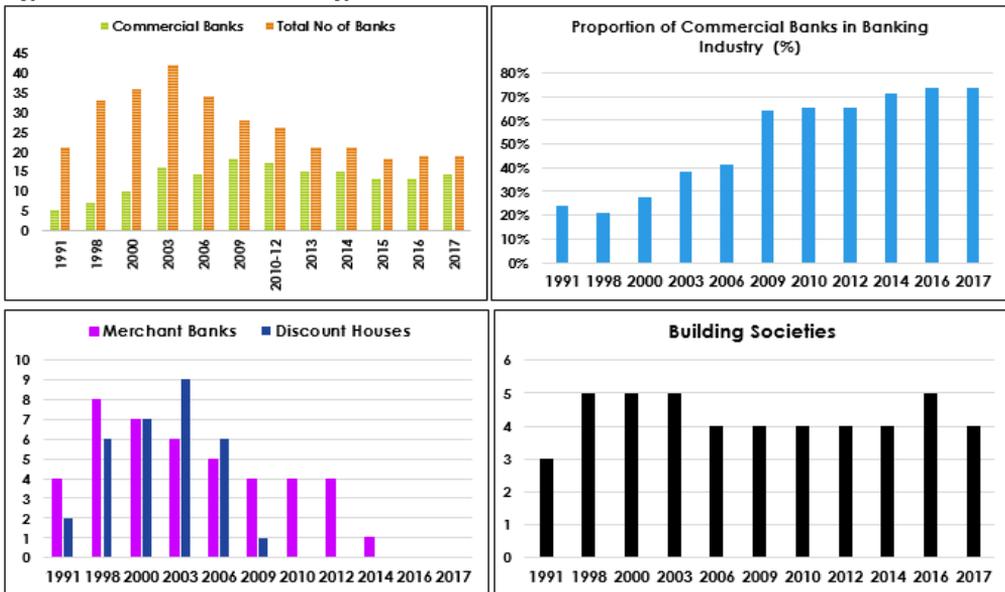
Whereas the banking sector entered the dollarization era being little more than a quarter of its 2004 size as hyperinflation had almost completely eroded the real value of financial assets and liabilities in domestic currency, the year 2010 saw the expansion of the banks’ balance sheets. After the end of hyperinflation, bank credit increased, supported by strong deposit growth, economic recovery and the formalization of the economy (see loans in Figure 1). However, vulnerabilities in the banking sector increased together with the expansion of credit and deposits. Some smaller banks struggled to comply with minimum capital requirements, rising credit risk and NPLs.

The new environment also introduced challenges for the banking sector, which included security risk, increased foreign exchange credit risk and income generation risk.

While banks are expected to contribute to the economic recovery process through, inter alia, provision of credit to the real sector, most banking institutions' capital bases were eroded in the hyper inflationary environment resulting in insignificant capital values following the changeover to dollarization. Dollarization also heightened operational risk, in particular security and fraud risks in banking institutions. Credit risk in banks was transformed from local currency to foreign currency, as the demonetization of the local currency rendered the central bank's domestic currency lender-of-last-resort facility redundant.

There was an increase in the number of commercial banks over the years, from five in 2003 to a high of 18 in 2009, before a fall to 14 in 2017, as shown in Figure 2.

Figure 2: Trends in banking sector architecture



Source: Reserve Bank of Zimbabwe.

This is explained, in part, by the migration of a number of banking institutions from merchant banking, discount and finance houses to commercial banking. At the same time, the number of banks fell from 42 in 2003 to 19 in 2017 due to closures, mergers and acquisitions. Two contrasting postulations can be drawn from these developments. Some may argue that, mergers and acquisitions would have the effect to lower the number of banks (increase concentration) in the system and consequently increase the market power of individual banks, a development that would presumably lead to lower levels of bank competition. On the other hand, the increase in the number of commercial banks may have resulted in increased competition in the deposit and loan markets, as that is their main line of business.

3. Theoretical and empirical literature review

The debate about the link between banking industry competition and stability has been a topical issue in the new millennium. In particular, the main question has been whether competition in the industry can be a conduit of fostering banking industry stability or not (Koskela and Stenbacka, 2000; Hartmann and Carletti, 2002; Beck, 2008; Berger et al, 2009; Schaeck and Cihák, 2014). Schaeck and Cihák (2014) claim that, academics and policy makers alike are yet to reach a consensus on the competition-stability trade-off. Berger et al (2009) discuss two contrasting views on the link between bank competition and stability. Some view competition as being bad in that it breeds fragility in the banking industry by way of diminishing market power, lowering profit margins and reducing franchise value, developments that may entice banks to take risks (Chan et al, 1986; Keeley, 1990; Marcus, 1984). The alternative view considers competition to be good for the banking industry as it fosters stability in that if a less competitive banking industry charges higher interest rates (monopoly rents), this may cause borrowers to take higher risks, resulting in higher probability of non-performing loans (NPLs) and a more fragile system.

The 2008 global financial crisis reignited the attention of bank regulatory bodies, policy makers and academics on revisiting the role of the state in formulating and implementing bank competition policies (World Bank Group, 2013). On the one hand, the notable increases in bank competition and financial innovation were viewed as having contributed to the financial turmoil, through subprime lending. Others, however, argue that government support to targeted individual banks following the financial crisis led to increased bank concentration, thereby lowering competition and in the process heightening risks of future bank instability emanating from moral hazard problems linked to “too-big-to-fail” (World Bank Group, 2013).

The argument on the link between bank competition and stability has been made problematic because of the weaknesses of available traditional techniques of measuring both bank competition and stability appropriately (Beck, 2008). Indirect measures of bank competition are bank concentration under the “structure-conduct-performance” model and regulatory indicators that measure the contestability of the banking industry. Direct measures focus on how banks price their products or product portfolios or their market power founded on the “new empirical industrial organization” literature. On the other hand, bank stability focuses on individual or systemic bank distress. Discussions on measures of bank competition and the link between competition and stability are outlined below.

Measurement of bank competition

Banking industry competition has traditionally been evaluated by measuring market power and efficiency (Van Leuvensteijn et al, 2011). In its 2013 Global Financial Development Report, the World Bank identifies three main approaches to measuring bank competition; they are, (i) measures of bank concentration under the so-called “structure-conduct-performance” paradigm, (ii) regulatory indicators that measure the contestability of the banking sector, and (iii) direct measures of bank pricing behaviour or market power based on the “new empirical industrial organization” literature. The decomposition of interest spreads is considered to be an alternative approach.

Banking concentration can be estimated by the concentration ratio, calculated as the share of assets held by the k largest banks (usually three to five) in a given economy. Alternatively, the Herfindahl-Hirschman index (HHI), an indicator of market power, in the context of the “structure-conduct-performance” can be used (Berger et al, 2004). The HHI, which is given as the sum of the squared market share of each bank in the system, can be applied as a measure of banking concentration. It takes into account the market share of all banks in the system and apportions a larger weight to the largest banks. The concentration ratio varies between nearly 0 and 1. The main idea is that banks with bigger market shares tend to have more market power and they use that to their advantage. In a banking industry with a smaller number of banks, the possibility of collusion is high. One of the weaknesses of concentration ratios is that they totally disregard smaller banks in the system.

Direct measures of competition include the Panzar-Rosse H-statistic, the Lerner Index and the Boone Indicator. In summary, the Panzar-Rosse H-Statistic measures the transmission of input price changes to revenues, the Lerner Index measures the static pricing power, and the Boone Indicator measures the dynamics of markets. The Panzar-Rosse H-statistic, proposed by Panzar and Rosse (1987), is an index that sums up the elasticities of bank interest revenues to factor costs (input prices). If this lies between 0 and 1, there exists monopolistic competition or a partially contestable equilibrium, whereas $H < 0$ would imply a monopoly or perfect collusion and $H = 1$ would suggest perfect competition. The key point is that if the market is characterized by perfect competition, an increase in input prices will not affect the output of firms, while it will under monopolistic competition. This approach has been applied by a number of researchers, including Bikker and Haaf (2002) in a study that covered all EU countries. Schaeck and Cihák (2008) note that while the Panzar-Rosse H-statistic is simple to use and does not have strong data requirements, its major drawback emanates from its simplicity in that the econometric identification and interpretation of the H-statistic can be complicated and misleading.

The Lerner Index, a measure of mark-ups in banking, is defined as the difference between output prices and marginal costs (relative to prices). Prices are calculated as total bank revenue over assets, whereas marginal costs are obtained from an estimated

Translog cost function with respect to output. A particular bank/firm's market power is noted by the divergence between its output price and marginal cost. Where there is perfect competition, the price and marginal cost are equal and where the two are diverging, competition is less. Higher values of the Lerner Index signal less bank competition. The appeal of the Lerner Index is its simplicity, easy to interpret and not posing stringent data requirements. The index, however, falls short on theoretical and practical aspects as it is a measure of pricing power, not a proxy for competition. In addition, the index is not able to appropriately capture the degree of substitutability and assumes perfect technical and allocative efficiency when banks rarely operate under perfect efficiency. The Lerner Index has been widely used, including in Berger et al (2009), Cipollini and Fiordelisi (2012) and Fu et al (2014).

In a broad set of theoretical models (Boone, 2000, 2001, 2004, 2008; Griffith et al, 2005), Boone develops the Boone Indicator, based on the efficient structure hypothesis. The indicator measures the effect of efficiency on performance by focusing on profits and is calculated as the elasticity of profits to marginal costs. To calculate this elasticity, the log of profits (usually return on assets) is regressed against the log of marginal costs. The elasticity is captured by the coefficient on the log of marginal costs, which are typically calculated from the first derivative of a Translog cost function. An increase in the Boone Indicator is interpreted as a decline in banks' competitiveness, while a fall in the indicator implies increased competitiveness. The indicator establishes a link between efficiency and profitability in that banks that are more efficient tend to be more profitable.

There are features that make the Boone Indicator more appealing than other proxies for competition. First, it is based on the efficient structure hypothesis, and as such, its reallocation of profits from the least efficient to most efficient banks in the market is considered a more robust measure of competition. Second, it addresses the weaknesses of other competition proxies which are based on concentration ratios, in that it traces how banks interact in the face of competition or lack of, while concentration ratios only focus on outcomes of competition. Third, by not assuming a long-run equilibrium, the indicator does not suffer from constricting assumptions that compel for the existence of a market long-run equilibrium in the Panzar-Rosse H-statistic. Fourth, the Lerner Index allows for product substitutability, and this comes with problems that make it less appealing. The Boone Indicator does not allow for product substitutability, and hence it is more robust. Fifth, it is able to measure competition of bank market segments, such as the loans market, unlike many well-known measures of competition which only consider the entire banking market. Sixth, it requires relatively little data, unlike many other approaches.

One of the demerits of the Boone (2008) Indicator is that it excludes firm competition that is based on differences in the quality of service. Higher service quality may result in higher profitability and vice versa. Other drawbacks are that it assumes that firms pass part of their efficiency gains to their clients and ignores differences in product quality and design across banks, as well as the appeal of innovations. Schiersch and Schmidt-Ehmcke (2010) test the empirical validity and robustness of the Boone

Indicator for the German manufacturing cartels in three different sectors. They find that it is not the most efficient firm that has the largest market share and hence they conclude that the Boone Indicator is not empirically robust. The results bring to the fore one of the major weaknesses of Boone's (2008) theoretical framework.

Competition and banking industry stability

There are a number of competing notions that attempt to explain the relationship between competition and stability. Marcus (1984), Chan et al (1986) and Keeley (1990) discuss the traditional view, also known as the "competition-fragility" notion. It asserts that banking industry competition compromises stability as competition in itself leads to lower profits and erodes a bank's franchise value, outcomes that may tempt banks to engage in risky business lines. In addition, competition may breed moral hazard and adverse selection in the loans market, consequently increasing the dangers of bank fragility (Allen and Gale, 2000). In a banking system which is highly concentrated and hence less competition, the "competition-fragility" view postulates that bigger banks are able to diversify their portfolios, thereby insulating themselves from the possibility of crises. On the other hand, the competition-stability view posits that banking industry competition is good as it enhances stability. Supporters of this notion disagree with the "competition-fragility" assertion that highly concentrated and less competitive banking systems are more stable. They argue instead that, high market power, synonymous with more concentrated and less competitive banking systems, can entice banks to charge higher interest rates. This is bound to increase moral hazard and adverse selection, resulting in higher NPLs, and ultimately banking industry instability.

Earlier empirical findings on the relationship between banking industry competition and stability are mixed. At country level, increased competition has been shown to heighten risk-taking at bank level (Dell'Ariccia et al, 2008). In particular, the findings of the only study on bank competition and stability in Zimbabwe by Sanderson et al (2018) for the period 2010-2016 supports the "competition-fragility" view. However, as discussed in World Bank Group (2013), Boyd and Runkle (1993), Boyd and Graham (1998) and De Nicolo (2001), the findings dispute the competition-fragility view that "larger banks are less likely to fail", hence rendering support to the "competition-stability" view. In addition, the "competition-stability" view finds support in findings that use cross-country time-series data sets offering evidence supporting the competition-stability view (Schaeck and Cihák, 2008).

In conclusion, while the traditional view has been that banking competition is bad for stability, other studies have shown that competition promotes efficiency and financial inclusion, and that it is a conduit for banking industry stability (World Bank Group, 2013).

4. Methodology

Measuring bank competition in Zimbabwe

The study applies a modified version of a competition indicator proposed by Boone (2001) and further developed by Boone (2008) under the so-called Relative Profit Difference (RPD) to understand the level of banking industry competition in Zimbabwe for the period 2009-2017. The Boone Indicator measures an increase in the level of competition that is due to more aggressive interaction between firms and when entry barriers are minimized. The indicator has been used in banking competition literature (Delis and Tsionas, 2009; Van Leuvensteijn et al, 2011; Tabak et al, 2012; Schaeck and Cihák, 2014). In this study, the Boone Indicator is chosen among several approaches to measuring bank competition given its more appealing features when compared to other models of measuring industry competition, as outlined and discussed earlier.

For Zimbabwe in particular, the reduction in entry barriers that came with liberalization of the banking industry culminated in an increase in the number of banks, both local and foreign-owned. This might have increased competition among banks. In addition, the increase in the number of commercial banks, through migration from other categories may have resulted in increased competition in the deposit and loan markets. At the same time, the mergers and acquisitions might imply that efficiency gains were transferred from less efficient banks to more efficient banks, and with it increased concentration and less competition among banks. These features, to some extent, give credence to choosing the Boone Indicator as a measure of bank competition in Zimbabwe as the index is premised on competition being more intense with reduced entry barriers and/or more aggressive interaction between and among firms. This is in addition to the indicator's more appealing features when compared to other widely used proxies for measuring bank competition. In employing the Boone Indicator, this study, however, bears in mind the indicator's caveats, mentioned above.

Following Van Leuvensteijn et al (2011), the study uses the market share as the dependent variable, instead of the bank's profit, expressed as follows²:

$$ms_{it} = \alpha + \beta \ln(c_{it}) + \epsilon_{it} \quad (1)$$

Where, ms_{it} is bank i 's market share at time t . β represents the Boone Indicator, c_{it} is the marginal cost of bank i at time t , and ϵ_{it} is the error term. The notion of the Boone Indicator is that more efficient firms (with lower marginal costs) attain higher profits or market shares, and that the more significant this effect is, the higher the

competition is in that industry. The market share can be calculated for either the loan or the deposit market. A bank's marginal costs, like in any other industry, are difficult to observe and quantify and as such average costs can be used as a proxy for marginal costs, following the suggestion in Boone (2004). Alternatively, marginal costs are obtained from an estimated Translog cost function with a number inputs and outputs (Pruteanu-Podpiera et al, 2016; Van Leuvensteijn et al, 2011; Fiordelisi and Mare, 2014). In this study, marginal costs are approximated using the Translog cost function, which is grounded in theory and is more precise (see Translog function estimation results in Table A1 in the appendix). The larger the β in absolute value, the higher the level of competition is in the banking industry. For banks that have lower marginal costs, their market shares are expected to be higher so that $\beta < 0$.

Based on (1) above, the study employs a two-step generalized method of moments (GMM)-style model to estimate the Boone indicators for the loans market in Zimbabwe on a sample of 18 banks for the period 2009-2017. The two-step (GMM)-style model is chosen ahead of instrumental variables estimators as it uses the optimal weighing matrix as well as relaxing the independent and identically distributed (*i.i.d*) assumption. The study used one-period lags of the explanatory variable(s) as instrument(s), following Blundell and Bond (1998) and Koetter et al (2012).

Relationship between bank competition and stability

The study uses the Z-score as a variable that proxies banking industry stability as in Laeven and Levine (2009), Demirguc-Kunt and Huizinga (2010) and Houston et al (2010), expressed as follows:

$$Z - score = \frac{\left((ROA) + \frac{E}{TA} \right)}{\sigma ROA} \quad (2)$$

Where, ROA represents the return on assets of a bank; E is bank equity, measured as the sum of interest income, commissions and trading income, fees and other operating income; while TA are total bank assets, calculated as the sum of interest expenses, personnel expenses, administrative expenses and other operating expenses. σROA is the standard deviation of ROA. The Z-score combines profitability, leverage and return volatility in a single measure. Specifically, it measures the number of standard deviations a return realization has to fall in order to diminish equity. The score increases as profitability and capitalization levels improve and fall with unstable earnings as indicated by a higher standard deviation of the ROA. A higher Z-score is interpreted as implying a lower chance of insolvency. It is considered to be a direct measure of financial stability at the firm-level, and that it is better than analysing leverage (Schaeck and Cihák, 2014).

In order to establish the relationship between competition and stability, the study follows Schaeck and Cihák (2014), and estimate a panel model of the general form expressed as:

$$Z_{it} = \alpha + \varphi\beta_t + \gamma X_{it} + \delta C_t + \varepsilon_{it} \quad (3)$$

Where, Z_{it} is a measure of bank stability for bank i at time t , β_t is the industry-wide Boone (2008) Indicator at time t , and X_{it} and C_t are vectors of bank-specific and macroeconomic variables, respectively. Bank-specific (internal) variables chosen for this paper are total assets, asset growth and the loan loss provision as a ratio of total assets. The macroeconomic environment has a potential to influence banking industry stability and is accounted for by two macroeconomic (external) variables which are the growth in GDP per capita and year-on-year inflation. ε_{it} is the error term representing omitted variables that determine Z_{it} . Specifically, (3) can then be expressed as follows:

$$Z_{it} = \alpha + \varphi\beta_t + \gamma_1 ta_{it} + \gamma_2 ag_{it} + \gamma_3 loan_{it} + \delta_1 econ_t + \delta_2 infl_t + \varepsilon_{it} \quad (4)$$

Where, ta_{it} , ag_{it} and $loan_{it}$ are total assets (log), growth of assets and the loan loss provision as a ratio of total assets, respectively, for bank i at time t . The variables $econ_t$ and $infl_t$ are growth in GDP per capita and year-on-year inflation, respectively, at time t . A negative sign on the coefficient of the Boone (2008) Indicator implies that, if profits are reallocated from inefficient banks to efficient banks, stability in the banking system increases. Total assets controls for bank size, and it is expected to have a negative impact on the Z-score given that the larger the bank, the more likely that it is subjected to too-big-to-fail policies. Asset growth accounts for differences in risk preferences across banks and the variable is expected to have a negative effect on the Z-score. The higher the risk-taking behaviour among banks, the less stable is the overall banking industry. NPLs are expected to impact on banking industry stability negatively. An increase in the GDP per capita, as reflected by a positive growth in GDP per capita, is expected to be associated with an increase in banking industry stability, while inflation erodes and increases volatility on profits and hence it is expected to impact banking industry stability negatively.

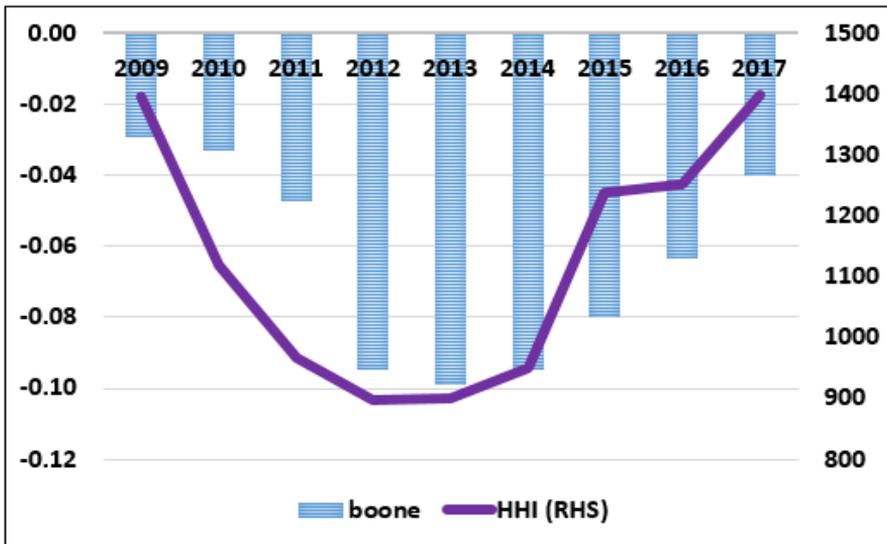
The study's delimitation period is 2009 to 2017. This period was preceded by an era when the country experienced an economic crisis (prior to full dollarization) and coincided with growth and stability (under full dollarization). The study uses data from a sample of 18 banks that were operational during the period of study. The data set was obtained from bank balance sheets and income statements reported to Reserve Bank of Zimbabwe (RBZ)'s Bank Supervision Division. Data on growth of GDP per capita was sourced from the country's Ministry of Finance and Economic Development while inflation figures are from the country's statistical agency, the Zimbabwe Statistics Agency (ZIMSTAT).

5. Empirical results and discussion

Estimation of the Boone Indicator

Figure 3 illustrates the evolution of the estimated Boone Indicator and the HHI for the period 2009-2017. The HHI was estimated as a benchmark for the evaluation of the Boone Indicator.

Figure 3: Evolution of the Boone Indicator for the loans market and HHI: 2009-2017



Source: Author's Own Computations

Banking industry competition between 2009 and 2017 took two distinctive phases (see Table A2 in the Appendix). First, there was a marked increase in competition in the loans market for the period 2009-2013. This was, to some extent, attributed to the banks' aggressive approaches to increasing client bases by offering loans in order to increase their asset bases and profitability. This trend was, however, reversed post-2013, as depicted by declining competition between 2014 and 2017. This was mainly attributed to waning demand for both personal and business loans and a cautious approach by banks in issuing new loans following the significant rise in NPLs.

Descriptive statistics

Table 3 shows summary statistics of the variables used in this study.

Table 3: Summary statistics of selected variables: 2009-2017

Variable	Mean	Median	Stan. Dev.	Min.	Max.
Bank Insolvency Risk					
Z -score	2.917	2.912	0.776	0.570	4.561
Market Structure					
Boone Indicator	-0.065	-0.063	0.027	-0.099	-0.029
Bank-Specific Control Variables					
Total Assets	18.848	18.995	1.143	14.858	21.396
Ratio of Loans to Total Assets (Loans)	0.489	0.519	0.362	0.001	1.180
Return on Assets (Profits)	0.004	0.012	0.171	-3.858	0.273
Non-Performing Loans	15.49	15.78	1.94	7.10	18.55
Macroeconomic Indicators					
Annual Growth of GDP Per Capita (%)	7.037	4.488	5.824	0.616	15.446
Annual CPI Inflation (%)	0.178	0.904	3.262	-7.000	3.725

Source: Author's own computations.

Note: Bank-specific variables were initially in US dollars and were transformed to logs.

As shown in Table 3, the **Z**-score, a measure of insolvency risk, has a minimum of 0.57 and a maximum of 4.56, indicating that the sample of 18 banks contained both stable and unstable banks. On average, about 52% of bank's assets were extended to clients as loans, indicating that banks were playing a fairly active intermediation role. Bank profitability, as measured by the return on assets, averaged about 1.2% of assets. The average growth of GDP per capita was fairly high, at 7.0%, while inflation remained relatively low, at an annual average of 0.2%.

Empirical analysis

The study employs bank and time-fixed effects and two-stage least squares (**2SLS**) estimators to investigate the relationship between banking industry competition and stability, based on (4) above. The bank and time-fixed effects regression controls for variables that differ from one bank to the next but remain constant over time and for variables that vary over time but are constant across the banks.³ The study includes, as regressors, three bank-specific variables: total assets, asset growth and loan loss provision to total assets; and two macroeconomic variables: the annual growth of GDP per capita and annual CPI inflation. This method, however, cannot control for omitted variables that vary both across the banks and over time. As such, the study also uses the **2SLS** which addresses endogeneity between measures of bank competition and stability and cluster errors at bank level. In particular, the measure of banking industry competition, the Boone (2008) Indicator, is treated as being endogenous. The study uses the same set of bank-specific and macroeconomic variables as regressors, together with a set of instrumental variables.

The **2SLS** estimation involves two stages. First, the included endogenous variables are regressed against the included exogenous variables and the three instruments. Second, the dependent variable, Z_{it} , is regressed against the included exogenous variables and the predicted values of the included endogenous variables from the first stage regressions. The study uses two of the several instrumental variables that are found in literature to affect banking industry competition and stability. These are an interaction term of market share and loan growth and the Financial Freedom Index. The Financial Freedom Index measures the degree of openness of the banking industry and the extent to which banks are free to conduct their businesses. Schaeck and Cihák (2014) employ the same instrumental variables; while Amidu and Wolfe (2013) use, as instruments, activity restrictions, banking and financial freedom, and bank size.

The model's diagnostic tests for the **2SLS** regressions are presented in Table 4.

Table 4: Model diagnostic results

Estimator	Fixed Effects		Two-Stage Least Squares	
	FE(1)	FE(2)	2SLS (1)	2SLS (2)
Dependent Variable	Z -score	Z -score	Z -score	Z -score
Anderson test	n/a	n/a	227.85***	222.06***
Shear's Partial R ²	n/a	n/a	0.15	0.14
Hansen J -test	n/a	n/a	19.68*	18.31*

Notes: ***, ** and * denote significance at 1%, 5% and 10%, respectively. **t**-statistics are in parentheses.

The Anderson canonical correlation coefficient tests for under-identification, and the null hypothesis is that the minimum canonical correlation is zero. The reported Anderson test results reject the null hypothesis. Shear's Partial **R**² performs tests for instrument relevance. The weak identification test examines the null hypothesis that the instruments are weak using the critical values presented in Stock and Yogo (2005). The Hansen **J**-test examines over-identification. The null hypothesis is that the two instruments are exogenous, hence valid; that is, there is no correlation between the error term of the regression and the excluded instruments. A statistically significant test statistic always indicates that the instruments may not be valid.

Table 5 also reports results of the two estimation techniques. Columns 1 and 2 report panel data models with bank-fixed and bank and time-fixed effects, respectively. Columns 3 and 4 present two-stage least squares models using the chosen two instrumental variables for the Boone (2008) Indicator.

Table 5: Effect of competition on bank stability

Estimator	Fixed Effects		Two-Stage Least Squares	
	FE(1)	FE(2)	2SLS (1)	2SLS (2)
Dependent Variable	Z-score	Z-score	Z-score	Z-score
Boone Indicator	-2.34* (1.91)	-2.27** (2.21)	-2.08* (-1.95)	-2.03* (-1.94)
Total Assets	-0.19** (2.01)	-0.13** (2.22)	-0.80* (-1.93)	-0.22* (1.98)
Asset Growth	-0.05** (2.18)	-0.03* (-2.03)	-0.04 (-1.44)	-0.001** (-2.10)
Non-Performing Loans	-0.71** (2.31)	-0.69** (-2.33)	-0.76* (-1.99)	-0.74** (-2.18)
Annual GDP Per Capita Growth		0.81*** (3.59)		0.69** (-2.23)
Annual CPI Inflation		-1.11** (2.02)		-1.17** (2.28)
Observations	162	162	162	162
R²	0.17	0.23	0.15	0.27

Notes: ***, ** and * denote significance at 1%, 5% and 10%, respectively. t -statistics are in parentheses.

The results in Table 5 show that the coefficient on the Boone (2008) Indicator is negative and statistically significant in all the model set-ups, indicating that in Zimbabwe, if profits are reallocated from inefficient banks to efficient banks, stability in the country's banking industry will be enhanced. This empirical outcome is consistent with the "competition-stability" theory which argues that competition among banks enhances banking industry stability. The directions of the signs on the coefficients of rest of the variables are as predicted. In particular, and based on the study's results, the high degree of banking industry competition witnessed in Zimbabwe between 2009 and 2013 reallocated profits from inefficient banks to efficient ones, resulting, in part, to the closures, mergers and acquisitions that saw the number of banking institutions fall from 28 in 2009 to 21 by the end of 2013.

6. Conclusion and policy implications

The study models the evolution of competition in Zimbabwe's banking industry using the modified version of the Boone (2008) Indicator and Boone (2008) model, a measure of firm competition, for the period 2009-2017. The results show that banking industry competition took two distinctive phases between 2009 and 2017. There was a pronounced increase in competition in the loans market for the period spanning 2009 to 2012. This was, to some extent, attributed to the banks' aggressive approaches to increasing client bases by offering loans in order to increase their asset bases and profitability. This trend was, however, reversed post-2013, as witnessed by declining competition between 2014 and 2017. This was mainly a result of falling demand for both personal and business loans and a measured approach by banks in issuing new loans following the significant rise in NPLs. The link between the level of competition in the country's banking industry and stability is strong, and competition appears to be good for the country's banking industry. Specifically for Zimbabwe, banking industry competition is good in that it fosters stability only if that competition is taking place in a stable macroeconomic environment with a sustained growth in economic activity, low and stable inflation, healthy bank deposits and assets base, as well as low NPLs. In addition, competition that reallocates profits from the least efficient to the most efficient banks in the Zimbabwean market, as witnessed during the 2009-2017 period is bound to foster stability.

The study's findings have potentially important policy implications regarding the design and enforcement of regulations that create the right incentives to safeguard stability, while at the same time conscious of the link between competition and stability. A better understanding of the dynamics of competition and stability is crucial, not only to banks, bank regulators and policy makers in Zimbabwe, but also to other developing countries. To banks, competition has implications on their access to finance and stability. Bank regulators and policy makers have the leverage to shape bank competition to levels that produce desired levels of stability.

Notes

- 1 Zimbabwe adopted full dollarization in February 2009 in a bid to manage hyperinflation and an economic crisis that dominated the period 2000-2008. Dollarization allowed for the simultaneous use of five currencies, namely, the United States dollar, South African rand, British pound, Botswana pula and the euro. The Zimbabwe dollar was subsequently officially demonetized in June 2015.
- 2 See Van Leuvensteijn et al (2011) for a detailed justification.
- 3 Formally, the bank and time fixed effects regression is expressed as:
 $Z_{it} = \alpha_i + \varphi\beta_t + \gamma X_{it} + \lambda_t + \mu_{it}$ where the Z-score, as Z_{it} , which is our proxy for banking industry stability is specified as the endogenous variable. α_i is the bank-fixed effect and λ_t is the time-fixed effect.

References

- Allen, F. and D. Gale. 2000. *Comparing Financial Systems*. Cambridge, Massachusetts, London, MIT Press.
- Amidu, M. and S. Wolfe. 2013. "Does bank competition and diversification lead to greater stability? Evidence from emerging markets". *Review of Development Finance*, 3(3): 152-66.
- Beck, T. 2008. *Bank Competition and Financial Stability: Friends or Foes?* Washington, D.C.: The World Bank.
- Berger, A.N., A. Demirgüç-Kunt, R. Levine and J.G. Haubrich. 2004. "Bank concentration and competition: An evolution in the making", 36 (3): 433-51.
- Berger, A. N., L.F. Klapper, and R. Turk-Ariss. 2009. "Bank competition and financial stability". *Journal of Financial Services Research*, 35(2):99-118.
- Bikker, J.A. and K. Haaf. 2002. "Competition, concentration and their relationship: An empirical analysis of the banking industry". *Journal of Banking and Finance*, 26(11): 2191-2214.
- Blundell, R. and S. Bond. 1998. "Initial conditions and moment restrictions in dynamic panel data models". *Journal of Econometrics*, 87(1): 115-43.
- Boone, J. 2000. "Measuring product market competition". CEPR Working Paper No.2636. Center for Economic and Policy Research, Washington, D.C.
- Boone, J. 2001. "Intensity of competition and the incentive to innovate". *International Journal of Industrial Organization*, 19(5): 705-26.
- Boone, J. 2004. "A New Way to Measure Competition". CentER Discussion Paper.
- Boone, J. 2008. "A new way to measure competition". *The Economic Journal*, 118(531): 1245-61.
- Boyd, J.H. and S.L. Graham. 1998. "Consolidation in US banking: Implications for efficiency and risk". In *Bank Mergers and Acquisitions*, pp. 113-35. Boston, MA: Springer.
- Boyd, J.H. and D.E. Runkle. 1993. "Size and performance of banking firms: Testing the predictions of theory". *Journal of Monetary Economics*, 31(1): 47-67.
- Chan, Y.S., S.I. Greenbaum and A.V. Thakor. 1986. "Information reusability, competition and bank asset quality". *Journal of Banking and Finance*, 10(2): 243-53.
- Cipollini, A. and F. Fiordelisi. 2012. "Economic value, competition and financial distress in the European banking system". *Journal of Banking and Finance*, 36(11): 3101-09.
- De Nicolo, G. 2001. "Size, charter value and risk in banking: An international perspective". In *EFA 2001 Barcelona Meetings*, April.
- Delis, M.D. and E.G. Tsionas. 2009. "The joint estimation of bank-level market power and efficiency". *Journal of Banking and Finance*, 33(10): 1842-50.
- Dell'Ariccia, G., D. Igan and L.U. Laeven. 2008. "Credit booms and lending standards: Evidence from the subprime mortgage market". *Journal of Money, Credit and Banking*, 44(2-3): 367-84.

- Demirgüç-Kunt, A. and H. Huizinga. 2010. "Bank activity and funding strategies: The impact on risk and returns". *Journal of Financial Economics*, 98(3): 626-50.
- Fiordelisi, F. and D.S. Mare. 2014. "Competition and financial stability in European cooperative banks". *Journal of International Money and Finance*, 45: 1-16.
- Fu, X.M., Y.R. Lin and P. Molyneux. 2014. "Bank competition and financial stability in Asia Pacific". *Journal of Banking and Finance*, 38: 64-77.
- Griffith, R., J. Boone and R. Harrison. 2005. *Measuring Competition*. Advanced Institute of Management Research, Paper No. 022.
- Hartmann, P. and E. Carletti. 2002. *Competition and Stability: What's Special About Banking?* Research Paper No. 140. Financial Markets Group.
- Houston, J.F., C. Lin, P. Lin and Y. Ma. 2010. "Creditor rights, information sharing, and bank risk taking". *Journal of Financial Economics*, 96(3): 485-512.
- Keeley, M.C. 1990. "Deposit insurance, risk, and market power in banking". *The American Economic Review*, 80 (5): 1183-1200.
- Koetter, M., J.W. Kolari and L. Spierdijk. 2012. "Enjoying the quiet life under deregulation? Evidence from adjusted Lerner indices for US banks". *Review of Economics and Statistics*, 94(2): 462-80.
- Koskela, E. and R. Stenbacka. 2000. "Is there a trade-off between bank competition and financial fragility?" *Journal of Banking and Finance*, 24(12): 1853-73.
- Laeven, L. and R. Levine. 2009. "Bank governance, regulation and risk taking". *Journal of financial economics*, 93(2): 259-75.
- Marcus, A.J. 1984. "Deregulation and bank financial policy". *Journal of Banking and Finance*, 8(4): 557-65.
- Panzar, J.C. and J.N. Rosse. 1987. "Testing for 'monopoly' equilibrium". *The Journal of Industrial Economics*, 35(4): 443-56.
- Pruteanu-Podpiera, A., L. Weill and F. Schobert. 2016. "Banking competition and efficiency: A micro-data analysis on the Czech banking industry". In *Global Banking Crises and Emerging Markets*, pp. 52-74. London: Palgrave Macmillan.
- Sanderson, A., P. Le Roux and L. Mutandwa. 2018. "Competition and bank stability". *International Journal of Economics and Financial Issues*, 8(3): 86-94.
- Schaeck, K. and M. Cihák. 2008. "How does competition affect efficiency and soundness in banking? New empirical evidence". Technical Report, ECB Working Paper, Paper No. 932.
- Schaeck, K. and M. Cihák. 2014. "Competition, efficiency, and stability in banking". *Financial Management*, 43(1): 215-41.
- Schiersch, A. and J. Schmidt-Ehmcke. 2010. "Empiricism meets theory: Is the Boone-indicator applicable?" Technical Report, DIW Berlin. German Institute for Economic Research.
- Stock, J. and M. Yogo. 2005. "Asymptotic distributions of instrumental variables statistics with many instruments". *Identification and inference for econometric models: Essays in Honour of Thomas Rothenberg*, 109-120.
- Tabak, B.M., D.M. Fazio and D.O. Cajueiro. 2012. "The relationship between banking market competition and risk-taking: Do size and capitalization matter?" *Journal of Banking and Finance*, 36(12): 3366-81.

Van Leuvensteijn, M., J.A. Bikker, A.A. Van Rixtel and C.K. Sørensen. 2011. "A new approach to measuring competition in the loan markets of the euro area". *Applied Economics*, 43(23): 3155-67.

World Bank Group. 2013. *Global Financial Development Report 2014: Financial Inclusion*, Vol. 2. The World Bank Publications.

Appendix

Table A1: Translog cost function results

Variable	Parameter	Coefficient	t -statistic	p -value
Intercept	α_0	4.0651*	1.7892	0.0811
$\ln(y)$	α_1	0.6238	1.3035	0.1289
$\frac{1}{2} (\ln(y))^2$	α_2	0.0351**	2.1810	0.0410
$\ln\left(\frac{w_1}{w_3}\right)$	α_3	0.5065**	2.2054	0.0395
$\ln\left(\frac{w_2}{w_3}\right)$	α_4	0.6121***	4.8634	0.0001
$\ln\left(\frac{w_1}{w_3}\right) \ln\left(\frac{w_2}{w_3}\right)$	α_5	-0.511***	3.5461	0.002
$\frac{1}{2} \left[\ln\left(\frac{w_1}{w_3}\right) \right]^2$	α_6	0.0698**	2.1521	0.0365
$\frac{1}{2} \left[\ln\left(\frac{w_2}{w_3}\right) \right]^2$	α_7	0.0224*	-1.9147	0.0752
$\ln(y) \ln\left(\frac{w_1}{w_3}\right)$	α_8	-0.0121**	2.2519	0.0489
$\ln(y) \ln\left(\frac{w_2}{w_3}\right)$	α_9	-0.0501***	-6.0956	0.0000
R^2	0.8321	Adjusted R^2	0.8267	
F -statistic	554.03	Prob (F -statistic)	0.0000	
Chi -square	18.9763	Prob (Chi -square)	0.0000	

Model assumes a cost function with one output, loans (y) and three input prices: price of labour (w_1), price of physical capital (w_2), and price of borrowed funds (w_3). The cost function takes the form of a Translog cost function. The assumption of linear homogeneity in input prices is imposed by normalizing total costs and input prices by one input price. The estimated coefficients of the cost function are then used in the calculation of the marginal cost. The marginal cost is equal to the product of the derivative of the logarithm of total cost to output and total cost over output.

Table A2: Boone indicators: 2009-2017

Period	Estimated Boone Indicator	t-value
2009	-0.029	2.0865
2010	-0.033	2.9547
2011	-0.047	1.9765
2012	-0.095	1.8867
2013	-0.099	2.3112
2014	-0.095	2.9086
2015	-0.080	1.9876
2016	-0.063	2.2097
2017	-0.040	2.7301
Observations	648	
R^2	0.598	
Anderson Correlation test	16.822*	
Shear's Partial R^2	0.503	



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