Characterising market power and its determinants in the Zambian banking indudstry

Simpasa, Anthony

6 December 2010

Characterising Market Power and its Determinants in the Zambian Banking Indudstry

Anthony M. Simpasa

Financial Markets Department
Bank of Zambia
P.O Box 30080
Lusaka, Zambia
Tel: +260 211 228888 ext. 3237
E-mail: 3kids.wkm@gmail.com

Abstract

This article evaluates the intensity of competition by estimate a bank-specific and time varying Lerner Index as a measure of market power by Zambian banks in the post-reform period. Using a model of oligopolistic conduct, we show that Zambian banks exercised market power in setting prices. Furthermore, market concentration, efficiency performance, diversity in revenue sources and regulatory intensity accounted for much of the banks' exercise of market power. However, the results indicate that credit risk and macroeconomic uncertainty had a weakening effect on the banks' exercise of market power. The policy lesson from the analysis is that regulatory authorities should continue with the policy of opening up the financial sector to more players in order to foster contestability in the banking industry.

JEL Classifications: C33, D43, G21
Key Words: Banking, market power, competition

Characterising Market Power and its Determinants in the Zambian Banking Indudstry

1. Introduction

The microeconomic theory of the banking firm offers different aspects on the conduct of banks and their pricing strategies. In particular, the existence of pure profits which arises from exercise of market power depicts the banks' long-run equilibrium configuration in an imperfect market situation. Market power, depicted by the Lerner Index, is measured as a relative mark-up of price over marginal cost divided by price (Lerner, 1934). Coccorese (2009) argues that the Lerner Index is a true reflection of the banks' degree of market power because it represents the behavioural departure from monopoly and perfect competition. Market power is especially prevalent in industries dominated by a few large firms, which serve as market leaders through collusive conduct.

A number of factors can influence banks' exercise of market power. For instance, structural indicators such as concentration ratios could induce changes in the banks' pricing conduct. The nature of regulatory policy and the macroeconomic environment in which banks operate could also interact and influence the manner in which banks price and cost their products and services. Cost inefficiency also has a significant bearing on the behaviour of commercial banks. In the Zambian banking sector, sustained wide interest rate spreads, high levels of market concentration coupled with high profit indicators have reinforced the view that Zambian banks exercise market power in pricing bank products and services.

This paper estimates the market power index in the Zambian banking industry and analyses its evolution during the post reform period. The study then investigates the factors that explain the banks' exercise of market power by relating the estimated bank-specific Lerner indices to structural and non-structural variables. Knowledge of banks' exercise of market power is critical because it provides information on the actual behaviour regarding the banks' influence over price and output in the banking sector. This is of particular importance to the regulatory authorities that rely on static measures of competitiveness which ignore the evolution of competition in the banking industry. Banks also need a clear assessment of their market position to ensure that they are not the focus of monopoly regulators.

To the best of our knowledge, this study is the first in understanding the nature of competition in the Zambian banking industry. The study utilises a unique bank level data set to analyse the banks' pricing behaviour and appeals to empirically tested methodologies in investigating the banks' actual conduct. The availability of longitudinal data allows us to estimate the Lerner Index using the output price and marginal cost estimated from a cost function and also to account for unobservable individual bank differences. From the Sub-African perspective, the study extends the analysis of Aboagye, et al. (2008) who estimated the Lerner index for the Ghanaian banking sector. In this regard, the study narrows the research gap on the measurement of banks' market power in developing countries and particularly in Sub-Saharan Africa (SSA) where there is a dearth of systematic research on the behaviour of banks.

The rest of the paper is organised as follows. Section 2 gives an overview of the performance of the Zambian banking industry during the post-reform period, highlights the dominance of large and of foreign owned banks. A survey of the literature is presented in Section 3, providing evidence that market power is prevalent in banking markets but that market concentration is not a key driver of the banks' exercise of market power. The methodology employed is discussed in Section 4, drawing from the influential works of Monti and Klein, which underpins models of oligopoly behaviour. Section 5 presents empirical results, providing evidence of the existence of market power in Zambian banking industry and the importance of structural, macroeconomic and regulatory factors in driving the price-cost mark-up. Section 6, which provides concluding remarks, shows the congruence in our results to those of previous studies but underscores the importance of strengthening policy reforms to deepen competitiveness in the Zambian banking industry.

2. Overview of the Zambian banking sector

Commercial banks in Zambia are the most active players in the financial sector with size of assets more than tenfold that of other financial institutions combined. However, the amount of credit allocated to the private sector is low, averaging only about 8 percent of Gross Domestic Product between 1998 and 2006. At this level, the level of banks' private sector lending is one of the lowest in Sub-Saharan Africa (World Bank, 2004). On the other hand, Zambian banks boast of a relatively similar magnitude of credit to the public sector,

mainly accounted for by holdings of Treasury securities. Until recently, bank lending to the government was blamed for the observed high cost of credit in the banking industry, which in turn has undermined financial intermediation. Demonstrating inefficient allocation of credit, this crowding out effect entails that Zambian banks have had a limited impact on the economy in terms of credit provision.

A possible explanation for the ineffectiveness of bank lending to the private sector may lie in the structure of the banking industry, which is dominated by a small number of large banks, mainly of foreign orientation. Table 1 summarises the structure and size of the Zambian banking between 1998 and 2006. The balance sheet composition of Zambian commercial banks shows that on aggregate, assets grew substantially over the sample period, amounting to K10.7 trillion (US$2.9 billion) at the end of 2006 against only K1.4 trillion (US$0.4billion) in 1998.

Table 1: Structure of the Zambian commercial banking sector, post crisis period

	1998			2002			2006		
	Foreign	Local	Public	Foreign	Local	Public	Foreign	Local	Public
Number of banks	7	5	1	8	5	1	8	4	1
Total assets (K'bn)	900.39	139.07	373.47	3,199.76	443.70	979.16	7,260.49	1,575.26	1,676.72
Percent of industry assets	63.73	9.84	26.43	67.73	9.39	20.73	68.01	14.76	15.71
Loans (K'bn)	288.94	28.65	142.18	825.85	83.29	65.61	2,739.78	609.33	517.53
Percent of industry loans	62.84	6.23	30.92	84.73	8.54	6.73	70.86	15.76	13.38
Securities (K'bn)	109.75	18.58	26.07	528.27	135.37	383.81	1,354.23	274.54	521.50
Percent of total industry holdings	71.08	12.03	16.88	50.43	12.92	36.64	62.98	12.77	24.25
Deposits (K'bn)	675.49	77.65	240.71	2,139.14	188.21	771.70	5,293.52	1,133.81	1,337.66
Percent of industry deposits	67.97	7.81	24.22	69.03	6.07	24.90	68.17	14.60	17.23

Source: Bank of Zambia and own calculations

The total share of assets held by local private banks and the public sector bank amounted to 30.5 percent of industry assets, representing K3.3 trillion (approximately US$0.9 billion) in value. On the other hand, foreign owned banks have the largest share of industry assets, reflecting their dominance in the Zambian banking market. The amount of loans held by subsidiaries of foreign banks stood at K2.7 trillion (US$0.7 billion) in 2006, a growth of 231 percent over 2002. The increase in loans granted occurred against a backdrop of renewed lending by most foreign owned banks, following improvements in macroeconomic conditions. Inflation declined to below 10percent for the first time in more

than thirty years, largely due to robust economic growth which averaged above 5percent in the four year period to 2006. In contrast, domestic private banks and the state-owned bank lagged behind, recording total loans worth K1.1 trillion (US$0.3 billion) between them, less than half that of foreign owned banks. As a proportion of total industry loans, private domestic banks accounted for 15.8 percent and the public sector bank took up 13.4 percent. However, relative to 2002, this represented an improvement, although the dominance of foreign banks remained evident despite shrinkage in their market share for loans.

The same pattern obtains on the liability side where foreign owned banks accounted for a significant proportion of purchased funds, particularly deposits. The stock of deposits held by subsidiaries of foreign banks amounted to K5.3 trillion (US$1.4 billion) in 2006, two thirds of the industry's total deposits. This amount depicted a growth rate of 147.5 percent in nominal terms over the 2002 position. Conversely, deposits held by domestic private banks amounted to K1.1 trillion (approximately US$0.3 billion) in 2006, a substantial increase over the 2002 position. The public sector bank also recorded an increase in the volume of deposits, growing from K0.8 trillion (US$0.2 billion) in 2002 to K1.3 trillion (US$0.3 billion) in 2006.

As argued above, the Zambian banking system is one of the most concentrated in Sub-Saharan Africa (SSA) and this is demonstrated by the three bank concentration ratio ($CR3$) for assets, deposits and loans. Table 2 presents the indicators of market concentration. The figures show that the three largest banks accounted for 58 percent of assets, 67 percent of loans and 62 percent of deposits.

Table 2: Concentration in the Zambian commercial banking sector

Three bank concentration ratios, CR3 (percent):1998-2006			
	Assets	Deposits	Loans
1998	64.3	67.7	71.2
1999	66.2	69.3	77.1
2000	59.4	61.9	71.5
2001	60.3	62.9	74.0
2002	59.2	62.4	62.7
2003	55.8	58.5	60.6
2004	58.1	61.5	61.6
2005	55.8	56.7	60.1
2006	50.4	53.1	59.7
Average	58.4	61.6	66.5

Source: BoZ data and author's own calculations

Two of these three banks were subsidiaries of foreign banks and the third was a state owned bank, which accounted for more than a fifth in each of the industry assets, deposits and loans. The information contained in $CR3$ is corroborated by the Herfindahl Hirschman Index (HHI) which also depicted a high level of concentration (Table 3). The observed HHI for loans far exceeded 1800 often used by regulators to measure the intensity of competition. Although the *HHI* for deposits and total assets was lower than the regulatory threshold, it remained higher than 1000, indicating low competitive intensity.

Table 3: Banking concentration - Herfindahl-Hirschman Index (HHI)

	Assets	Deposits	Loans
1998	1683.4	1691.0	2036.7
1999	1729.1	1740.3	2369.0
2000	1453.8	1762.5	2116.3
2001	1537.0	1576.4	2165.4
2002	1491.0	1577.1	1952.3
2003	1399.3	1398.7	1918.0
2004	1459.4	1466.7	1872.3
2005	1418.8	1292.0	1848.9
2006	1267.3	1194.3	1689.1
Average	1493.2	1522.1	1996.4

Source: BoZ data and author's own calculations

The high level of market concentration partly explains the banks' high profits. A look at two main profitability indicators, namely the return on assets (ROA) and net interest margin (NIM), underscores the banks' high level of profitability. At an average of more than 20percent, the spread is also considered one of the highest in SSA (IMF and World Bank, 2002).

Table 4: Bank profitability measures, by ownership category

	Return on assets, ROA (percent)					Net interest margin, NIM (percent)			
	Foreign	Local	Public	All banks		Foreign	Local	Public	All banks
1998	4.80	0.85	2.75	3.89		5.47	2.29	0.39	3.86
1999	7.92	0.47	0.17	5.61		4.53	1.01	1.81	2.97
2000	9.99	3.12	4.32	8.16		6.72	4.17	1.66	5.74
2001	7.48	5.93	-7.16	4.70		5.65	4.81	1.82	5.35
2002	7.15	7.60	6.43	7.05		4.64	5.68	5.29	5.35
2003	5.65	6.27	0.93	4.76		2.85	5.80	0.09	3.70
2004	3.14	4.94	1.31	3.02		5.10	7.54	5.01	6.00
2005	6.52	6.99	3.15	6.00		5.25	7.71	9.15	6.70
2006	3.98	5.27	1.33	3.68		4.75	4.84	7.18	5.60
Average	6.29	4.61	1.47	5.21		5.00	4.87	3.60	5.03

Source: Author's own calculations from BoZ data

An analysis of profitability by bank ownership structure shows that foreign owned banks recorded higher profits than domestic and public sector banks. At an average of 6.3 percent, foreign banks' profitability index was 37 percent higher than that for domestic banks and was 4.3 times greater than that posted by the public sector banks. A striking feature of the banks' profitability is that foreign owned banks lost their first position to domestic private banks between 2002 and 2006, thanks to the latter group's rationalisation of operational costs. Between 2002 and 2006, domestic private banks instituted cost saving measures resulting in better profit performance.

The improvement in profit performance showed that domestic private banks had recouped the loss in profitability since the banking crisis in the mid-1990s which had dampened their earning opportunities as a result of flight to quality. The performance of the state owned bank was adversely affected by a sharp increase in losses, which resulted in negative profits in 2001. Nonetheless, profits rebounded strongly in 2002, but this momentum was short-lived as profits declined to below 2 percent on average between 2003 and 2006. Therefore, the recovery of 2002 did little to offset earlier losses, largely due to a reduction in fee income and an appreciation of the domestic currency which substantially eroded foreign exchange gains of the earlier years.

The wide net interest margins and high profitability reflect the oligopolistic nature of the Zambian banking market as seen by the dominance of few banks in the industry (World Bank, 2004). High margins may also be due to macroeconomic instability and regulatory burden. Over the years, Zambian banks have operated under a high inflationary environment while the statutory reserve ratio was, until 2007, above 10 percent.

3. Overview of the literature on market power

Models of oligopoly behaviour have become increasingly popular in analysing bank conduct, including market power. These imperfect competition models offer robust improvements to the traditional measures of banking conduct such as the SCP and they make the analysis more appealing (Toolsema, 2004; Freixas & Rochet, 1997). A theoretical framework for analysing bank profit margins has its roots in the seminal works of Klein (1971) and Monti (1972).

Previous studies of bank oligopolistic behaviour relied on aggregate indicators of performance. However, in recent years, the availability of individual firm level data and the discontent about the failure of structural models to explain bank behaviour has spurred growth in new methodologies of analysing bank performance, known as non-structural models of New Empirical Industrial Organisation (NEIO) models, couched in panel data econometrics. By analysing firm level mark-ups, one can readily satisfy the assumptions of possible price-taking behaviour among individual firms as opposed to previous studies which violated this assumption (Hanan & Liang, 1993). The use of bank-level data also provides an opportunity to examine the evolution of market power over time and across firms.

In view of the above, Angelini and Cetorelli (2003) analysed the behaviour of Italian regional banks using a Lerner Index estimated from a conjectural variations model. The authors show that financial deregulation fostered a reduction in price-cost margins. Fernandez de Guevara, et al. (2005) estimated the Lerner Index for the European Union (EU) banking system. Their estimates of the Lerner Index could not support presence of competitive behaviour within the banking markets of the EU member countries. The authors also assessed the determinants of market power, using among other variables, a measure of concentration in the deposits market, which was found to be insignificant. Instead, bank cost efficiency, default risk and bank size were found to be the main explanatory factors. Utilising a similar approach, Fernandez de Guevara and Maudos (2007) estimated the Lerner index for Spanish banks. Their conclusion was that market power increased among Spanish banks, driven largely by bank size, efficiency and specialisation. However, bank concentration was found to be an insignificant variable, corroborating earlier research findings.

In a study of market power in Swedish banking, Sjöberg (2006) estimated a conduct parameter based on the Bresnahan (1982; 1989) oligopoly model. The estimated Lerner Index showed that the degree of competition was especially high (lower market power) among large banks in Sweden despite high concentration in the sector. Based on the same framework, Fischer and Hempell (2006) showed that the Lerner Index for German banks depicted increasing competitive pressures with regional structural and economic variables playing an important role in sustaining the banks' exercise of market power. Demand factors were also found to have a strong economic effect on market power but the level of concentration was insignificant.

The literature of banks' exercise of market power and the factors influencing it in developing countries is sparse and mainly confined to emerging and transition economies.

For sub-Saharan Africa, (SSA) the evidence is especially scanty. The majority of the studies infer market power using interest rate spreads, implying that these are good measures of market power. The problem with this approach is that market power may be endogenous. For instance, interest rate spreads could be affected by banks' exercise of market power while high margins may themselves be a consequence of market power, as demonstrated by Moore and Craigwell (2002), Chirwa and Mlachila (2004), among others.

As a remedy to the above shortcomings, Fahrer and Rohling (1981) argue it is important to apply approaches that take into account the direct behaviour of commercial banks in estimating market power. The NEIO models fall in this category. These approaches recognise the need to endogenise market structure in the banking industry and test the exercise of market power without relying on structural measures such as concentration ratios and number of firms (Delis, Staikouras, & Varlagas, 2008). Indeed competition can exist even in a duopoly market while monopolistic conduct is also possible even in markets with a large number of players as Ausunbel (1991) has demonstrated for the U.S. credit card market.

Only a handful of studies for SSA have used the NEIO methodologies in measuring market power more directly. Of special interest is a study by Aboagye, et al. (2008) for Ghanaian banks. The authors applied a methodology along the lines of Fernandez de Guevara, et al. (2005) to a panel of Ghanaian banks. Their observation was that Ghanaian banks possess market power on account of size, efficiency and the macroeconomic environment in which they operate. The other study by Okealaham (2007) took a different approach to the assessment of market power in the South African banking sector. The author argues that banks' exercise of market power is not a reflection of market imperfections but a consequence of cost economies. This is consistent with the theoretical prediction of the efficiency structure hypothesis. This implies that commercial banks enjoying scale economies may exercise greater market power thereby dwarfing the effects of structural indicators such as concentration ratios.

Other studies for developing countries include Solis and Maudos (2008), who estimate and offer evidence on the social cost of market power using data from the Mexican banking sector. The results of this analysis show that Mexican banks exercised substantial market power in setting loan interest rates with the consequence that cost efficiency was significantly undermined. The estimate of the Lerner Index derived from interest rates showed that in 2005, social cost of market power was 0.15 percent of GDP. However, no evidence of the 'quiet life' hypothesis was found for the deposits market.

Tovar, et al. (2007) analysed the interplay between risk, concentration and market power in the Colombian banking industry after the regulatory reforms. Their results show that subsequent to the reforms, Colombian banks exhibited high systemic risk, which served as a collusive device and the cost of this risk was borne by bank customers through high mark-ups. However, the authors failed to find evidence of market concentration as a significant collusive factor. Rather, its effect on market power was only robust after controlling for systemic risk.

4. Methodological framework

4.1 Analytical Framework

The analytical framework for estimation of market power in the Zambian banking industry borrows from the influential Klein-Monti theoretical oligopolistic model.

In order to simplify the Klein-Monti framework, we use a special case of duopoly in line with Dvořák (2005). Let the cost function be denoted by $TC_i\left(D,L\right)=\gamma_D D_i+\gamma_L L_i,\ i=1,2$ where TC, represents total operating costs, D and L denote total deposits and loans while γ_D and γ_L are marginal costs of producing them, respectively. The loan rate $\left(r_L\right)$, deposit rate $\left(r_D\right)$, and the money market rate $\left(r\right)$ are exogenously determined assuming banks compete in quantity, . Therefore, each bank faces a downward sloping demand curve for loans and an upward supply curve for deposits, given by $L\left(r_L\right)$ and $D\left(r_D\right)$, respectively. The loan and deposit rates are inverse functions of the demand for loans and supply of deposits, as depicted by $r_L\left(L\right)$ and $r_D\left(D\right)$, respectively. Finally, the cash statutory reserves denoted by R, are given by $R=\left(1-\alpha\right)D-L$ where α is a fraction of deposits held as cash reserves at the central bank. Taking the amount of loans and deposits chosen by other banks as given, each bank maximises its profit according to the following specification

$$\pi_i=\left\{\left[\left(r_L\left(L_1+L_2\right)-r\right)\right]L_i+\left[r\left(1-\alpha\right)-r_D\left(D_1+D_2\right)\right]D_i-\left(\gamma_D D_i+\gamma_L L_i\right)\right\} \quad (1)$$

where, π_i is bank i's profits, L_1, L_2 are the amount of loans granted by bank 1 and 2 whereas D_1, D_2 are the amounts of deposits received by bank 1 and 2, respectively. Equation (1) shows that a bank's profit can be expressed as the difference between intermediation margins and operating expenses. The first order conditions for loans and deposits are derived as follows

$$\begin{aligned} \frac{\partial \pi_i}{\partial L_i} &= \left(r_L^{'}\left(L^*\right)\frac{L^*}{2} + r_L\left(L^*\right) - r \right) - \gamma_L = 0 \\ \frac{\partial \pi_i}{\partial D_i} &= \left(r\left(1-\alpha\right) - r_D\left(D^*\right) \right) - r_D^{'}\left(D^*\right)\frac{D^*}{2} - \gamma_D = 0 \end{aligned} \tag{2}$$

L^* and D^* are solutions to the bank's objective function denoting equilibrium amounts of loans and deposits for the banking sector. Rewriting the first order condition for loans in elasticity form yields the Lerner Index $\left(LI\right)$ given by

$$LI = \frac{r_L^* - \left(r + \gamma_L\right)}{r_L^*} = \frac{1}{2\varepsilon_L\left(r_L^*\right)} \tag{3}$$

where ε_L denotes the elasticity of demand for loans and LI is the Lerner Index defined above. The Lerner Index for deposits can be derived analogously. Under the N-firms case, the demand elasticities would be scaled by a factor of N, the total number of banks in the industry.

4.2 Empirical model and estimation strategy

The empirical model is adapted from Fernandez de Guevara, et al. (2005). Other empirical studies in this genre of models include Corvoisier & Gropp (2002) and Gropp, et al. (2007). Other variants of imperfect competition models are based on the conjectural variations approach following Appelbaum (1982), Bresnahan (1989) and Lau (1982). Applications of this group of models have included Shaffer (1993; 2001), Angelini and Cetorelli (2003) and Kubo (2006), among others.

In this empirical formulation, the estimation of the Lerner Index requires knowledge of the price of banking output such as actual interest rates charged on loans. However, for the banking industry in general and the Zambian banking sector in particular, the data on loan interest rates are not readily available. Since the flow of banking services is proportional to its stock of assets, the price of bank output can be approximated by the ratio of total revenue (interest and non-interest income) to total assets. Averaging across all banks yields an average market price. This output price construct ensures that both on-balance sheet outputs and off-balance sheet asset items are captured in order to avoid understating bank production (Jagtiani & Khanthavit, 1996). It is therefore consistent with overall bank behaviour.

The profit and loss statements do not also report marginal costs related to the production of any of the individual asset items for Zambian banks. Therefore, an approximate measure of marginal cost has to be estimated. Given that marginal cost is not directly observable, it has to be estimated from a translog cost function. In industrial countries and other developed emerging markets where interbank trading accounts for a large volume of sources of funds for commercial banks, the interbank interest rate has been used as a proxy for marginal cost of production.

However, in less developed countries characterised by rudimentary financial markets, the main source of banks' funds is bank deposits. In Zambia, the amount of funds raised through the overnight interbank market represents only 1.8 percent of total liabilities while deposits account for 78.2 percent. While recognising that banks are multioutput firms, we aggregate all bank outputs, namely loans, securities, and other assets into an aggregate measure of bank product (total assets) which enables us to construct a single measure of marginal cost for overall production activity. If costs were reported for individual bank products and markets, we would then calculate output-specific marginal costs as Berg and Kim (1998) did for retail and corporate submarkets. Thus, the translog cost function used for estimating marginal cost is given by

$$
\begin{aligned}
\ln TC_{it} = {} & \beta_0 + \beta_y \ln Y_{it} + \frac{1}{2}\beta_{yy}\left(\ln Y_{it}\right)^2 + \beta_1 \ln w_{Lit} + \beta_2 \ln w_{Fit} + \beta_3 \ln w_{Kit} \\
& + \beta_{11}\left(\ln w_{Lit}\right)^2 + \beta_{22}\left(\ln w_{Fit}\right)^2 + \beta_{33}\left(\ln w_{Kit}\right)^2 + \beta_{12} \ln w_{Lit} \ln w_{Fit} \\
& + \beta_{13} \ln w_{Lit} \ln w_{Kit} + \beta_{23} \ln w_{Fit} \ln w_{Kit} + \sum_{j=L,F,K} \delta_{yj} \ln Y_{it} \ln w_{jit} \\
& + \theta_t t + \theta_{tt} t^2 + \sum_{j=L,F,K} \theta_{tj} t \ln w_{jit} + \theta_{ty} t \ln Y_{it} + \psi_1 \ln\left(BRANCH_{it}\right) \\
& + \psi_2 \ln\left(RISK_{it}\right) + \psi_3 \ln\left(INTERMED_{it}\right) + \zeta, \\
& i = 1,...,N; t = 1,...,T
\end{aligned}
\tag{4}
$$

where, TC_{it} denotes total operating costs, w_{jit} represents factor input prices, Y_{it} is total output, j denote actual inputs, ζ is an error term. The estimation of the cost function also includes control variables. The variable *BRANCH* is the number of branches operated by commercial banks. It controls for the scale of operation and effect of branch network density on costs.[1] By including *BRANCH* in the cost function, we postulate that the banks' production technology differs in a significant way due to variations in size and other unmeasured factors associated with maintaining the bank branches. The variable *RISK* is the ratio of non-performing loans to total loans. Non-performing loans (NPLs) are treated as banks' undesirable outputs or costs which decrease banks' performance. The risk variable captures the impact of poor output quality on bank costs. Finally, *INTERMED* is the intermediation ratio defined as the ratio of loans-to-deposits. The flow of deposits into the banking sector determines the amount of loans a bank can make in a given period. Furthermore, banks that rely more on deposits to finance assets face a higher funding risk than those that hold a relatively higher proportion of equity capital. Therefore, this variable is included to measure the effect of deposit fund utilisation in financial intermediation. In line with standard literature, we also impose symmetry and homogeneity conditions on the cost function above.

The cost function depicted by Equation (4) can be estimated directly using ordinary least squares in a panel data context. However, there are efficiency gains when it is estimated jointly with input cost share equations. The inclusion of the cost share equations in the estimation procedure has an advantage of creating more degrees of freedom without adding any unrestricted regression coefficients. It also yields more asymptotically efficient parameter estimates than would otherwise be if the cost function is estimated on its own. Input share

[1] In some studies, the log of assets is used to capture bank size. However, this may introduce problems of multicollinearity given that output is also measured by total assets.

equations for labour, funds or capital are calculated by partially differentiating the cost function with respect to w_L, w_F and w_K, the variables depicting labour, funds and capital inputs, respectively Input share equations for these three inputs are given below:

$$
\begin{aligned}
S_L &= \frac{\partial \ln TC_{it}}{\partial \ln w_{Lit}} = \frac{w_{Lit} X_{Lit}}{TC_{it}} = \beta_1 + \beta_{11} \ln w_{Lit} + \beta_{12} \ln w_{Fit} + \beta_{13} \ln w_{Kit} + \delta_{yL} \ln Y_{it} + \theta_{tL} t + \omega_j, \\
S_K &= \frac{\partial \ln TC_{it}}{\partial \ln w_{Kit}} = \frac{w_{Kit} X_{Kit}}{TC_{it}} = \beta_1 + \beta_{22} \ln w_{Kit} + \beta_{21} \ln w_{Lit} + \beta_{23} \ln w_{Fit} + \delta_{yK} \ln Y_{it} + \theta_{tK} t + \omega_j, \qquad (5) \\
S_F &= \frac{\partial \ln TC_{it}}{\partial \ln w_{Fit}} = \frac{w_{Fit} X_{Fit}}{TC_{it}} = \beta_1 + \beta_{33} \ln w_{Fit} + \beta_{31} \ln w_{Lit} + \beta_{32} \ln w_{Kit} + \delta_{yF} \ln Y_{it} + \theta_{tF} t + \omega_j,
\end{aligned}
$$

where S_j is input specific share such that $S_L + S_K + S_F = 1$ and ω_j is a random error term for the jth input $\left(j = L, K, F \right)$.

Since the input shares sum to unity, one of the factor share equations is dropped to obtain a non-singular covariance matrix. Therefore, only $J-1$ share equations are estimated jointly with the cost function. The resulting parameter estimates are asymptotically equivalent to those obtained by the maximum likelihood approach and are invariant to the factor share equation dropped during estimation. The joint estimation of the cost function and the $J-1$ input cost share equations is estimated by applying Zellner's (1962) two-step iterated seemingly unrelated regression estimation (ISURE) procedure. The cost function is normalised by the input price of funds, leaving us with two share equations for labour $\left(S_L \right)$ and capital $\left(S_K \right)$, respectively.

Partially differentiating Equation (4) with respect to $\ln Y_{it}$ yields a measure of marginal cost according to Equation (6)

$$
mc_{it} = \frac{\partial \ln TC_{it}}{\partial \ln Y_{it}} = \frac{TC_{it}}{Y_{it}} \left(\beta_y + \beta_{yy} \ln Y_{it} + \sum_{j=L,K} \delta_{yj} \ln w_{jit} + \theta_{ty} t \right) \qquad (6)
$$

where mc_{it} is the bank level marginal cost. The industry wide marginal cost (MC) is obtained by $MC = \sum_{i=1}^{N} mc_i \Big/ N$ where N is the number of decision making units, herein called banks. Consistent with Fernandez de Guevara, et al. (2005), the bank specific Lerner Index measure of market power is given by

$$LI_{it} = \frac{p_{it} - mc_{it}}{p_{it}} \tag{7}$$

where, p_i denotes output price for each bank, proxied by the ratio of total revenue to total assets in each period. Equation (8) depicts the average Lerner Index for the banking industry

$$LI_t = \frac{P_t - MC_t}{P_t} \tag{8}$$

where P captures the market price for the whole banking industry, calculated by as $P = \sum_{i=1}^{N} p_i \Big/ N$.

4.3 Evolution of market power and its determinants

A major advantage of the approach adopted in estimating the Lerner Index is that it gives a better understanding of the evolution of competition over time. In this way, we can then relate the market power index to its explanatory factors. These factors could be bank-specific, structural, regulatory or macroeconomic in nature. Firstly, we control for the structure of the market in which banks operate, depicted by the Hirschman-Herfindahl index (HHI) derived from gross loans.[2] The theoretical rationale for including a measure of market structure is that an individual bank exerts greater influence over the market price

[2] As a robustness check, alternative measures of market structure were introduced. Specifically, the *HHI* based on total assets and deposits and four-firm concentartion ratio were used in place of the loans based *HHI*. Estimation with the alternative definitions of *HHI* produced insignificant and/or wrong signs for coefficients while using the four-firm concentration ratio led to significant loss of observations. Therefore we retained the loans based *HHI* in the regression.

relative to marginal cost, thereby increasing the mark-up (Beighley & McCall, 1975; Cowling & Waterson, 1976). This impact is greater the more dominant the bank is and how other banks respond to this dominance. Results of previous research notwithstanding, we conjecture that HHI has a positive effect on the Lerner Index.

The second variable we consider is bank credit risk $(RISK)$, defined earlier. Banks' exposure to high credit risk could manifest itself in deterioration of the credit portfolio. To avoid incurring risk, banks may pre-screen their customers and choose to lend to less risky borrowers, even at high interest rates (Stiglitz & Weiss, 1981). Commercial banks may also increase the proportion of risk free assets such as Treasury securities thereby reducing risk-premiums (Tovar, Jaramillo, & Hernandez, 2007). When banks opt to increase their risk exposure, the price-cost margins tend to be higher as banks cover up for the potential loss in revenue arising from default risk by raising their prices relative to marginal cost. However, when the proportion of bad loans is lower, margins tend to decrease, suggesting weaker market power. Therefore, the effect of the credit risk variable on the Lerner Index is expected to be positive.

We also consider the effect of regulatory intensity on banks' exercise of market power. Since the banks' core business involves risk lending, minimum capital requirements are imposed to ensure that banks possess sufficient capital to cover liabilities in an event of bank failure. However, higher regulatory capital requirements could potentially harm bank competitiveness by increasing market power. Thus, to capture the impact of regulatory burden on market power, we include the capital adequacy ratio $(CAPRATIO)$. Banks facing tighter regulatory burden are expected to raise margins in order to build up a sufficient revenue buffer necessary for maintaining solvency. Thus, a positive sign is expected on $CAPRATIO$.

Cost inefficiency in banking is often associated with high mark-ups because banks tend to mask their operating inefficiency through wide spreads, the cost of which is borne by customers. Some authors interpret existence of wide mark-ups as evidence of cost inefficiency in the banking sector (Vera, Zambrano-Sequin, & Faust, 2007). When cost inefficiency is a binding constraint, this leads to high market power and may be exacerbated by agency problems. However, it is also possible that banks' high price-cost margins could move in tandem with better cost efficiency performance, mainly because efficient banks are able to contain costs and therefore post wide mark-ups as predicted by the efficiency-

structure hypothesis. For these reasons, the relationship between cost efficiency and mark-ups is unclear.

Another important performance indicator for Zambian banks is the proportion of other income to total assets $(OITASS)$. Banks with better non-interest revenue performance would exert greater market power, and may use this as an entry barrier. A positive coefficient is therefore expected on the variable $OITASS$. We also control for the ratio of interbank deposits to total customer and short-term funds $(DEPMIX)$ to account for diversity of bank funding on banks' exercise of market power. We conjecture that banks with a high proportion of interbank deposits relative to total deposits will have a low mark-up, depicting lower market power.

Price-cost margins could also vary with macroeconomic conditions and the monetary policy rule. For instance, during a recession, mark-ups tend to decrease and increase in boom times. Small (1998) found that mark-ups in the financial services sector in the United Kingdom were procyclical. However, Carbo´ et al. (2003) argue that buoyant economic growth and a stable macroeconomic environment tend to negatively affect prices and costs, although the extent to which these variables are influenced may be significantly different. Other studies see for instance Toolsema (2004) suggests that procyclical monetary policy affects the Lerner Index in a countercyclical manner, indicating that there is an inverse relationship between monetary conditions and market power. We include the rate of inflation $(INFLATION)$ as an indicator of macroeconomic uncertainty and hypothesise a positive coefficient.[3] This suggests that a high rate of inflation induces banks to increase prices of bank products whilst cutting down on operating costs to remain competitive. We also include the 91-day Treasury bill rate (TBR) to capture effects of monetary policy stance given that the central bank uses auctions of Treasury securities to raise funds for the government and also as a monetary policy tool for mopping up excess liquidity from the banking system. Therefore, a positive coefficient is expected on TBR.

In view of the foregoing, we estimated Equation (9) below to assess the determinants of market power in the Zambian banking industry

[3] In Zambia, the exchange rate is also widely viewed as an important signal of macroeconomic uncertainty. However, its inclusion in the regression yielded poor results, see discussion below. Therefore, we posit that given the strong passthrough effects, see for instance, Mutoti (2006) (2006) (2006) the rate of inflation adequately captures movements in the exchange rate.

$$\ln(LI_{it}) = \alpha_0 + \alpha_1 \ln(HHI_{it}) + \alpha_2 \ln(EFF_{it}) + \alpha_3 \ln(CAPRATIO_{it}) + \alpha_4 \ln(RISK_{it}) + \alpha_5 \ln(OITASS_{it}) + \alpha_6 \ln(DEPMIX_{it}) + \alpha_7 \ln(INFLATION_t) + \alpha_8 \ln(TBR_t) + v_t \quad (9).$$

The variables in Equation (9) are respectively, Lerner Index (LI), Hirschman-Herfindahl index (HHI), a measure of macroeconomic policy stance $(INFLATION)$, monetary policy stance (TBR) bank credit risk $(RISK)$, cost efficiency index (EFF), regulatory capital intensity $(CAPRATIO)$, a measure of deposit mix $(DEPMIX)$, a revenue scaling factor $(OITASS)$. Finally, v denotes a random error term and as before, i denotes observation per bank while t is the time of observation in quarters.

5. Sample, data and estimation results

9.1 Sample and data

The sample covers all commercial banks that were present at the end of each period from 1998 to 2006. We employ unique quarterly data gleaned from monthly balance sheet and income statement returns submitted by each individual bank to the supervisory department of the central bank. During the observation period, one merger took place. Prior to the merger, the two merged banks are treated as two separate sample units, in post merger period; the absorbed banks are dropped from the data base which means the merged bank enters the sample as a single bank. Therefore, due to entry and mergers, the sample is an unbalanced panel of 388 observations. Table 5 gives variable definitions and summary of descriptive statistics.

Table 5: Variables used in estimating cost efficiency and determinants of market power

Variable Symbol	Variable Name	Description and measurement	Mean	Median	Std Dev.
TC	Total costs	Interest expenses plus operating costs	52,200.45	54,027.88	20,222.87
Y	Bank output	Stock of total assets	329,127.70	137,957.00	402,073.50
w_L	Unit price of labour	Total personnel expenses expressed as a proportion of total assets	0.005	0.004	0.004
w_F	Unit price of funds	Total interest expenses on deposits and other borrowed funds divided by total deposits and borrowed funds	0.01	0.01	0.12
w_K	Unit price of physical capital	Sum of all other expenses (on building, equipment, furniture, etc.) divided by stock of fixed and other assets	0.11	0.05	0.41
BRANCH	Branches	Total number of bank branches operated by an individual bank per given period	11	7	13
RISK	Portfolio credit risk	Non-performing loans expressed as a proportion of total loans	0.09	0.07	0.11
INTERMED	Intermediation ratio	Proportion of total loans to total deposits (Loan-to-deposit ratio)	12.239	0.41	35.48
CONTASS	Asset concentration ratio	Proportion of total government securities to total loans (proxy for disintermediation)	2.75	0.84	8.41
INFLATION	Inflation rate	Changes in consumer price index (CPI), percent per annum, expressed on a quarterly basis	20.87	20.60	5.85
TBR	Treasury bill rate	Yield rate on 91-day Treasury bill paper (percent per annum) expressed on a quarterly basis	27.30	32.40	12.51
OPPCOST	Opportunity cost of cash statutory reserves	Interest foregone on cash reserve requirements expressed as a proportion of interest expenses	695.9	213.6	1065.4
EFF	Cost efficiency	Bank-specific cost efficiency score	0.90	1.00	1.00
DEPMIX	Deposit mix	Share of interbank deposits in total deposits	0.23	0.04	3.34
OITASS	Other income	Non-interest income as proportion of total assets	0.008	0.007	0.007
P_i	Price of bank output	Total individual bank revenue/total bank assets Total revenue	0.02	0.02	0.01
P	Market Price of output	Average of all bank-level output prices	0.02	0.02	0.001
MC	Bank-specific marginal cost	Estimated from the translog cost function	0.01	0.010	0.003
LI_i	Bank-specific Lerner Index	Bank-specific Lerner Index of market power	0.50	0.53	0.021
LI	Industry- average Lerner Index	Industry average Lerner Index of market power	0.50	0.51	0.14
HHI_i	Hirschman-Hirfindahl index	Market structure concentration index	1970.8	2000.9	182.6
CAPRATIO	Regulatory capital adequacy ratio	Banks' total capital (Tier I and Tier II capital) as a proportion of risk-weighted assets	0.427	0.300	0.448
OWNERSHIP	Ownership dummy	Dummy variable for bank ownership structure (1 for foreign and domestic private banks, zero for public banks)			

Note: Total costs and bank output (assets) are measured in millions of current Zambian Kwacha (K'million).
To calculated interest foregone, the risk free 91-day Treasury bill rate is applied to total cash reserves on the assumption that under a regime of zero reserve requirements, banks would invest their funds in less risk assets for a guaranteed income stream. Of course, banks can also invest any freed resources in other assets, including foreign exchange deposits abroad and loans. However, these assets are subject to intertemporal uncertainty during the period of investment. Securities are less prone to uncertainty.
Source: Bank of Zambia (BoZ) and author's own computations

9.2 Empirical Results of market power

Empirical results obtained through joint estimation of equations (4) and (5) pass diagnostic tests and coefficients for variables of interest are statistically significant and carry expected signs. Empirical results of the ISURE estimation procedure are presented in Table 6. Using these results, we calculate the bank-specific marginal cost as given in equation (6). The marginal cost was then used in conjunction with the approximate measure of output price to estimate the bank specific and time variant Lerner Index $\left(LI_i\right)$. Averaging across all banks yields the industry level Lerner Index $\left(LI\right)$.

Table 6: Iterated cost function estimation results

	Coefficient	Parameter	Standard error	t-statistic	p-value
Intercept	β_0	4.419	0.718	6.151	0.000***
ln(w_L)	β_1	0.074	0.238	0.311	0.756
ln(w_K)	β_3	1.069	0.241	4.439	0.000***
ln(Y)	β_y	0.312	0.140	2.236	0.025**
$1/2$ (ln(Y))^2	β_{yy}	0.052	0.014	3.662	0.000***
$1/2$ (ln$(w_L)^2$	δ_1	0.063	0.035	1.783	0.075*
$1/2$ (ln$(w_K)^2$	δ_3	0.017	0.037	0.463	0.643
ln(w_L)ln(w_K)	δ_{13}	-0.057	0.032	1.779	0.075*
ln(w_L)ln(Y)	δ_{1y}	-0.011	0.016	-0.699	0.484
ln(w_K)ln(Y)	δ_{3y}	0.037	0.015	2.479	0.013***
t	θ_t	-0.005	0.011	-0.450	0.653
t^2	θ_{tt}	0.000	0.000	-0.309	0.758
t ln(Y)	θ_{ty}	0.001	0.001	1.154	0.248
t ln(w_L)	θ_{tL}	0.002	0.002	1.136	0.256
t ln(w_K)	θ_{tK}	-0.004	0.002	-2.748	0.006***
Control Variables					
ln*(BRANCH)*	ψ_1	0.042	0.012	3.449	0.001***
ln*(RISK)*	ψ_2	0.012	0.008	1.606	0.108
ln*(INTERMED)*	ψ_3	0.030	0.010	2.926	0.003***

Diagnostics

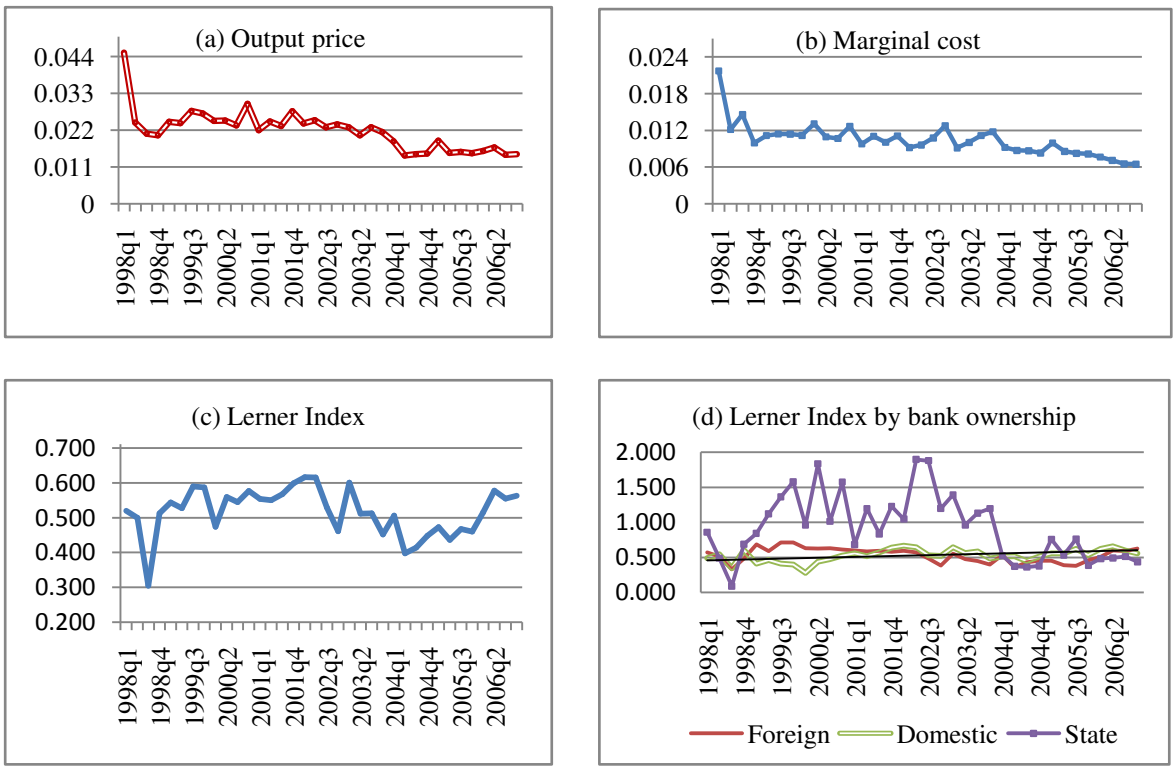
Equation	Obs.	Parameters	RMSE	R^2	p-value
Cost Function	388	17	0.146	0.995	0.000***
Labour input share	388	3	1083.940	0.698	0.000***
Capital input share	388	3	141.579	0.405	0.000***

Significance level: * p<0.10, ** p<0.05, *** p<0.01
Source: Author's own computations based on BoZ data

5.2.1 Characteristising the Lerner Index and its evolution

The evolution of industry output price, marginal cost and the resulting Lerner Index are given in Figure 1. Panel (a) of Figure 1 indicates a general decline in output price throughout the study period, except for a small spike in early 2005. From 2005, bank output price was relatively stable, more or less consistent with developments in the banking sector. In April 2005, Zambia attained the Heavily Indebted Poor Countries (HIPC) initiative completion point, resulting in debt forgiveness which helped improve the country's macroeconomic outlook and credit standing. Improvement in macroeconomic conditions spurred a reduction yields rates on Treasury securities and bank loans, although bank lending interest rates fell only marginally.

Figure 1: Output price, marginal cost and the Lerner Index (industry average)



Source: Author's own computations from BoZ data

Despite this, aggregate bank interest revenue decreased. Non-interest income also decreased, mainly because of the appreciation in the exchange rate arising from capital inflows and market confidence. The appreciation in the exchange rate led to a diminution of foreign exchange gains and as a result non-interest income decreased. Prior to the HIPC initiative, banks' income attributed to foreign exchange transactions was more than a quarter

of total bank revenue, shored up by a rapidly depreciating currency. However, this share contracted to less than one fifth from 2005 onwards. Other categories of non-interest income were less affected but their share was overshadowed by reductions in major revenue components.

The movement in marginal cost (Panel b) mimicked that of bank output price, underpinning the banks' realisation of cost containment in a quest to realign their cost structure with shrinking revenues from both traditional and non-traditional sources. The reduction in marginal cost accelerated from around 2003 and persisted through to 2006, reflecting a decrease in operating and financial costs. The net effect of the decrease in the price of bank output and marginal cost does not necessarily translate into a lower price-cost mark-up. Rather, it depends on which one falls faster.

Over the sample period, the fall in output price was less rapid relative to the decline in marginal cost. As a result, the Lerner Index assumed an upward trend for most part of the sample period (see, Panel (c)). For the full sample, the average Lerner Index was estimated as 50.9 percent, indicating that banks priced above marginal cost by more than 50.0 percent. Across the sample, there are two distinct episodes in the movement of the price-cost margin. The average mark-up decreased from 52.6 percent between 1998 and 2001 to 49.6 percent for the period between 2002 and 2004. Although it bottomed out slightly between 2005 and 2006, it remained below the pre-2002 level, averaging 49.4 percent over the last two years of the study period.

The above analysis shows that between 1998 and 2001, Zambian banks enjoyed greater latitude in setting prices, which helped them maintain significant market power. During this period, the Lerner Index was therefore largely driven more by the high price of bank products and services than by falling costs. On the other hand, from 2002 onwards, the banks' marginal costs decreased precipitously mainly due to a fall in deposit interest rates. Concurrently, the price of output also decreased, as banks' lending rates declined in line with falling yield rates on Treasury securities. Consequently, the Lerner Index declined marginally over this period, implying a slight decrease in market power.

The estimates of market power suggest that Zambian banks operate in an imperfectly competitive environment defined by oligopolistic conduct. This behaviour may be due to risk aversion or inadequate predatory strategies that prevent a majority of banks from engaging in intense competition. This finding is more compelling for state banks (see Panel (d)) which, for reasons of poor credit risk screening mechanisms which resulted in high proportion of bad

loans, shied away from engaging in further risky lending. Instead, and supported by soft budgets to cushion them from asset deterioration, they accumulated risk-free securities to boost their revenue base. This is evidenced by the relatively higher Lerner Index for this group of banks compared with other bank categories. The greater exercise of market power by public sector banks was a manifestation of incentives created by soft budgets which created an uneven competition platform with other banks.

As these guarantees were eased in preparation for bank privatisation, the Lerner Index declined steeply from about 2004, even to the point of converging with mark-up estimates for other bank categories. Taking the Lerner Index as an indicator of bank competitiveness, the evidence given by Figure 6(d) shows that competition among private and foreign banks may have been tighter while public sector banks operated as a monopoly mainly due to state incentives and implicit guarantees.

5.2.2 Market structure and other determinants of market power

In order to explore the determinants of market power by Zambian banks, we exploit the rich data set and relate the bank level Lerner Index it indicators of market structure, regulatory and macroeconomic variables and bank-specific factors. Regression results are summarised in Table 2. The regression equation for the determinants of market power was estimated using fixed effects in the context of a static panel, which does not assume endogeneity of the explanatory variables. On the other hand is the error term is suspected to be correlated with any of the explanatory variables, the system GMM estimation procedure will be the appropriate technique, in which case the lagged Lerner Index could be used as an instrument. To control for potential heteroscedasticity, the estimation was conducted using robust standard errors in line with Hoechle (2007) and Green (2003).

The Wald-statistic for model adequacy is statistically significant at 1 percent. However, the independent variables explain only 18 percent of the Lerner Index. Given the nature of our sample, this appears rather low. Nonetheless, it is not uncommon for most panel data estimations and cannot be used to authenticate the research findings. Instead, the significance of individual coefficients is more informative in making a case for the usefulness and robustness of the results as provided in Table 2.

The results are indicative of the strong effect of market structure index on market power. This is depicted by the positive and highly significant coefficient on the Herfindahl Hirschman index (HHI), suggesting that market structure is an important factor in explaining banks' market power. This finding is consistent with theoretical predictions and renders support to the hypothesis that firms operating in concentrated markets tend to exercise market power.

Table 7: Determinants of market power in Zambian banking sector

	Coefficient	Parameter	t-statistic	p-value
Intercept	α_0	-6.166	-2.348	0.019**
$\ln(HHI)$	α_1	0.869	2.332	0.020**
$\ln(EFF)$	α_2	0.585	2.385	0.018**
$\ln(CAPRATIO)$	α_3	0.130	2.011	0.045**
$\ln(RISK)$	α_4	-0.041	-1.824	0.069*
$\ln(OITASS)$	α_5	0.216	4.184	0.000***
$\ln(DEPMIX)$	α_6	-0.055	-2.117	0.035**
$\ln(INFLATION)$	α_7	-0.232	-3.040	0.003***
$\ln(TBR)$	α_8	0.164	3.633	0.000***
σ_u		0.331		
σ_ε		0.366		
ρ		0.449		
No. of Obs.		359		
Wald $\chi^2(8)$		10.730		
p-value		0.000***		
R^2		0.180		
Hausman test		27.390		
p-value		0.000***		

Significance level: *** 1 percent, ** 5 percent and * 10 percent
Source: Author's own calculations based on BoZ data

The effect of a measure of cost efficiency (EFF) is also robust and of the expected positive sign. This result deserves special mention in light of the ambiguity in the market power-efficiency relationship discussed earlier. The intuition behind this result is that conceptually, cost efficient banks have the ability to exert market power in the Zambian banking sector as propagated by proponents of the efficiency structure hypothesis (ESH).

Indeed, banks that better manage their productive resources are also able to achieve significant market shares and strategically reposition themselves by posting profits generated from high mark-ups.

The credit risk variable $(RISK)$ has a negative but weakly significant and small coefficient. At first glance this finding appears counterintuitive. However, it must be interpreted as follows. Due to historically high proportion of bad loans, Zambian banks have shied away from extending credit to a majority of Zambians, thereby shutting them out of the credit market. Instead, commercial banks have opted for much safer Treasury securities or accumulation of excess reserves (Oxford Policy Management, 2007). In view of this, the risk of default is much less, which means that the weight attached to the risk variable in driving market power is smaller. When banks have extended credit to the private sector, a majority of these banks (largely foreign owned) have employed robust screening techniques before loan disbursement. As a result, the ratio of NPLs to gross loans is smaller for this category of banks relative to say, public sector banks.[4] By pre-screening their customers, foreign owned banks are able to trade low risk for a small amount of rent. Therefore, the negative parameter estimate on the risk variable must be viewed in the context of the high level of risk aversion which characterises the Zambian banking sector.

As expected, the effect of regulatory capital $(CAPRATIO)$ is positive and statistically significant at 5 percent level. This means that well capitalised banks tend to exercise greater market power by virtue of their strength and reputation which manifests itself in capturing a large market share as these banks are deemed safer. In the context of the capital buffer theory, this result highlights the fact that banks build up capital to hedge against possible insolvency.[5]

Controlling for diversity in revenue sources, the study shows that banks with a greater proportion of other income (fees, commissions, foreign exchange gains, etc.) use this as a

[4] From the available data, of the three categories of banks, namely foreign owned, domestic private and public owned banks, the latter had the highest proportion of non-performing loans (NPLs) relative to gross loans. At an average of 34 percent of gross loans, NPLs for public banks was double that for domestic private banks (18 percent) because this group of banks was not strict in screening loan applicants. Therefore, public owned banks tended to load the risk of default and other charges on the loan rate, thereby intensifyng the degree of market power. Recall that soft budget guarantees also played a significant part in perpetuating exercise of market power by state owned banks. On the other hand, foreign owned banks which boast of better screening techniques had the lowest proportion of NPLs of only 6.8 percent. Therefore, it is clear to see that conservative lending, especially by subsidiaries of foreign banks, resulted in a much lower estimate of market power as Panel (d) of Figure Figure 11 illustrates.

[5] It is worth noting that the relationship between capital requirements and bank stability is a subject of ongoing debate, with no conclusive evidence on the direction of causality (Rochet, 1992).

device for perpetuating market power. The estimated parameter on $OITASS$ is positive and significant at 1 percent level. Therefore, we submit that including a measure of non-interest revenue in the market power regression helps address the important role other sources of income play in the Zambian banking sector. The same can be said about the effect of the TBR on the Lerner Index. Since Zambian banks have historically enjoyed buoyant revenues from investing in Treasury securities, this is captured by the coefficient on the TBR, which is positive and statistically significant.

The negative coefficient on the inflation variable $(INFLATION)$ indicates that banks operating under conditions of macroeconomic uncertainty tend to enjoy relatively less market power.[6] The main prediction from this analysis is that *ceteris paribus*, bringing down the rate of inflation and an improvement in the broad macroeconomic environment can create incentives for increased market power in the Zambian banking industry. Comparatively, Aboagye, et al. (2008) also found a negative impact of inflation on market power for Ghanaian banks.

The impact of deposit mix $(DEPMIX)$ on the Lerner Index was found to be negative and significant. This result shows that banks with easy recourse to interbank funds suffered a reduction in the relative mark-up. For such banks, short-term interbank borrowing constitutes a fundamental source of funding and raises the marginal cost of short-term funds, which feeds into a lower mark-up.

6. Conclusion

This study provides evidence on an important subject of banks' conduct in terms of pricing and cost decisions. The choice of methodological approach and the sample period allowed for estimating the bank-specific and time varying Lerner Index. This is important in assessing evolution and intensity of competition in the Zambian banking industry. Empirical results show that the average Lerner Index for the full sample was 50.9 percent, indicating that banks priced above marginal cost by more than 50.0 percent, indicating departure from both monopoly behaviour and perfect competition. Results also show that the Lerner Index

[6] An alternative predictor of macroeconomic conditions would be the gross domestic product (GDP). However, quarterly GDP data for Zambia are unavailable. Therefore, overall macroeconomic stance is proxied by the inflation rate on the premise that macroeconomic uncertainty is inimical to economic growth and therefore high inflation would reasonably approximate deterioration in economic conditions.

increased steadily from 1998 until 2001 after which it tapered off, suggesting a reduction in exercise of market power by Zambian banks.

The findings also indicate that state banks operated as a monopoly, mainly due to soft budgets, which sustained their market power by keeping costs artificially low. The easing of implicit guarantees and other operating incentives levelled the playing field somewhat, thereby narrowing the divergence in the price-cost mark-up between public sector banks and other bank subgroups. The estimates also reveal that domestic private and foreign owned banks exhibited similar degree of market power with the Lerner Index within range of the sample average. The paper established that bank-specific, structural and macroeconomic factors were all important in explaining banks' exercise of market power during the post reform period in the Zambian banking industry. Broadly, the results are in line with previous research, which suggests that banking competition in developing and emerging economies is low. However, relative to previous studies, our estimate of the Lerner Index suggests that Zambian banks exercised greater market power than banks in other countries. It is also worth noting that unlike previous research, the level of concentration was found to reinforce banks' exercise of market power, indicating that market dominance was influential in the banks' pricing behaviour.

Although the results suggest that banks' conduct was not characteristic of monopolistic behaviour, they also indicate a lower level of competitiveness in the Zambian banking system. Therefore, there is room for exploiting possibilities of strengthening the degree of competition in order to diminish the banks' exercise of market power. Thus, regulatory authorities should design measures aimed at creating further incentives for enhancing competitiveness in the banking sector. In particular, the regulatory authorities should endeavour to create an enabling environment for contestability in the banking industry, for example continuing with the open policy of allowing foreign as well as domestic bank entry into the sector. This will intensify competition and propagate efficiency gains across the banking market.

References

Aboagye, A. Q., Akoena, S., Antwi-Asare, T., & Gockel, A. (2008). 'Explaining the market power of Ghanaian banks'. *South African Journal of Economics , 76*, 569-585.

Angelini, P., & Cetorelli, N. (2003). 'The effects of regulatory reform on competition in the banking industry'. *Journal of Money, Credit and Banking , 35*, 663-684.

Appelbaum, E. (1982). 'The estimation of the degree of oligopoly power'. *Journal of Econometrics , 19*, 287-299.

Ausunbel, L. (1991). 'The failure of competition in the credit card market'. *American Economic Review , 81*, 50-81.

Beighley, P. H., & McCall, A. (1975). 'Market power and structure and bank installment lending'. *Journal of Money,Credit and Banking , 7*, 449-467.

Berg, A. S., & Kim, M. (1998). 'Banks as multioutput oligopolies: an empirical evaluation of the retail and corporate banking markets'. *Journal of Money,Credit and Banking , 30*, 135-153.

Bresnahan, T. F. (1989). 'Empirical studies of industries with market power'. In R. Schmalensee, & R. Willig (Eds.), *Handbook of Industrial Organization* (Vol. 2, pp. 1011-1057). Amsterdam: North-Holland.

Bresnahan, T. F. (1982). 'The oligopoly solution concept is identified'. *Economic Letters , 10*, 87-92.

Carbó Valverde, S., Humphrey, D., & Rodriguez, F. (2003). 'Deregulation, bank competition and regional growth'. *Regional Studies , 37*, 227-237.

Chirwa, E. W., & Mlachila, M. (2004). 'Financial reforms and interest rate spreads in the commercial banking system in Malawi'. *IMF Staff Papers , 51*, 96-122.

Coccorese, P. (2009). 'Market power in local banking monopolies'. *Journal of Banking & Finance , 33*, 1196-1210.

Corviosier, S., & Gropp, R. (2002). 'Bank concentration and retail interest rates'. *Journal of Banking and Finance , 26*, 2155-2189.

Cowling, K., & Waterson, M. (1976). 'Price-cost margins and market structure'. *Economica , 43*, 267-274.

Delis, D. M., Staikouras, K. C., & Varlagas, T. (2008). 'On the measurement of market power in the banking industry'. *Journal of Business Finance and Accounting , 35*, 1-25.

Dvořák, P. (2005). 'Rethinking the Monti-Klein model of banking industry: new insights about the separability of loans and deposits decisions'. *Discussion Paper No. 2005-138* . Centre for Economic Research and Graduate Education, CERGE-EI.

Fahrer, J., & Rohling, T. (1981). 'Some tests of competition in the Australian housing loan market'. *Australian Economic Papers , 33*, 107-119.

Fernandez de Guevara, J., & Maudos, J. (2007). 'Explanatory factors of market power in the banking system'. *The Manchester School , 75*, 275-296.

Fernandez de Guevara, J., Maudos, J., & Perez, F. (2005). 'Market power in European banking sectors'. *Journal of Financial Services Research , 27*, 109-137.

Fischer, K.-H., & Hempell, H. S. (2006). *'Regional markets, oligopoly and market power in banking'*. Retrieved August 2008, from teaching.coll.mpg.de/econwork/FischerHempell.pdf

Freixas, X., & Rochet, J. (1997). *'Microeconomics of banking'*. Cambridge: Massachusettes Institute of Technology (MIT) Press.

Green, W. H. (2003). *'Econometric Analysis'*. New Jersey: Prentice Hall.

Gropp, R., Sørensen, C. K., & Lichtenberger, J.-D. (2007). 'The dynamics of bank spreads and financial structure'. *Working Paper Series, No.714* . European Central Bank.

Hanan, T., & Liang, N. (1993). 'Inferring market power from times series data: the case of of the banking firm'. *International Journal of Industrial Organisation , 11*, 205-218.

Hoechle, D. (2007). 'Robust standard errors for panel regressions with cross-sectional dependence'. *Stata Journal , 7*, 281-312.

IMF and World Bank. (2002). *'Financial Sector Assessment Programme: Selected Financial Sector Issues'*. Washington D.C: International Monetary Fund/World Bank.

Jagtiani, J., & Khanthavit, A. (1996). 'Scale and scope economies at large banks: including off-balance sheet products and regulatory effects 1984-1991'. *Journal of Banking and Finance , 20*, 1271-1287.

Klein, M. (1971). 'A theory of the banking firm'. *Journal of Money,Credit and Banking , 7*, 205-218.

Kubo, K. (2006). 'The degree of competition in the Thai banking industry before and after the East Asian crisis'. *ASEAN Economic Bulletin , 23*, 325-340.

Lau, L. (1982). 'On identifying the degree of competitiveness from industry price and output data'. *Economics Letters , 10*, 93-99.

Lerner, A. (1934). 'The concept of monopoly and the measurement of monopoly power'. *Review of Economic Studies , 1*, 157-175.

Monti, M. (1972). 'Deposit, credit and interest rate determination under alternative bank objective functions'. In K. Shell, & P. G. Szego (Eds.), *Mathematical Methods in Invesment and Finance* (pp. 431-454). Amsterdam: North Holland.

Moore, W., & Craigwell, R. (2002). 'Market power and interest rate spreads in the Caribbean'. *International Review of Applied Economics , 16*, 391-405.

Mutoti, N. (2006). 'Monetary Policy Transmission in Zambia'. *Bank of Zambia Working Paper, No. WP/06/2006* . Bank of Zambia.

Okealaham, C. (2007). 'Estimating market power in the South African banking sector'. *International Review of Applied Economics , 21*, 665-689.

Oxford Policy Management. (2007). *'FinMark Trust: Supply side study of the inclusiveness of Zambia's Financial System'*. Lusaka: Government of Zambia (GRZ).

Rochet, J. (1992). 'Capital requirements and the behaviour of commercial banks'. *European Economic Review , 36* (5), 1137-1178.

Shaffer, S. (1993). 'A test of competition in Canadian banking'. *Journal of Money, Credit and Banking , 25*, 49-61.

Shaffer, S. (2001). 'Banking conduct before the European single banking licence: a cross country comparison'. *North American Journal of Economics and Finance , 12*, 79-104.

Sjöberg, P. (2006). 'Two essays on performance and growth in Swedish banking'. *Unpublished PhD Dissertation* . Department of Economics,Göteborg University.

Small, I. (1998). 'The cyclicality of mark-ups and profit margins: some evidence for manufacturing and services'. *Quarterly Bulletin* (August).

Solis, L., & Maudos, J. (2008). 'The social costs of bank marker power: evidence from Mexico'. *Journal of Comparative Economics , 36*, 467-488.

Stiglitz, J., & Weiss, A. (1981). 'Credit rationing in markets with imperfect information'. *American Economic Review , 71*, 393-410.

Toolsema, L. (2004). 'Monetary policy and market power in banking'. *Journal of Economics , 83*, 71-83.

Tovar, J. A., Jaramillo, C. R., & Hernandez, C. E. (2007). 'Risk, concentration and market power in the banking industry: evidence from the Colombian System (1997-2006)'. *Serie Documentos Cede, 2007-27* . Centro de Estudios sobre Desarrollo Económico.

Vera, L., Zambrano-Sequin, L., & Faust, A. (2007). 'The efficiency-stability trade-off:the case of high interest rate spreads in Venezuela'. *The Developing Economies , XLV*, 1-26.

World Bank. (2004). *'Zambia-Country Economic Memorandum: Policies for Growth and Diversification'*. Washington DC: World Bank.

Zellner, A. (1962). 'An efficient method of estimating seemingly unrelated regressions and tests of aggregation bias'. *Journal of the American Statistical Association , 57*, 348-368.