Deregulation, Market Power and Competition: An Empirical Investigation of the Zambian Banking Industry

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Abstract
One of the main objectives of financial sector reforms undertaken in Zambia in the early 1990s was to stimulate competition and efficiency in the commercial banking industry. Although some indicators depict improvements in the performance of banks, major weaknesses still remain in the industry. Bank interest spreads, fees and other charges have remained high, undermining intermediation and accessibility to banking services. Thus, despite many years after the reforms were initiated, competition in the banking sector remains low but rising. Using the Panzar-Rosse approach, this study exploits panel data techniques to estimate the degree of competition in the Zambian commercial banking industry in post-liberalisation period. The results show that Zambian banks earned their revenue under conditions of monopolistic competition. The results also show that the level of competition for interest revenue is more intense than for total income. Equally, foreign private banks exhibit a higher degree of competition than their domestic counterparts. However, the same is not true with large banks versus small banks. The former are more competitive than the latter. On regulatory distortions, well-capitalised banks appear to bear the brunt of regulatory burden than undercapitalised banks. These results have important policy implications in the design of second generation policy reforms aimed at deepening the degree of banking competition and promoting prudential regulations. Hence, future policy design should aim at dismantling structural and institutional impediments that have prevented banks from operating more competitively.

JEL classification: C33, **D43, G21**

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1 Introduction

There are a number of problems facing the banking industry in developing countries, including Zambia. The banking industry is characterized by high operating costs and dominance of few and relatively large foreign and public sector banks. In addition, the economic environment under which banks operate is unstable largely due to high and often volatile rate of inflation fuelled by persistent fiscal deficits. Institutionally, the enforcement of regulatory norms is often lacking, entailing that banks' deviant behaviour goes unpunished. Although substantial progress has been made in reducing inflation, and restructuring of public sector banks, including privatization, many problems remain and have tended to discourage competition in the banking industry.

Hence, despite the reforms, it has been observed that bank interest margins have remained high while financial intermediation continues to be low. A possible explanation is that despite financial liberalisation, banks have continued to ration credit at high interest rates in many developing and transition economies thereby resulting in wide margins and non-competitive conduct. Thus, some element of collusive behaviour has been observed even after financial liberalisation (Gruben & McComb, 2003).

In view of the above, there has been a growing interest to study of banking competition in developing countries, stemming largely from the need to evaluate the efficacy of financial sector reforms since they were initiated in the late 1980s to early 1990s. Given the dominance and importance of the banking industry in many developing countries, it is imperative that the market structure under which commercial banks operate is empirically assessed. Thus, taking a cue from developed countries, research in developing countries and emerging markets has focused attention on the degree of competitiveness and market power in banking. The rationale for this is that competition in banking, like in any industry, has important positive spinoffs for the economy in that it induces efficiency and improvement in quality of bank products and services. Competition can also enhance financial stability when high profits are used to enhance bank capital. On the other hand, competition in banking may also undermine

financial stability by promoting risk taking. Nonetheless, the dominant view is that competition is desirable and the perceived trade-off between competition and stability can be overcome by designing competitive friendly regulatory policy (Northcott, 2004; Resti, 1997).

This study investigates the degree of competition and market power in the Zambian commercial banking industry under a deregulated economic environment. For the Zambian banking industry, this is an important policy issue in view of the perceived shortcomings of the financial sector reforms. Hitherto, to our knowledge no empirical study has been conducted to assess the degree of competition in the Zambian commercial banking industry. Thus, the Zambian banking sector presents a fertile ground for this investigation. Of major importance in this study is the need to empirically respond to the continuing policy challenges and dilemmas presented by inconsistencies between expectations of policy reforms and observed evidence in the Zambian banking system. This is done by utilising a tested methodology based on sound theoretical foundations. Accordingly, the study is both timely and relevant to the present situation.

The rest of the paper is structured as follows. In the next section the performance of the banking industry is assessed against a backdrop of financial sector reforms and liberalization policies. Section three is a review some literature while section four discusses the methodological framework. In section five an empirical model is presented and section six presents and discusses the results. Section seven concludes.

2 Financial sector reforms and characteristics of the Zambian banking industry

Zambia undertook comprehensive economic reforms in the early 1990s, a significant component of which was financial liberalisation. Reform measures included liberalisation of interest rates, removal of restrictions on foreign exchange transactions, easing of banking restrictions and strengthening of the regulatory and supervisory framework. In addition, the central bank adopted indirect instruments of monetary policy and streamlined its operations, focussing more on price stability. Reforms also entailed restructuring the banking system. One of the main objectives of financial liberalisation was to remove operating obstacles in the banking sector in order to foster competition and efficiency so that banks could provide the much needed funds for private sector investment to support rapid and sustainable growth in the economy after many years of decline.

Prior to 1992, only three local private banks were in existence and commanded a smaller share of the market. Private foreign banks and government owned banks took up much of the market share. However, between 1992 and 1997 the structure of the banking industry changed significantly following financial liberalisation, due to the proliferation of more local private banks. A total of twelve new banks were licensed between 1992 and 1994. The entry of new local private banks introduced some level of competition especially on the deposit side of the market (Brownbridge & Gayi, 1999).

Simultaneously, however, a majority of them also engaged in risk lending, providing credit to retail traders with no track record of loan repayment. As a result, the majority of these banks experienced financial difficulties prompting the authorities to liquidate them within a short period. Between 1995 and 1998, six banks were liquidated. In order to prevent future crises, the central bank instituted tougher prudential regulatory requirements and restructured other banks to make them viable. Therefore, since 1999, only three banks have been closed down, two due to the failure to recapitalise and the other one had its operating licence revoked in 2001 due to imprudent banking conduct related to money laundering activities. By end 2006, the Zambian banking industry boasted six subsidiaries of foreign banks incorporated in Zambia, four local private sector banks, and three public sector banks (see Table 1). Public sector banks included one wholly owned by the Zambian government and two other foreign public banks.[1] For the size of the Zambian banking system, the number of foreign banks (both private and public) is relatively large to foster competition in the industry.

[1] The public sector banks comprised the Zambia National Commercial Bank (ZNBC) wholly owned by the state but it has been privatised and transfer of ownership was concluded in April 2007, a Chinese state bank and a joint venture between the governments of Zambia and India.

Table 1: Licensed Zambian commercial banks, end 2006

No.	Name of bank	Type of ownership
1	Barclays Bank	Foreign private
2	Standard Chartered Bank	Foreign private
3	Stanbic Bank	Foreign private
4	Citigroup	Foreign private
5	African banking corporation	Foreign private
6	Intermarket Banking Corporation	Foreign private
7	Zambia National Commercial Bank	Local Public
8	Indo-Zambia Bank	Joint (defined as foreign public)
9	Bank of China	Foreign public
10	Finance Bank	Local private
11	Investrust Bank Plc	Local private
12	First Alliance Bank	Local private
13	Cavmont Capital Bank	Local private

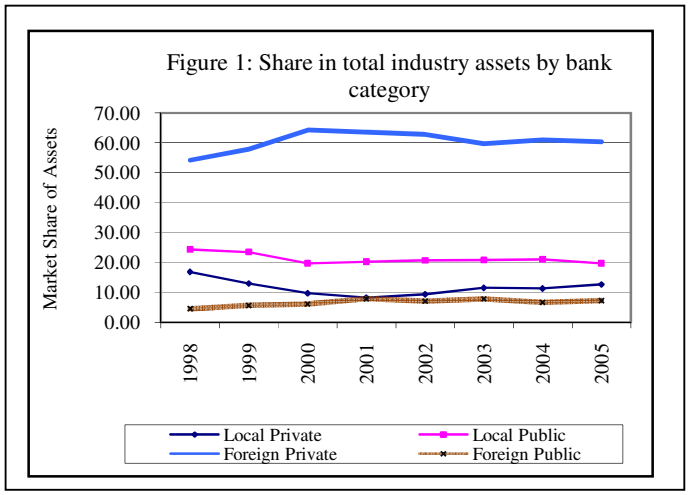
Source: Bank of Zambia

Literature shows that foreign bank presence in the domestic banking sector can lead to an increase in competition and efficiency (Claessens & Laeven, 2004; Gelos & Roldos, 2004; Green, Murinde, & Nikolov, 2004; Jayaratne & Strahan, 1998) and the benefits of entry of foreign banks are amplified by the process of financial liberalisation. Fries et al (2005) also argue that foreign bank entry into local banking markets can bolster the performance of the local banking industry by promoting lower marginal costs and enhanced demand for services, a feature reminiscent of higher competition. Thus, for developing countries in the process of financial sector reforms, foreign banks could stimulate greater efficiency, encourage competition and help lower costs in the host banking systems. However, in the case of Zambia, de Luna Martinez (2006) observes that despite the policies of open doors to foreign bank participation, existing foreign banks have not been able to widen the range of bank products offered to both households and firms. This may suggest that there is inadequate level of competition and innovation in the industry.

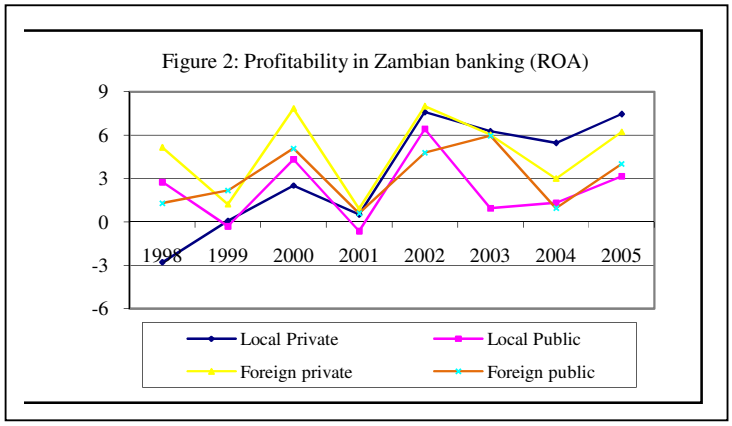
2.1 Stylised facts about the Zambian banking sector

A look at the performance of Zambian banks shows that foreign banks dominate the banking industry as gauged by a number of performance indicators. Figure 1 below gives a trend of assets held by different bank categories. As a proportion of total assets, the size of

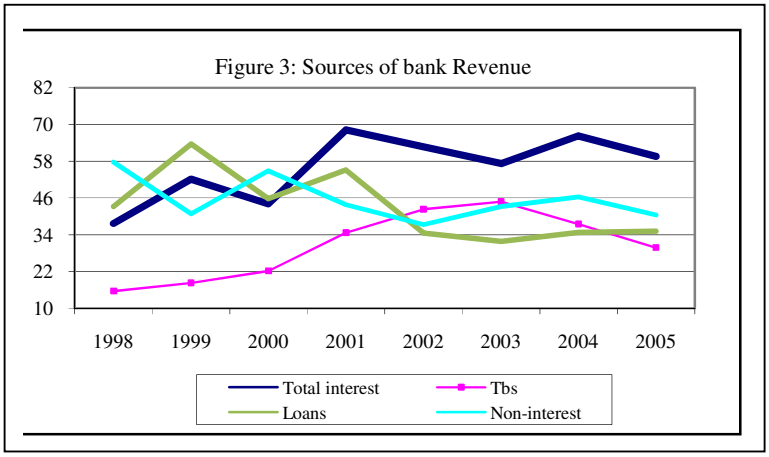
assets held by foreign private banks has been on the rise since 1998, showing persistent dominance of this submarket. In contrast, the share of assets of the public local bank has been on the decline in the latter part of the review period.



One possible explanation of this mismatch may be attributed to a resurgence of lending by private banks while the local public bank has had to cut its lending activities as preparations for privatisation intensified. The share of assets by the foreign public banks has little changed over this period, averaging less than 10 %. On the other hand, local private banks have seen a pickup in assets since the crisis of the 1990s, gaining marginally from about 10 % in 2002 to around 12 % in recent years. The uptake in level of assets by local private banks is reflected in increased profitability, earned mainly on the back of positive real returns on government securities and investment in foreign assets. Between 1998 and 2001, industry wide return on assets (ROA) averaged 3.7 %. This figure rose to 5.3 % between 2002 and 2005, reflecting strong growth in income. In particular, local private banks have recouped the loss in profitability since the banking crisis which dampened their earning opportunities as a result of flight to quality. Other bank categories recorded profitability slightly below the industry average, the exception being foreign private banks which recorded ROA of 5.8 % (see Figure 2 above).



For all bank categories, the main source of income has been interest income, largely from investment in government securities. Indeed, the Bank of Zambia reports that without earnings from government securities and foreign exchange operations, the majority of Zambian banks would have long been insolvent (Bank of Zambia, 2004). In 1998, interest income from securities as share of total interest income amounted to only 22.2 %. In 2002, it more than doubled to 50.8 %. However, in 2006, this figure dropped to 33.2 % mainly due to a fall in yields on securities arising from a reduction in government borrowing requirements beginning in 2005. In contrast, interest income on loans progressively declined before picking up in recent years due to growth in credit as yields on securities have become less attractive.



Interest income from loans as share of total interest revenue was 63.9 % in 1998 but fell to 40.7 % in 2002. However, this figure rose to 52.0 % in 2006 reflecting shift to credit extension in response to a reduction in yield rates on government securities. Indeed, Martinez (2006) reports that Barclays bank which is the largest lender only resumed making loans to the private sector in 2005 after a drastic fall in Treasury bill yield rates.

The strong profits reported by many banks are largely due to net interest margins (NIM) which by international comparisons are still wide. This reflects weaknesses in the industry as many banks have sought to cover the cost of their own inefficiencies and of non-performing loans. Large spreads have undermined financial intermediation and efficiency in the sector. For the industry as a whole, NIM more than doubled to 9.4 % in 2002/2005 period from 4.5 % over the 1998/2001 period. The local private and foreign private banks recorded the highest NIM, averaging 10.0 % between 2002 and 2005 in both cases. However, average NIM for the local public bank was 7.2 % between 2002 and 2005, more than double the amount posted during the 1998/2001 period. A possible explanation of such wide margins may be the instability in the macroeconomic environment under which Zambian banks have had to operate for many years. Zambian banks have also run large overhead costs. Both by

category and industry as a whole, non-interest expenses were more than three quarters of total costs. For many banks the bulk of these costs were employee expenses suggesting that there is room to capture efficiency gains by reducing labour expenses. Figure 4 below depicts the ratio of overheard costs to total expenses.

The Zambian banking industry is also underdeveloped. Relative to the Gross Domestic Product (GDP), total assets amounted to 35.8 % between 1998 and 2001. Between 2002 and 2005, this figure fell sharply to 26.7 %, depicting a decrease in financial development. The ratio of private sector credit to GDP amounted to only 8.0 % in 2005, virtually unchanged at 8.2 % recorded in 1990, thereby manifesting significant disintermediation in the sector, reforms notwithstanding. Low financial intermediation has been undermined by high levels of concentration in the Zambian banking sector. Table 2 below depicts the five bank concentration ratio (CR5) between 1998 and 2005 for assets, loans and deposits, respectively.

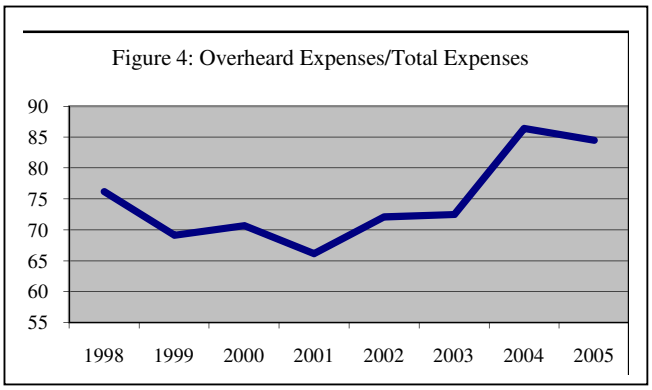
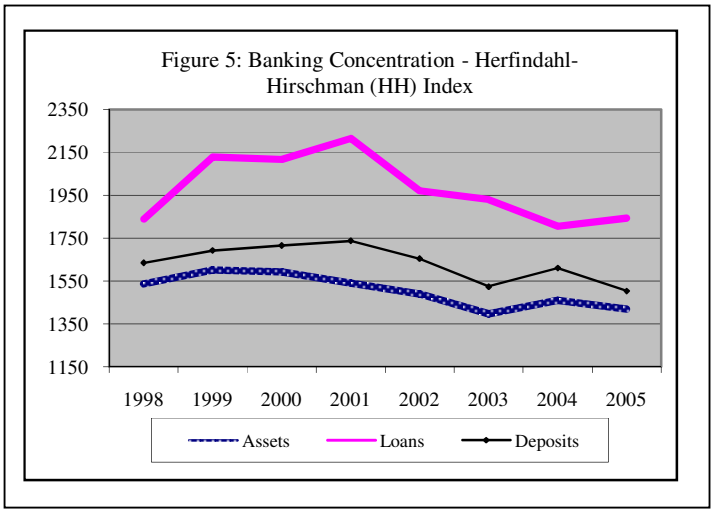


Table 2: **Concentration of assets, deposits and loans: Five bank concentration ratio, 1998 – 2005**

	Concentration Ratio (%)		
	Assets	**Deposits**	**Loans**
1998	80.6	83.4	87.8
1999	82.7	84.5	89.0
2000	85.4	86.3	91.9
2001	82.3	85.0	92.4
2002	80.2	84.8	83.7
2003	77.1	80.3	84.3
2004	79.4	82.3	85.5
2005	77.4	79.5	84.8
Average	**80.7**	**83.3**	**87.4**

Source: Bank of Zambia and author's calculations

From Table 2 it can be seen that the five largest banks accounted for over 80 % in all three segments of the industry. Over the entire period, the five largest banks held an average of 80.7 % of assets, 83.3 % of deposits and 87.4 % of loans. The Herfindahl-Hirschman (HH) index shows a similar pattern (see Figure 5). Clearly, these indices show the dominance of the small number of banks in the banking industry. Out of the five banks, four are subsidiaries of foreign banks and the other one is the local public bank. Thus, the relatively large number of foreign banks has not been reflected in improved competition, contrary to economic postulations. Such foreign bank dominance has led to the Zambian authorities to conclude that foreign private banks in the Zambian banking industry are an obstacle to the development of the sector (Bank of Zambia, 2004).



Unlike in emerging markets, the Zambian banking industry has not experienced any form of consolidation, whether market driven or government induced. It is therefore not clear from the figures in Table 3 if this concentration is evidence of efficient operations as propagated by the efficient-structure hypothesis or a general tendency towards non-competitive behaviour. Whilst we can not a priori determine the degree of competition using concentration ratios, these data can only be used as indicative. Both the CR5 ratio and the HH index depict a slight decline in concentration and market power, suggesting that competitive pressures may slowly be setting in. However, as argued above, these measures are only indicative of market structure and provide a crude analysis of competition in banking.

Thus, actual competition levels must be estimated to ascertain the degree of banking competition by analysing bank conduct with respect to revenue generation. Nonetheless, the observed high levels of concentration, wide margins and low intermediation may reflect ineffectiveness of financial reforms. In particular, these factors may be a reflection of structural problems specific to the sector but may also be due to macroeconomic instability

experienced over the years. Specifically, structural problems have resulted in banks charging high fees and commissions, making it difficult for the public to access financial services.

2.2 Motivation of Study

Studies on competition in banking markets spans at least four decades, yet it still remains a relevant subject of empirical enquiry. This is because a competitive and efficient banking system is assumed to make a contribution to economic growth by supplying more funds at lower costs, thereby enhancing capital formation necessary for growth (Pagano, 1993). Without doubt, a competitive banking system is a pre-requisite for providing the most basic intermediary and payment tasks in the economy. Therefore, studying competition in banking industry is particularly relevant for developing countries where reforms have been undertaken over the past decades with a view to foster competition in the banking sector.

From public policy perspective, banking competition and efficiency represent socially optimal targets, since they reduce the costs of financial intermediation leading to high quality service delivery on the part of banks, thereby enhancing consumers' social welfare. Hence, competition must be placed at the centre of any public policy agenda since it has the mechanism to respond to the dynamic changes in economic conditions, especially those that affect financial services delivery.

A common expectation from financial liberalisation policies is an increased degree of competition in the banking system. However, this reasoning is often at variance with practical observations, especially for less mature markets previously shielded from prudent risk assessment. Consequently, one observes large spreads emanating largely from a correction in pricing and costing of bank assets and liabilities. High intermediation costs tend to manifest managerial incompetence, ill qualified human resource and inadequate technology (Gruben & McComb, 2003).

In Zambia, several bottlenecks have been identified by both Government and international experts including the World Bank and International Monetary Fund (IMF) in their Financial Sector Assessment Programme (FSAP) conducted in 2002. The FSAP pointed out that there was no competition among Zambian banks and efficiency levels were low. To address this problem, some measures were proposed. They include, among others, privatisation of the public sector bank, reforms to the prudential regulatory framework and

the legal and judicial institutions to ensure that recovery of collateral is expedited, reduction in government borrowing requirements to free resources for private sector lending and achievement of macroeconomic stability.

In 2004, the Zambian Government launched the Financial Sector Development Programme (FSDP) blueprint in response to the challenges facing the financial sector. The FSDP report raised concerns about dominance of foreign banks, suggesting possible collusive behaviour. The report also noted that high service fees have hampered access to financial services by the broad section of society. In addition, the report identified wide interest rate spreads as major causes of low intermediation. The report also noted that the banks' assets were little diversified as shown by relatively high proportion of assets in Treasury bills and foreign currency deposits in off-shore financial institutions. It was suggested that these structural and institutional weaknesses serve as constraints to efficient operations of the banking system and they have undermined financial innovation and hence development of the industry. A recent study by FinMark Trust (2006) made similar conclusions.

Aryeetey *et al* (1994) argue that such weaknesses as highlighted above are evidence of deep rooted information and other structural problems, characteristic of undeveloped financial systems. The implication being that financial liberalisation measures may have placed too much emphasis on policy reforms ignoring structural impediments that obstruct banks to operate more competitively and efficiently. Indeed the benefits of removing institutional and structural impediments to fostering banking competition and enhancing efficiency are well established (Northcott, 2004).

That these weaknesses have remained after many years since reforms were initiated may suggest that financial liberalisation has failed to deliver on the expected results of promoting competition and efficiency and hence improvement in the performance of the banking sector [see also de Luna Martinez, (2006)]. The perceived shortcoming of reforms has attracted debate with critics questioning the efficacy of liberalisation policies. However, these criticisms are not supported by any empirical evidence. Accordingly, addressing these concerns requires an empirical evaluation of the effect of the reform programme on the performance of the banking industry. Although economic theory posits that liberalisation enhances banking competition and promotes efficiency, empirical evidence elsewhere has been mixed (Hauner & Peiris, 2005; Pasadilla & Milo, 2005; Drakos & Konstantinou, 2005).

3 Competition in banking – an overview of the literature

Two main approaches dominate the study of competition in banking – the structural and non-structural approaches. The structural approach draws significantly from traditional industrial organisation (IO) economics. The classic IO characterisation of banking competition indicates that there is a causal link running from bank market structure to conduct and performance, measured by the bank's pricing behaviour and profits (Northcott, 2004). The leading methodology of structural models is the so-called Structure-Conduct-Performance (SCP) paradigm initially proposed by Bain (1951).

Formal theoretical and empirical treatments of the SCP paradigm examine the effect of bank market structure and performance on interest rates on loans and deposits. The argument is that market power depicted by high concentration allows banks to charge higher loan rates and lower deposit rates, thereby reducing equilibrium quantities of funds available for credit (Pagano, 1993; Besanko & Thankor, 1992; Hannan, 1991b; Hannan, 1991a). The policy implication is that higher market concentration is associated with lower social welfare and, therefore, higher concentration is undesirable. However, the sources of differential levels of market concentration are left unexplained and this has been part of the reason the SCP paradigm has lost much of its appeal in modern banking literature.

An alternative theoretical proposition in the structural approaches is the efficiency structure hypothesis (ESH) due to Peltzman (1977) and Demsetz (1973), among others. Proponents of the ESH submit that there is a reverse causality between competition and concentration, suggesting that higher profits may be a result of efficient operations of banks with dominant market shares. Such banks may thus be exploiting greater X-efficiency.

Much of the empirical literature on the application of both the SCP paradigm and the ESH has been dominated by evidence from industrial countries. However, the statistical support for both explanations has been a source of controversy in the literature. The literature for developing countries is limited and also less conclusive (Mugume, 2007; Okealaham, 2004; Chirwa, 2003; Chirwa, 2001; Nannyonjo, 2002).

Critics of the structural models, and in particular the SCP paradigm, argue that the relationship between market structure and conduct and performance may not be monotonic (Jackson, 1997; 1992). A further observation is that structural characteristics may vary widely for markets exhibiting similar concentration ratios. Therefore, these factors tend to weaken the impact of concentration on commercial bank interest rates (Hannan, 1997; Rhoades,

1995). Recent evidence for European Union banking markets provides similar conclusions (Casu & Girardone, 2006). For an appreciation of this subject, Northcott (2004), Bikker & Haaf (2003) and Gilbert (1984) provide a good survey of the literature.

The general observation from the review of structural measures of competition in banking is that the evidence is inconclusive (Berger, 1995). This means that concentration on its own may not fully explain competitive behaviour in the banking industry, implying that the relationship between concentration and competition may not be a straightforward issue (Claessens & Laeven, 2004; Borenstein & Shepard, 2002).

The statistical failure of the structural measures of competition has been attributed in part to lack of a sound theoretical foundation of these models. Accordingly, attempts have been made to rescue the discussion on competition by providing theoretically robust explanations to the relationships between market structure and conduct in banking. To this end, non-structural approaches dubbed new empirical industrial organisation (NEIO) models have evolved. The NEIO models have attempted to offer an alternative and a theoretically sound foundation of competition among rival firms (Panzar & Rosse, 1987; Bresnahan, 1982; Lau, 1982; Iwata, 1974). Therefore, the NEIO models are seen as reconciling the observed ambiguity between theory and firms' behaviour by appealing to the models of oligopolistic markets in analysing industry competition (Cetorelli, 1999).

For the NIEO models, market concentration is not necessary to explain competition in the industry since competition can actually occur even in concentrated markets (Shaffer, 1994). Hence, as argued in the contestability literature (Baumol, 1982), the number of banks in the industry does not matter for competition. Rather, the driving force is the threat to entry defined by presence or absence of barriers, economic or legal.

The leading methodologies in the NEIO models are the Panzar-Rosse (P-R) methodology and the Bresnahan-Lau (B-L) approach. Both these models have been extensively applied to banking competition although mainly in industrial countries (Matthews, Murinde, & Zhao, 2007; Bikker & Haaf, 2002; Shaffer, 1993). The Iwata model is less common due to demanding data requirements. Although many of the studies have focussed on mature banking markets, in recent years as data have become readily available and economic reforms entrenched, there has been a growing application of the NEIO methodologies in developing countries and emerging markets given that the link between traditional measures of competition and market structure disappear with deregulation of the banking system (Bruno,

2003). Despite this interest, the evidence for sub-Saharan African (SSA) countries remains limited (Mugume, 2007; Hauner & Peiris, 2005; Buchs & Mathisen, 2005; Korsah & Nyarko, 2001).

The broad conclusion of NEIO models is that the banking industry is characterised by monopolistic competition although results exhibit low levels of consistency across countries. Possibly this inconsistency emanates from differences in economic, institutional and regulatory structures, with the implication that banks may respond differently to the opportunities and constraints presented by these forces. The depth of liberalisation policies may also account for these inconsistencies. In particular, results from cross-country studies must be taken with a pinch of salt since they tend to mask differences in economic conditions and the policy environment. Therefore, Gunji *et al* (2006) have cautioned against drawing blanket conclusions from previous studies and generalising them to other countries.

Banking competition can also be influenced by the type of ownership (foreign versus domestic) and size of banks (large versus small). This classification is of particular importance because banks' conduct and performance may be uniquely different depending on class of banks. For instance, smaller and domestic banks may not possess similar reputation as their foreign or large competitors. Accordingly, they may respond differently to challenges and opportunities defined by the environment in which they operate. Inevitably, this could potentially affect the level of competition they exhibit.

The conventional argument for foreign bank presence in local banking markets is that they infuse new technologies, promote competition and provide managerial expertise. Foreign banks also increase local banks' resilience to withstand shocks through peer pressure and learning by imitation. Also, the number of foreign banks alone may exert a greater influence on the degree of competition even when their market share is large. This means that despite high levels of concentration, foreign banks may spur competition in the banking industry (Uiboupin, 2004; Claessens, Demirgüc-Kunt, & Huizinga, 2001).

A counter argument is that foreign banks tend to crowd out smaller domestic private sector banks in the deposits and loans markets. Because of their financial clout and reputation, foreign banks mobilise deposits from large multinational corporations, thereby crowding out domestic banks. In the loans market, foreign banks also tend to lend to large firms without helping nurture the smaller ones. This leads to a reduction of total credit available to small and medium-size enterprises (Stiglitz, 1994). In the short-term, foreign

banks can also raise overhead costs for domestic banks and dampen their profitability as the latter seek to adopt new technologies and hire skilled personnel in order to amply compete with foreign banks (Claessens, Demirgüc-Kunt, & Huizinga, 2001).

With the exception of a few examples (Yuan, 2006; Staikouros & Koutsomanoli-Filipaki, 2006; Bikker & Haaf, 2002), many studies have not endeavoured to factor in the discriminatory effect of differences in bank sizes and type of ownership on banking competition. When such factors are taken into account, the evidence suggests that there are significant differences in the degree of competition between foreign and domestic banks and between large and small banks, respectively. However while this evidence may be illuminating, the economic structure of Asian and European markets upon which this result is based is markedly different from that obtaining in many SSA countries. Thus, it may be instructive to assess the nature of competition defined by different bank classes in the context of a post-crisis reforming African country and draw conclusions based on this analysis. This study is an attempt in this direction.

In Zambia, large foreign banks dominate the banking industry in both the loans and deposit markets and even by scale of operation defined by asset size (Martinez, 2006). This is because over the years, foreign banks have gained a substantial market share. The entry of new small foreign and domestic private banks has not helped limit the existing large banks' continued dominance. Recently therefore, concerns have been raised regarding foreign banks' dominant position in Zambian banking, noting that this may have dwarfed competition in the industry. Specifically, it has been alleged that large and mainly privately owned foreign banks have failed to influence changes in the banking sector with regard to promoting competitive behaviour through, for instance, reduction in interest margins and collusive behaviour.

4 Methodological framework: the Panzar – Rosse approach

Given that the banking industry is one of the most regulated industries, the issue of competition has occupied the minds of most economists. In this section of the essay, competition in Zambian banking is measured by the Panzar-Rosse (P–R) methodology based on the reduced form revenue equation. The main appeal of the P–R model is its strong

theoretical foundation (Bikker & Haaf, 2002) and can be applied to a small sample size, making it suitable for the Zambian banking industry.

The analytical framework of the P–R model is based on the structural revenue and cost relationship facing a particular banking firm i as follows:

$$R_i = R_i(q_i, n, \Psi) \quad (1)$$

$$C_i = C_i(q_i, w_j, \Omega) \quad (2)$$

where

$R_i =$ an appropriate measure of bank revenue of bank i

$C_i =$ total (financial and operating) costs of bank i

$q_i =$ output of bank i

$n =$ number of banks in the industry

$w_j =$ price of factor input j

$\Psi =$ vector of exogenous factors shifting the firm's revenue function, including risk factors, scale of operation, etc.

$\Omega =$ vector of exogenous factors shifting the firm's cost function, for example regulatory burden and other cost distortions, etc

The Panzar-Rosse approach is predicated on a number of assumptions, one of which is profit maximisation. Accordingly, profits are expressed as a difference between total revenues and total economic costs, as given in Equation (3) below:

$$\pi_i = R_i(q_i, n, \Psi) - C_i(q_i, w_j, \Omega) \quad (3)$$

The profit maximisation condition requires that marginal revenue (MR) equal to marginal cost (MC), regardless of the market structure. Therefore, by taking first partial derivatives of Equation (3) with respect to output and equating the result to zero yields the profit maximising conditions of marginal revenue equals to marginal cost as in Equation (4):

$$\frac{\partial R_i}{\partial q_i} - \frac{\partial C_i}{\partial q_i} = 0 \quad (4)$$

Solving for q_i yields the profit maximising equilibrium level of output, q_i^* defined in general terms as:

$$q_i^* = q_i^*(w_j, \mathrm{n}^*, \Psi, \Omega) \tag{5}$$

Substituting Equation (5) into Equation (1) the reduced form revenue function becomes:

$$R_i^* = R_i^*[q_i^*(w_j, \Psi, \Omega), \mathrm{n}^*, \Psi] = R_i^*(w_j, \mathrm{n}^*, \Psi, \Omega) \tag{6}$$

It can be seen from Equation (6) that in equilibrium, the revenue of the bank is a function of factor prices and exogenous variables including regulatory and institutional factors while the number of firms are assumed to be in steady state. It follows therefore that the number of firms does not impact on the equilibrium revenue. Under the Panzar-Rosse approach, market power is measured by the extent to which a change in factor input prices is reflected in the equilibrium revenue earned by a bank. Accordingly, from the reduced form equation, the sum of revenue elasticities with respect to the firm's factor input prices is the H-statistic used to determine the degree of competition (market power) in the banking industry (Panzar & Rosse, 1987).[2] Algebraically, it reads as follows

$$H = \sum_{j=1}^{S} \left(\frac{\partial R^*}{\partial w_j} \frac{w_j}{R^*} \right), \quad j = 1, 2, \ldots\ldots\ldots\ldots S \tag{7}$$

where $j = 1, 2, \ldots\ldots\ldots\ldots S$ is the number of factor inputs used in the bank's production process.

From the H-statistic, different market structures can be identified based on the sign and magnitude of the competitive index. When $H \leq 0$ the market is monopolistic implying that an increase in input prices increases marginal cost, reducing the equilibrium output and hence revenue. Consequently, the sum of revenue elasticities is negative. Under perfect competition an increase in factor prices leads to a proportionate increase in marginal cost and since zero equilibrium profits are assumed marginal revenue equals marginal cost. Accordingly, there is

[2]For formal derivation of the H-statistic, see Panzar and Rosse (1987).

no change in the equilibrium level of output and consequently $H = 1$. Monopolistic competition is defined by intermediate values of the H-statistic $(0 < H < 1)$. Intuitively, an increase in factor input prices raises a bank's marginal cost and hence revenue, but less than proportionately.

From these postulations, it means that the Panzar-Rosse methodology exploits the proposition that pricing reactions to changes in input prices determine the market structure in which banks operate. It is important to point out that both the sign and magnitude of the H-statistic depict the degree of competition in the banking industry (Panzar & Rosse, 1987). Therefore, a higher H-statistic would indicate increasing competitiveness. Another important postulate of the P-R approach is that banks must be in long-run equilibrium for the above market structures to hold. Table 3 below gives summary interpretations of the market structure and equilibrium conditions defined by the H-statistic.

Table 3: Interpretation of the Panzar-Rosse H-statistic

Value of H-statistic	**Market Structure Characterisation**
$H \leq 0$	Monopoly or conjectural variations short-term oligopoly. In this case each bank operates independently as under monopoly profit maximising conditions and the H-statistic is a decreasing function of the perceived demand elasticity.
$0 < H < 1$	Monopolistic competition characterised by free entry equilibrium excess capacity. The H-statistic is an increasing function of the perceived demand elasticity.
$H = 1$	Perfect competition, or natural monopoly in a perfect contestable market, or sales maximising firm subject to break even constraint. It could imply free entry equilibrium with full (efficient) capacity utilisation.
Market equilibrium test	
$H = 0$	Equilibrium
$H \leq 0$	Disequilibrium

In transition countries, the assumption of long-run equilibrium may be difficult to sustain because these countries are still in the adjustment process although it may not be untenable for developed economies (Mktrtchyan, 2005; Northcott, 2004). However, given the internal logic of the model, it is best to think of equilibrium as a steady state, reflecting adjustment to shocks (Buchs & Mathisen, 2005). With reference to the Zambian banking industry, long-run equilibrium may imply that since the banking crisis of the mid-1990s and subsequent restructuring, the banking sector has attained a reasonable level of stability (implied steady state). Therefore, over time there may have been no further incentive for many banks to

continue to price their products and services below marginal cost in order to gain market share. These and related factors place the industry in what may be characterised as some sort of long-run equilibrium. Accordingly, Zambian banks may be seen as readily able to absorb the effect of exogenous shocks. For this argument to be sustained one would think of compliance with regulatory capital requirements and adoption of international best accounting standards and other regulatory norms as indicators of the equilibrium state. Nonetheless, the assumption of long-run equilibrium must be empirically tested rather than imposed arbitrarily. This issue is addressed in the empirical section of this essay.

5 Econometric Estimation and Data Description

For purposes of econometric estimation, the reduced from revenue equation is specified below.

$$\ln(REV_{it}) = \alpha_0 + \beta_1 \ln(ULC_{it}) + \beta_2 \ln(UCF_{it}) + \beta_2 \ln(UCC_{it}) + \delta \ln(STATRES_{it}) + \\ + \rho \ln(CAPRATIO_{it}) + \theta \ln(LOANASST_{it}) + \sum_{m=1}^{3} \zeta_m \ln(MACRO_t) + \epsilon_{it} \qquad (8)$$

where ln is a natural logarithm operator,i denotes bank, t is time period (in quarters), $m = 1, 2, 3$ represent a vector of three macroeconomic variables defined below, REV is a measure of bank revenue, ULC, UCF and UCC denote unit labour costs, unit cost of funds and unit cost of capital, respectively while ϵ_{it} is a disturbance term specified as a one-way error component model of the form:

$$\epsilon_{it} = \mu_i + \nu_{it}, \quad i = 1, \ldots\ldots\ldots, N, t = 1, \ldots\ldots\ldots\ldots, T$$

where μ_i is a bank specific effect and ν_{it} is assumed to be white noise, $T = 36$ quarters (1998q1-2006q4) and $\alpha, \beta_1, \beta_2, \beta_3, \delta, \rho, \theta, \zeta$ are parameters to be estimated. From Equation (8), the competitiveness index is measured by the sum of the revenue elasticities with respect to input factor prices given by $H = \beta_1 + \beta_2 + \beta_3$.

Banks operate within a framework that imposes additional costs upon their operations due to institutional and regulatory factors. These costs have implications for bank

performance and behaviour and must be incorporated in the revenue equation to reflect banks' overall goal of profit. In a theoretical formulation of the standard Panzar-Rosse model, such effects are not reflected. Therefore, such costs as regulatory burden or distortions must be accounted for in the empirical estimation. Failure to do so may result in a potentially misspecified regression.

Given that Zambian banks have to contend with the cost of different regulatory requirements, two variables capturing important prudential regulatory requirements are included. In Zambia, bank reserve requirements do not attract interest. Rather than serve as a regulatory standard to enhance safety of the banking system, reserve requirements have the propensity to limit banks' independent behaviour and hence curtail competitiveness in the industry.[3] This is because they create compelling pressures that force banks to move in tandem and for banks that deviate, a penalty is imposed, yet independent action is the hallmark of competition (Telser, 2007). Hence, banks incur an opportunity cost by complying with reserve requirements because funds placed in the reserve account at the central bank can be used to acquire interest earning assets. Accordingly, to try and capture the effect of the implicit cost of statutory reserve requirements on banks' revenue, a variable $STATRES,$ is included.

Banks are also required by law to hold a certain amount of capital as a proportion of risk-weighted assets defined under the Basle Accord. Since the majority of banks thrive by engaging in risk lending, minimum capital requirements serve to ensure that banks have sufficient capital buffer to cover liabilities in an event of a bank closure. However, higher capital requirements could potentially endanger competitiveness. Thus, to capture the impact of costly regulatory capital requirements on competition, we include the capital adequacy ratio($CAPRATIO$). This variable also serves as an indirect measure of risk taking in banking.

To directly investigate how overall portfolio credit risk affects banks' revenue and by extension competitiveness, a variable $LOANSSET$, defined as ratio of total loans to total assets, is also included. Aside from bank-specific variables, macroeconomic factors and government financing requirements through issuance of debt have a long-standing role to

[3] Reserve requirements are imposed and adjusted on occasion, mainly as a monetary policy tool than for prudential regulatory purposes. As a prudential regulatory requirement, they complement but not supersede equity and capital requirements.

play in the Zambian banking sector. To investigate this impact, three variables jointly termed $MACRO$ common to all banks are also included.

To test empirically for the long-run equilibrium condition, Equation (9) below is estimated with the natural logarithm of the return on assets, $\ln(ROA)$, as the dependent variable while retaining all the explanatory variables specified in Equation (8) above. This is because in long-run equilibrium, rates of return should not be correlated with input prices, that is, $H = 0$ (Shaffer, 1983). Since ROA can potentially be negative on occasion, it is adjusted by a factor of one for convenience. The long-run specification reads thus:

$$\ln(ROA_{it}) = \alpha_0 + \beta_1 \ln(ULC_{it}) + \beta_2 \ln(UCF_{it}) + \beta_2 \ln(UCC_{it}) + \delta \ln(STATRES_{it}) + \\ + \rho \ln(CAPRATIO_{it}) + \theta \ln(LOANASST_{it}) + \sum_{m=1}^{3} \zeta_m \ln(MACRO_t) + \epsilon_{it} \quad (9)$$

5.1 Sample and data

To capture correctly the degree of competition and market power in the banking system, we include all commercial banks that have been operating in Zambia between 1998 and 2006, inclusive. The year 1998 marks the beginning of the restructuring process and strengthening of the prudential regulatory framework in the wake of the banking crisis during the early years of deregulation. Since 1998, some key microeconomic reforms have been implemented whilst macroeconomic reforms and financial deregulation policies continued side by side. Furthermore, over the sample period, a few banks closed down and some new ones opened up, including one merger. In our estimation, closed banks are excluded from the analysis but estimations allow for new banks. For the merged banks, the data are reported separately for each bank before the merger and subsequently, the merged bank enters as a single institution.

Therefore the study exploits an unbalanced quarterly panel sample constructed using a rich database gleaned from the banks' balance sheet and profit and loss account monthly returns to the Bank of Zambia. An advantage with panel estimation over cross-section analysis is that it enables the researcher to combine time series and cross sectional data in order to account for unobservable individual bank-specific effects. Therefore it has great flexibility in modelling differences in behaviour across individual sample units (Green, 2003).

5.2 Description and measurement of variables

In the regression equation, the dependent variable is each bank's measure of revenue[4]. Previous studies have considered both scaled revenue (revenue-to-assets ratio) and unscaled revenue measures. Thus, although Bikker *et al* (2006) posit that using the ratio of revenue to assets leads to a misspecification of the P-R model, our study uses scaled revenue measures. Buchs & Mathisen (2005) have argued that for Ghana, the evidence shows a strong effect for the scaled revenue measure than the unscaled one.

Due to lack of data on the number of employees for all the banks in the sample, the unit labour cost (ULC) is approximated by the ratio of personnel expenses to total assets. Similarly, the unit funding cost (UFC) is measured as the ratio of total interest expenses to total deposits and other borrowed funds. Finally, unit cost of capital (UCC) is derived as the ratio of all other expenses to total fixed and other assets. These measures are consistent with the extant literature where banks are modelled as intermediaries that use labour, funds and capital to produce loans, securities and other investments.

Since banks respond differently to challenges presented by portfolio credit risk, a ratio of total loans to total assets ($LOANSSET$) is used to reflect bank specific risk factors. The coefficient on $LOANSSET$ is expected to be positive since a higher proportion of loans relative to assets implies greater revenue. Implicitly, this variable could also be capturing scale effects. In some studies, equity and loan loss provisions have been used to capture credit risk. Broadly, the results based on these alternative risk measures are qualitatively similar.

A priori, the sign on statutory reserve requirement ($STATRES$) is expected to be negative. A higher statutory reserve ratio translates into a larger amount of unremunerated funds sitting idle at the central bank, depicting a higher opportunity cost of funds. Hence, higher interest forgone reduces the amount of revenue the bank can earn if such reserves were remunerated. The coefficient on $(CAPRATIO)$ is ambiguous ex-ante, depending on whether a higher capital requirement leads to higher or lower bank revenues. To the extent that this variable has distortionary regulatory effects, bank revenue may decline. On the other hand, if

[4] Total revenue and interest income are each estimated and results reported. Where necessary, a regression for non-interest income is also estimated for comparative purposes.

such distortions are absent, say because banks engage is risk lending and hence earn a higher return, this could lead to higher revenue. Data on all bank-specific factors have been collected from banks' monthly returns to the Bank of Zambia.

In addition to bank specific factors, we include some macroeconomic factors-inflation(INF) and the exchange rate (EXR) to capture differential effects of policy stance and uncertainty on bank revenue. Also included is the 91-day Treasury bill yield rate (TBR) to account for the co-dependence between government domestic borrowing requirement and banking sector performance. Specifically for the TBR, the majority of commercial banks benchmark their base lending rate to this rate. Inevitably, an appropriate measure of banking competition in Zambia should reflect the effect of this variable. The data on the rate of inflation, exchange rate and the Treasury bill rate were collected from various central bank publications. Table 4 below gives a summary of descriptive statistics of variables used in the regressions.

Table 4: Sample descriptive statistics

	Mean	Standard deviation	Minimum	Maximum
Total assets (K'mn)	333094.1	406250.3	4788	1747298
Fixed assets (K'mn)	10618.01	14491.92	39.33	73294.33
Fixed and other assets (K'mn)	28460.16	34610.86	114	160740
Total deposits (K'mn)	235679.6	309899.2	0	1376719
Loans-assets ratio (%)	25.727	16.639	0.0196	87.288
Statutory reserves (K'mn)	16320.38	24130.82	5.93	115550.8
Capital adequacy ratio (%)	6.807	5.574	0.766	10.000
Interest revenue (K'mn)	3775.14	4280.01	33.22	18163
o/w interest on loans	1845.43	2575.76	1	11724.67
o/w interest on securities	1505.34	1784.68	-41	11218.33
Non-interest income (K'mn)[1]	2098.945	2664.85	-1036	13960.33
Total revenue (K'mn)	5910.24	6782.08	-305.66	32123.33
Return on assets, ROA (%)	0.51	0.74	-5.3	6.15
Unit labour cost	0.01	0	0	0.03
Unit cost of funds	0.01	0.12	0	2.67
Unit cost of capital	0.12	0.41	0.01	5.78
Inflation (% per annum)	20.8	5.89	8.2	30.6
Exchange rate (ZK/US Dollar)	3647.1	1024.63	1541.15	4845.73
91-Treasury bill yield rate	27.01	12.54	5.5	53.4

Source: Bank of Zambia, Own calculations
[1]Fees, commissions, foreign exchange transactions (gains/losses)

6 Empirical Results of the Panzar-Rosse Approach

This section presents and discusses findings of the Panzar-Rosse methodology estimated using panel analysis based on reduced form revenue regressions. From these estimations, the H-statistic is calculated from total and interest income regressions in order to provide measurements of competition in the Zambian commercial banking industry. However, before actual empirical results are presented; some underlying econometric issues are discussed in the next sub-section.

6.1 Econometric issues

Given the unbalanced nature of the panel, several econometric issues arise. In order to evaluate competition in the Zambian commercial banking industry, some specification tests were conducted. First, although banks may be modelled as potentially heterogeneous cross-sectional units, estimations are conducted assuming homogeneity. This approach is justified on the assumption that parameters are homogenous across banks. Furthermore, Baltagi *et al* (2003) argue that when the sample period is short, homogenous panel estimation may be a more preferred approach to heterogeneous panel estimation.

Another issue concerns what estimation approach to use between pooled analysis, fixed effects and/or random effects. The choice of the appropriate methodology is based on the specification test employed. To choose between fixed effects and pooled estimation, the likelihood ratio (LR) test was used and the Bruesch-Pagan Lagrange Multiplier (LM) test was conducted to assess whether the model must be estimated by random effects or pooled analysis, while the Hausman test was used to choose between fixed and random effects. In all the specifications, pooled analysis was rejected at conventional significance levels. In a majority of specifications, the Hausman test urges use of fixed effects estimation. Accordingly, in order to account for unobserved factors, the empirical evidence reported is based on the fixed effects estimation throughout the section.[5]

[5] In a few specifications, the Hausman statistic is indeterminate. Under these instances, a fixed effects specification is estimated and reported.

6.2 Empirical results

In this section, the benchmark model is estimated with the ratio of total revenue to total assets (TREVASST) as the dependent variable. Using the total revenue equation as the core specification ensures that a comprehensive measure of the degree of competition for all banking services (traditional and non-traditional) is captured, since total revenue includes both interest and non-interest income. Thus it is consistent with the proposition that for survival, banks have to aggressively contend with each other in both lines of business. In order to provide robustness check to the benchmark model, an interest revenue equation is also estimated.

Since the model specification corrects for responses to regulatory intensity by individual banks, it would be anticipated that differences in the degree of competition between different classes of banks could emanate largely from managerial expertise and access to technology and other unobserved unique bank characteristics. This aspect is buttressed, for instance, by the claim that large foreign banks have hampered the development of the Zambian banking sector, while continued public ownership of the Zambia National Commercial Bank (ZNCB) dwarfed competition in the industry.[6]

In perfectly competitive markets, delayed changes in the pricing of banking products and services may bias downwards the estimates for the competitiveness index. To correct for this potential bias, Drakos & Konstantinou (2005) suggest conditioning the estimation of the H-statistic on the maturity structure of bank assets. In Zambia, however, this issue may be of little consequence given that most banks operate at the shorter-end of the market meaning that the maturity structure is reasonably uniform across a large spectrum of banks. Thus, the H-statistic is not expected to be significantly influenced by the maturity structure of assets. Even if this were a major problem, detailed data for such maturity structure is absent in the banks' balance sheets. Accordingly, the results reported below do not specifically address this conditioning effect.

[6] The privatization of ZNCB was finally concluded in April 2007.

6.2.1 Estimating industry wide competitiveness index

This subsection reports empirical estimates of banking competition for all banks in the sample. In doing this, the level of competition is estimated by analysing the degree of market power depicted by the H-statistic calculated using both total and interest revenue for the full sample.

6.2.1.1 Total revenue specification

To assess the intensity of competition for the entire banking system, the canonical model with total income as the dependent variable is estimated. As noted earlier, the H-statistic estimated from the total revenue regression provides a more comprehensive measure of market power in banking. Fixed-effects regression results based on total operating income are given in Panel I of Table 5 below.

Earlier it was noted that regulatory requirements impose costs upon banks. These costs have implications on banks' conduct and competition in the sense that they could interact with other real resource costs. To directly assess if such regulatory distortions affect the degree of competition in Zambian banking, each of the unit factor costs has been interacted with a capital regulation requirement dummy variable, $CAPDUM$. Using a threshold value of 10 % for the Tier I capital-asset ratio we separate banks with lower capital requirements (less than 10 %) from those with high capitalisation (10 %).[7] Consequently, for the 10 % ratio the dummy variable carries a value of one, and below 10 % ratio, a value of zero. The essence of this analysis is to directly isolate the impact of regulatory burden on banking competition when estimating the H-statistic. Thus, from this specification we obtain a modified H-statistic calculated as a sum of elasticities on unit factor costs and coefficients on interactions of unit factor costs and $CAPDUM$.

[7] Zambian banks are subjected to a 10 % capital-asset ratio in contrast to the 8 % recommended under the Basle Accord. The higher capital ratio is meant to provide cushion to lenders in an event of a bank facing insolvency.

Table 5: Competitiveness in the Zambian commercial banking industry (all banks)

Dependent variable: Log of Total Revenue/Total Assets (ln(TREVASST)) - Fixed effects

	PANEL I				PANEL II			
	Coefficient	Robust Std. Err.	t-statistic	p-value	Coefficient	Robust Std. Err.	t-statistic	p-value
Intercept	-1.157	0.717	-1.610	0.129	-0.952	-1.350	-1.350	0.199
ln(ULC)	0.320	0.058	5.550	0.000***	0.393	3.020	3.020	0.009***
ln(UFC)	0.211	0.032	6.510	0.000***	0.139	3.620	3.620	0.003***
ln(UCC)	0.121	0.034	3.600	0.000***	0.130	4.630	4.630	0.000***
CAPULC	-	-	-	-	-0.090	-0.920	-0.920	0.37
CAPUFC	-	-	-	-	0.096	2.710	2.710	0.017***
CAPUCC	-	-	-	-	-0.035	-0.400	-0.400	0.69
ln(STATRES)	-0.108	0.017	-6.280	0.000***	-0.129	-5.380	-5.380	0.000***
ln(CAPRATIO)	-0.061	0.050	-1.210	0.25	-0.035	-0.710	-0.710	0.49
ln(LOANSSET)	0.063	0.028	2.270	0.040**	0.062	2.260	2.260	0.040**
ln(INFL)	-0.176	0.057	-3.080	0.008***	-0.214	-2.910	-2.910	0.011***
ln(EXR)	0.221	0.096	2.310	0.037**	0.231	2.130	2.130	0.051**
ln(TBR)	0.027	0.022	1.250	0.23	0.025	1.020	1.020	0.32
H-statistic	**0.652**				**0.634**			
Null: H=0	158.25				74.77			
p-value	0.000***	Reject Monopoly			0.000***	Reject Monopoly		
Null: H=1	45.14				19.47			
p-value	0.000***	Reject Perfect Competition			0.001***	Reject Perfect Competition		
Market Structure	**Monopolistic Competition**				**Monopolistic Competition**			
Diagnostics								
σ_u	0.345				0.376			
σ_e	0.251				0.248			
ρ	0.653				0.696			
R^2	0.379				0.336			
No. of Obs	448				450			
F-statistic	133.95				8332.6			
p-value	0.000***				0.000***			
Hausman test	17.500				179.92			
p-value	0.041***				0.000***			
Normality tests								
Shapiro-Wilk W-statistic	0.982				0.982			
p-value	0.000***				0.000***			
Skewness-Kurtosis	13.710				13.400			
p-value	0.001***				0.001***			

Source: Bank of Zambia and author's estimations

Significance level: *** 1 %, ** 5 % and * 10 %

Accordingly, $CAPULC$, $CAPUFC$ and $CAPUCC$ denote interactions between $CAPDUM$ and ULC, UFC and UCC, respectively. Directly modelling regulatory intensity in banking revenue equation is aimed at providing an accurate understanding of how unit costs may be affected by the burden imposed by capital regulation requirements. Panel II of Table 5 presents results of the specification adjusted for distortionary (cost) effects of banking regulation on the H-statistic. Estimates of the H-statistic from Panels I and II are then compared to see if capital requirements impose any discernible cost on the banks' intermediation functions due to regulatory burden. Implicit in this approach is that banks build up capital buffers to secure reputation for safety but this comes at a cost which may augment real resource costs. Therefore, ex post, intermediation costs should be high, reflecting significant costs in raising capital up to the regulatory threshold. Hence all coefficients on interaction terms are expected to be positive.

As Table 5 above shows, for both specifications, most diagnostic tests point to well-specified models. The results suggest that the data fit the model reasonably well with the goodness of fit of 38 % (Panel I) and 34 % (Panel II), not uncommon for panel data estimations. The test for model adequacy as given by the overall F-statistic is also robust in both cases. Furthermore, the null hypothesis of non-normality of residuals is rejected at 1 % significance level using the Shapiro – Wilk (Shapiro & Wilk, 1965) W-statistic and the alternative Skewness-Kurtosis statistic. Following Hoechle (2007) and Green (2003) the regressions were estimated with robust standard errors in order to correct for groupwise heteroscedasticity and cross-sectional correlation in panels.

From both specifications, all input prices perform well, and are of a correct sign and significant at 1 %. Intuitively, this implies that factor prices are important for Zambian banks in the pricing of bank products and services. Accordingly, this result justifies the choice of the intermediation approach in modelling bank behaviour by incorporating all cost elements – financial as well as real resource costs (Swank, 1996; Baltensperger, 1980). The results also suggest that by magnitude, funding and labour costs rank highly in determining banking competition. This finding confirms results in previous studies. Equally, the relatively small coefficient on the unit cost of capital is not unexpected (Yuan, 2006). For most Zambian banks, this could mean that capital expenses are initially higher but relatively stable over time owing to the fixed nature of equipment and buildings. Consequently, it is not unusual that in

the longer term, the impact of capital factor costs should be smaller relative to other more variable costs.

As indicator of bank-specific risk the loans-assets ratio is also significant at 1 % and carries a positive sign, denoting that risky assets attract a higher return and hence generate more revenue. In addition, the impact of reserve requirements on bank revenue is negative as expected, positing that the more is maintained in regulatory reserves, the less remains for loans and the higher the interest forgone. Accordingly, revenue decreases. However, it is difficult to separate the effect of minimum regulatory capital requirements on revenue. In both specifications, the sign is negative and insignificant. This finding would imply that bank capital ratios dampen revenue although this effect is non-robust.

Apart from assessing the effect of bank-specific factors in driving bank revenue and by extension, competitiveness, three variables capturing the impact of macroeconomic factors are also evaluated. Both the rate of inflation and exchange rate are significantly different from zero and correctly signed. The intuition is that persistently higher inflation erodes banks' nominal revenues. Conversely, since banks generate a significant portion of non-interest income from foreign exchange operations, it could be the case that a depreciation in the local currency translates into higher foreign exchange gains and hence revenue. The result reinforces claims that income from foreign exchange transactions and fees and/or commissions has helped most Zambian banks stay profitable (Bank of Zambia, 2004). On the other hand, the insignificant coefficient on the 91-day Treasury bill rate reflects a weaker fiscal dimension on banks' revenue and hence competitiveness. This result is incompatible with prior expectations in view of the apparent co-dependence between government and the banking sector. It is also surprising because most banks benchmark their base lending rate to the Treasury bill rate.

The conflicting results of these macroeconomic factors have also been noted in some previous work. Although our study corroborates findings by Buchs & Mathisen (2005) on the effect of the rate of inflation for Ghanaian banks, Yuan (2006) and Hauner & Peiris (2005) found an insignificant inflation effect for Chinese and Ugandan banks, respectively. However, Buchs & Mathisen (2005) also found a positive and significant Treasury bill rate effects, contrary to our findings.

In the P-R approach, the parameter of interest is the H-statistic, which determines the market structure under which Zambian banks operated during the sample period. For the

standard reduced revenue equation (Panel I), the estimated H-statistic is 0.65 and based on the Wald-statistic which follows an F distribution, this value is significantly different from zero and unity at 1 %, thereby rejecting the hypotheses of monopoly and perfect competition. Since this value lies between zero and one, it means that Zambian banks earned their income under conditions of monopolistic competition. The intuition is that for the entire banking market, individual banks have the ability to exercise significant degree of market power. Particularly, this may be driven by technological differences enjoyed by some banks and by branding and quality of service provided. Together, these factors also suggest that monopolistic competition is the dominant market structure for the Zambian commercial banking sector.

Results of the regression with a measure of regulatory cost (Panel II) do not show a significant dampening effect of capital regulatory requirements on competition in the Zambian banking industry. The degree of banking competition depicted by the regulation adjusted H-statistic is 0.63 against the unadjusted competitiveness index of 0.65, posits that higher capital requirements have the potential to increase bank market power, albeit marginally. The marginal decrease is due to negative albeit insignificant coefficients on $CAPULC$ and $CAPUCC$. However, the results mark out an important effect induced by capital regulatory ratio on unit funding costs. Specifically, the significantly positive interaction between the regulatory dummy and funding costs imply that well-capitalised banks incur significant regulatory costs and these are reflected in higher unit funding expenses. This could mean that for well-capitalised banks, meeting the threshold 10 % capital requirement attracts costs that also augment funding costs by approximately 10 percentage points relative to undercapitalised banks.

One reason for this may be that since depositors are often concerned about the safety of their deposits, banks tend to build up capital buffers and maintain loyal customers by offering them attractive terms, including payment of deposit rates above the sample average rate. This translates into nominally higher funding costs, as observed. Deducing from this, it can be argued that bank prudential regulations are obviously beneficial to depositors and the economy as a whole in terms of financial stability, but at the same time have implications for bank profitability as well, in so far as funding costs form a significant part of bank expenses. It must be noted that in undertaking further prudential regulatory reforms, authorities must be alert to the potential adverse effects that regulations could impose upon banking competition.

Regarding the measure of competition, these results are arguably comparable with global estimates as well as results for some sub-Saharan African countries with similar market structures, institutional and regulatory characteristics. For example, the estimated H-statistic for Ghanaian banks by Buchs & Mathisen (2005), was broadly in line with the estimates suggested in this paper. Also, the degree of competition in the Zambian banking industry does not significantly depart from the competitiveness index reported for advanced and emerging economies (Drakos & Konstantinou, 2005; Gelos & Roldos, 2004; Bikker & Haaf, 2002). However, estimates for Ugandan banks (Mugume, 2007; Hauner & Peiris, 2005) and South Asian banking markets as shown by Perera *et al* (2006) suggest a somewhat smaller H-statistic than the evidence adduced in our study. This implies that Zambian banks exhibit a slightly higher degree of competitiveness than those in Uganda and South Asia. Suffice to say, such differences could be attributed to economic conditions and mode of bank ownership. They could also be underpinned by progress made in microeconomic financial sector reforms and restructuring and how these impact on banking competition.

6.2.1.2 Interest revenue regressions

The canonical model for total revenue provides an analysis of banking competition more comprehensively and the result showed that the Zambian banking industry was characterised by monopolistic competition as the dominant market structure. To get a further insight into the degree of competition at a disaggregated level we consider estimates based on traditional banking activities. Therefore, this section reports the H-statistic estimated from an interest revenue equation. This specification sets apart the significance of interest revenue from that of non-interest income and ensures that banks' competitiveness is assessed from the perspective of the banks' core business.

The results help address the question of whether the degree of competition obtained from total operating income which also includes fees and commission based products differs substantially from the interest based banking markets, and by analogy, if these non-interest fee income sources account for the observed differences. Although the Hausman specification test urges estimating with random effects (RE), results of the RE model are insignificantly different from those obtained by fixed effects (FE). Given the superiority of the FE in accounting for unobserved bank specific factors, a fixed effects model was preferred in this regard. Table 6 below reports the results.

Table 6: Interest and non-interest income competitiveness estimations

	Dependent variable								
	ln(INTRASST)						ln(NINTRASST)		
	Panel I(a)			Panel I(b)			Panel II		
	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value
Intercept	-3.148	-3.730	0.002***	-3.129	-4.070	0.001***	0.889	0.670	0.512
ln(ULC)	0.304	5.150	0.000***	0.411	4.220	0.001***	0.459	4.380	0.001***
ln(UFC)	0.323	7.100	0.000***	0.301	4.930	0.000***	0.116	2.870	0.012***
ln(UCC)	0.038	0.740	0.469	-0.003	-0.060	0.956	0.146	3.960	0.001***
CAPULC	-	-	-	-0.109	-1.890	0.080*	-	-	-
CAPUFC	-	-	-	0.006	0.110	0.913	-	-	-
CAPUCC	-	-	-	0.104	1.120	0.281	-	-	-
ln(STATRES)	-0.039	-1.010	0.329	-0.072	-1.860	0.084*	-0.188	-5.720	0.000***
ln(CAPRATIO)	-0.061	-1.120	0.283	-0.046	-0.880	0.392	-0.099	-1.050	0.310
ln(LOANSSET)	0.071	1.360	0.195	0.067	1.420	0.178	0.045	1.320	0.208
ln(INFL)	-0.188	-1.950	0.072*	-0.217	-2.590	0.022**	-0.218	-2.460	0.027**
ln(EXR)	0.353	2.390	0.032**	0.405	2.730	0.016**	0.003	0.020	0.098
ln(TBR)	0.070	1.860	0.083*	0.094	2.560	0.023**	-0.041	-1.060	0.309
H-statistic	**0.665**			**0.711**			**0.721**		
H=0	117.980			67.220			108.940		
p-value	0.000***	Reject Monopoly		0.000***	Reject Monopoly		0.000***	Reject Monopoly	
H=1	30.010			11.300			16.310		
p-value	0.000***	Reject Perfect Competition		0.005***	Reject Perfect Competition		0.001***	Reject Perfect Competition	
Market Structure		**Monopolistic Competition**			**Monopolistic Competition**			**Monopolistic Competition**	
Diagnostics									
Hausman Test (χ^2 Wald-statistic)	8.140			-			-		
p-value	0.520			-			-		
σ_u	0.343			0.322			0.401		
σ_e	0.251			0.247			0.386		
ρ	0.650			0.631			0.631		
R^2	0.501			0.543			0.316		
No. of Obs	450			450			443		
F-statistic (9,14)	74.18			943.94			409.94		
p-value	0.000***			0.000***			0.000***		
Normality Tests									
Shapiro-Wilk W-statistic	0.991			0.988			0.965		
p-value	0.000***			0.000***			0.001***		
Skewness-Kurtosis	8.100			11.410			21.770		
p-value	0.017***			0.001***			0.000***		

Source: Bank of Zambia and author's estimations
Significance level: *** 1 %, ** 5 % and * 10 %
ln(INTRASST) - Log of Total Interest Revenue/Total Assets
ln(NINTRASST) - Log of Fees and Commisions based Revenue/Total Assets

As with total revenue, interest revenue regression was conducted with and without the regulatory dummy interactions to assess the robustness of the competitiveness index to regulatory intensity (Panel II). In Panel I(a) of Table 6, we note that with the exception of the unit cost of capital, input factor costs are positive and highly significant at 1 %. However, in contrast to previous estimates of the total income equation, none of the two regulatory variables (statutory reserves and capital asset ratio) is significant. A similar result is observed for the risk measure, ln(LOANSSET) which is also insignificant even though it is positive. This could be due to the noise implicit in the model, emanating from the effect of interest earned on securities, which may not be responsive to risk factors.[8] The implication is that contemporaneously, regulatory and risk factors have negligible influence in banks' interest revenue. These results are puzzling and counterintuitive. On the other hand, the Treasury bill rate emerges significant and positively robust, a key result which was absent in the total revenue estimations. This result partially explains the insignificance of $LOANASST$ since, as mentioned in footnote 8, interest income from securities forms a significant share (27.1 %) of total interest income. The significance of other macroeconomic factors is also noted.[9]

Regarding the competitiveness index, again monopolistic competition emerges as the dominant market structure and significantly so at 1 % with the H-statistic estimated at 0.67 compared with 0.65 for the total revenue equation. In Panel I(b), the regulation adjusted H-statistic is 0.71, significantly higher than the unadjusted one. Accounting for this relatively higher degree of competition is the coefficient on labour cost, up by 0.11 percentage points and the positive coefficient on the interaction of the dummy variable and capital and funding costs, respectively, although neither is significant.

Relative to estimates in Panel I(a), individual estimates in Panel I(b) perform better. Unit labour and funding costs are significant at 1 %, the statutory reserves impact enters significantly and all macroeconomic variables are of the correct sign and significantly different from zero at 5 %. Nonetheless, the interaction term on labour costs is negative but significantly different from zero only at 10 %.

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[8] For a number of banks, interest earned from investment in securities commands a large proportion of total interest. Therefore if the securities interest dominates loans interest, the significance of loans-asset ratio as a measure of credit risk may be smaller and possibly non-existent.

[9] As a cross check, random effects regression results are reported in the appendix, and based on key diagnostic tests, there is no significant difference between the random and fixed effects model. The H-statistic too is the same for both regressions. However, for the macroeconomic factors, only the Treasury bill rate is significantly different from zero. In addition, both regulatory variables and loan-asset ratio risk measure remain insignificant with random effects.

In comparison with results obtained using total income, the H-statistic calculated from an interest income specification in Panel I(a) of Table 6 is marginally higher than that for total interest income, Panel I of Table 5. This finding is consistent with estimates reported in some previous studies in which the degree of competition is greater with interest revenue than with total revenue (Mugume, 2007; Perera, Skully, & Wickramanayake, 2006; Prasad & Ghosh, 2005). A possible explanation for this may be that in the total interest equation, non-interest income from fee – and commission – based banking market segment has a counteracting effect, thereby subduing the intensity of banking competition measured by total operating income.[10] However, as the results of the non-interest revenue equation (Panel II) suggest, competition in this segment of the banking market is equally intense. This implies that in view of the restructuring process in post-crisis period there has been an accelerated degree of catching-up with international trends towards fee – and commission – based income. On the other hand, contrary to total interest estimation results, the positive and highly significant coefficient for the Treasury bill rate in all regressions manifests the banks' reliance on government borrowing for their performance. Indeed it is posited that some banks have a deliberate strategy to hold a significant share of assets in government debt than in loans, both as an inflation hedge and as a buffer against expected high default risk on loans.

6.2.2 Bank ownership and competition

This section presents results on banking competition of foreign banks vis-à-vis their domestic counterparts with the H-statistic estimated for each class of banks. Since foreign banks do not face any special regulatory requirements separate from those suffered by domestic competitors, it would be expected that differences in the degree of competitiveness stems largely from unobservable characteristics defined by type of ownership, for example, managerial ingenuity and expertise in generating revenue and cost rationalisation.[11] As in the previous analyses, these estimations are conducted for total operating income as well as interest revenue. Table 7 below reports the regression results and the accompanying H-statistic for total revenue as well as interest revenue for each class of banks.

[10] To specifically test for the robustness of this possibility, a separate regression for fee and commission based income was estimated. However, contrary to our view, the Wald-statistic suggests that competition in this segment of the market is actually high with the H-statistic calculated to be 0.72 (see Panel II of Table 6)

[11] Domestic banks here include Zambia national commercial bank, which until April 2007 was wholly owned by the Zambian government.

Table 7: Bank ownership and competitiveness in Zambian banking

	Foreign Banks						Local Banks					
	ln(TREVASST)			ln(INTRASST)			ln(TREVASST)			ln(INTRASST)		
	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value
Intercept	-1.215	-1.140	0.292	-2.258	-2.170	0.066*	-1.259	-1.200	0.276	-4.684	-3.930	0.008***
ln(ULC)	0.361	5.610	0.001***	0.305	4.560	0.003***	0.260	2.210	0.069)	0.322	2.520	0.045**
ln(UFC)	0.207	4.120	0.004***	0.369	9.810	0.000***	0.206	7.100	0.000***	0.202	3.460	0.013***
ln(UCC)	0.110	2.500	0.041**	-0.035	-0.910	0.393	0.128	1.160	0.289	0.130	0.940	0.385
ln(STATRES)	-0.116	-5.860	0.001***	0.000	0.000	0.998	-0.104	-1.860	0.113	-0.102	-1.260	0.256
ln(CAPRATIO)	-0.062	-0.700	0.505	-0.016	-0.240	0.817	-0.066	-1.410	0.208	-0.026	-0.420	0.686
ln(LOANSSET)	0.071	1.230	0.257	-0.029	-0.730	0.488	0.060	1.580	0.165	0.134	2.100	0.080***
ln(INFL)	-0.223	-2.020	0.083*	-0.130	-1.190	0.273	-0.118	-1.720	0.136	-0.160	-1.580	0.165
ln(EXR)	0.266	1.710	0.131	0.183	1.180	0.276	0.176	1.700	0.140	0.581	2.480	0.048**
ln(TBR)	0.043	1.250	0.251	0.049	1.560	0.164	0.023	0.450	0.672	0.067	0.800	0.453
H-statistic	**0.678**			**0.640**			**0.594**			**0.654**		
Null: H=0	196.000			112.900			11.770			10.250		
p-value	0.008***			0.000***			0.014***			0.019***		
Null: H=1	44.090			35.840			5.520			2.870		
p-value	0.000***			0.001***			0.057*			0.141		
Market Structure	**Monopolistic Competition**			**Monopolistic Competition**			**Monopolistic Competition**			**Perfect Competition**		
Diagnostics												
R^2	0.258			0.512			0.621			0.510		
No. of Obs	253			254			195			196		
F-statistic	98.900			18.130			45.270			7.640		
p-value	0.008***			0.001***			0.000***			0.013***		
Hausman test	32.190			34.160			Inconclusive[a]			Inconclusive[a]		
p-value	0.000***			0.000***			0.000***			0.011***		
Normality tests												
Shapiro-Wilk W-statistic	0.981			0.988			0.984			0.985		
p-value	0.000***			0.001***			0.000***			0.000***		
Skewness-Kurtosis	13.750			11.510			12.310			11.550		
p-value	0.001***			0.003***			0.002***			0.003***		

Source: Bank of Zambia and author's estimations

Significance level: *** 1 %, ** 5 % and * 10 %

ln(TREVASST) - Log of Total Revenue/Total Assets

ln(INTRASST) - Log of Interest Revenue/Total Assets

[a] Hausman test is negative, making it inconclusive. Nonetheless, in order to model unobserved effects, a fixed effects model is preferred.

The results in Table 7 indicate that broadly, foreign banks appear to be competing more aggressively than domestic banks. In the total income specification the fixed effects regression results show that the estimated H-statistic for foreign banks is 0.68 against 0.59 for domestic banks. These results indicate that monopolistic competition is the dominant market structure, consistent with findings for the full sample. On the other hand, analysis with interest income does not show a significant difference between foreign and local banks, with the H-statistic for the former group estimated at 0.64, marginally lower than the domestic banks' competitiveness index of 0.65. However, for domestic banks, the statistical test shows that monopolistic competition cannot be rejected only at 15 % but this is a strange result given that the H −statistic falls within the zero-unit range. This finding may be due to other unaccounted factors.

Furthermore, for the domestic banks sample, the regression results based on total income are non-robust since only the funding price is significantly different from zero and of correct sign. Inflation is also robust for bank revenue but only at 10 %. In contrast, results for foreign banks are plausible and key variables are significant. However, for bank-specific factors, only reserve requirements appear important, the capital adequacy ratio and bank portfolio risk less so. While foreign banks perform better with respect to total income, the opposite is the case for interest revenue. In this segment of the market, domestic banks outperform foreign peers in terms of significance of individual coefficients. This probably explains the marginally higher degree of competitiveness among domestic banks.

In general terms, the higher degree of competition for foreign banks relative to domestic banks when estimated from total operating income is in keeping with empirical evidence in previous studies. From a regulatory policy perspective, this evidence casts doubt on allegations that the dominant presence of foreign banks has undermined competition in the Zambian banking industry. This means that contrary to popular belief, the perceived leadership role attributed to foreign banks does not seem to be supported by empirical evidence. This argument is supported by the near equivalence of competitiveness between foreign and domestic banks, notwithstanding the less robust estimates in the interest income specification for the latter group of banks.

6.2.3 Bank size class and market power

A key determining factor in bank performance and competition is the size of the bank measured by its value of assets. Using the Zambian regulatory authorities' classification of

banks, we decompose them broadly as small and large banks, depending on the proportion of the bank's assets relative to the industry. A bank is defined as large if its share of assets in total industry assets is at least 9.0 %. Based on this, five large banks are identified, accounting for over 80.0 % of the industry's assets with mean asset ratio of 16.3 %. Among the larger banks, one was a public sector bank accounting for about a fifth of the industry assets. The remainder are foreign banks. Collectively, small banks with an asset ratio below 9.0 % (mean 2.2 %) accounted for just less than 19.0 % of total industry assets. Small banks are dominated by the domestic private sector banks and there is a great dispersion of assets around the mean.

A priori, larger banks are expected to manifest stronger competition than their smaller counterparts. In this section we report results of estimations conducted for each class of banks in order to get an in-depth analysis of market power attributed to size. These results are reported in Table 8 below. For comparative purposes, these estimations are conducted only for total income and interest income, both as share of total assets.

From Table 8 all estimations indicate that regardless of bank size, monopoly and perfect competition are once again overwhelmingly rejected at conventional significance levels. These findings reinforce earlier results for the full sample that banks earn their income (both composite and from traditional banking activities) under conditions of monopolistic competition. An important observation from these results is that for both income measures, smaller banks exhibit a higher degree of competition than larger banks. This evidence is shown by the relatively larger H-statistic of 0.66 for smaller banks against 0.59 for larger banks obtained with the total revenue ratio. Equally, when interest income ratio is used, smaller banks depict slightly higher degree of competition with the H-statistic of 0.67 relative to 0.66 for large banks.

A further observation is that competition for small banks increases less dramatically as we move from total income to interest revenue specification. The opposite is observed for large banks, which show a marked increase in the degree of competition, significantly higher for interest revenue than for total revenue. This finding might be as a consequence of stronger competition by large banks in pricing loans, suggesting that for this category of banks interest income probably remains the most dominant source of revenue.

Table 8: Bank size and degree of competitiveness

	Large Banks						Small Banks					
	ln(TREVASST)			ln(INTRASST)			ln(TREVASST)			ln(INTRASST)		
	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value	Coefficient	t-statistic	p-value
Intercept	-1.045	-0.960	0.391	-3.640	-4.020	0.016***	-2.085	-2.980	0.015***	-3.740	-3.630	0.005***
ln(ULC)	0.307	3.400	0.027**	0.321	4.460	0.011***	0.342	3.900	0.004***	0.314	3.930	0.003***
ln(UFC)	0.238	4.550	0.010***	0.285	4.240	0.013***	0.198	6.180	0.000***	0.338	5.720	0.000***
ln(UCC)	0.047	0.500	0.642	0.050	0.910	0.414	0.117	4.540	0.001***	0.015	0.210	0.835
ln(STATRES)	-0.193	-4.250	0.013***	-0.211	-3.770	0.02**	-0.092	-3.740	0.005***	-0.009	-0.310	0.761
ln(CAPRATIO)	-0.112	-6.530	0.003***	-0.145	-2.580	0.061*	0.011	0.150	0.886	0.003	0.050	0.959
ln(LOANSSET)	0.143	2.550	0.063*	0.182	2.730	0.052**	0.039	0.870	0.407	0.028	0.550	0.594
ln(INFL)	-0.223	-2.350	0.079*	-0.293	-2.440	0.071*	-0.186	-2.180	0.057*	-0.218	-1.400	0.195
ln(EXR)	0.367	2.920	0.043**	0.698	3.010	0.04**	0.313	1.870	0.094*	0.396	2.390	0.041**
ln(TBR)	-0.026	-0.680	0.532	0.029	0.600	0.579	0.029	0.760	0.469	0.075	1.430	0.187
H-statistic	**0.592**			**0.656**			**0.656**			**0.667**		
Null: H=0	23.440			31.110			90.930			83.750		
p-value	0.008***			0.005***			0.000***			0.000***		
Null: H=1	11.130			8.570			24.910			20.830		
p-value	0.029**			0.043***			0.000***			0.001***		
Market Structure	**Monopolistic Competition**			**Monopolistic Competition**			**Monopolistic Competition**			**Monopolistic Competition**		
Diagnostics												
R^2				0.380			0.402			0.582		
No. of Obs	174			174			274			276		
F-statistic	6.30			6.980			200.670			219.450		
p-value	0.051**			0.043***			0.000***			0.000***		
Hausman test	253.060			597.840			115.310			21.340		
p-value	0.000***			0.000***			0.000***			0.011***		
Normality tests												
Shapiro-Wilk W-statistic	0.982			0.981			0.976			0.990		
p-value	0.000***			0.000***			0.000***			0.004***		
Skewness-Kurtosis	11.710			15.710			18.240			10.000		
p-value	0.003***			0.001***			0.001***			0.007***		

Source: Bank of Zambia and author's estimations
Significance level: *** 1 %, ** 5 % and * 10 %
ln(TREVASST) - Log of Total Revenue/Total Assets
ln(INTRASST) - Log of Interest Revenue/Total Assets

The observed difference in the level of competition in favour of small banks for both total and interest income is at odds with prior expectations and with results of other studies. In previous studies that have modelled competition for different classes of banks, the dominant view is that large banks exhibit more intense competition than smaller banks, both by aggregate income and interest income (Staikouros & Koutsomanoli-Filipaki, 2006; Yuan, 2006; Bikker & Haaf, 2002). However, it must be stressed that these studies compare large and small banks in more mature banking markets where many large banks have a significant international presence. For the Zambian industry, parent company effects play minimal influence in determining bank behaviour given that large as well as small banks are incorporated under Zambian law.

Statistically, all models are well behaved with coefficients carrying correct signs for key variables. With the exception of the cost of capital, factor input prices have positive signs and broadly significant at minimum of 5 %. Only in the total revenue specification is the cost of capital significant at 1 %. As in previous estimations labour and funding costs contribute the most to the calculation of the H-statistic. In relative terms, specifications for large banks have more significant coefficients for bank-specific and macro factors.

For example, the coefficient on statutory reserve requirements is significant and with a correct negative sign. However, it is only significant and negative in total income specification for small banks. In contrast, large banks elicit negative response to increases in capital requirements while small banks react positively. This could suggest that a build up of capital for small banks translates into higher revenue while it serves as a cost to large banks.

Since most well-capitalised banks are also the large banks, this finding is robust to earlier evidence for the full sample that in maintaining a 10 % capital requirement threshold, well-capitalised banks incur some costs, which may dampen revenue generation and accordingly, impede competition in the industry.[12] On the other hand, revenue for undercapitalized small banks moves in tandem with capital requirements, positing that smaller banks may also be using some of their revenue to build up capital in order to catch-up with their large counterparts. The risk measure is consistently positive in all specifications, although only significant for large banks. This result is not unexpected. It was argued above that large banks appear more competitive with respect to interest income. It follows that to be competitive,

[12] Recent evidence by Schaeck & Čihák (2007) suggests a reverse causality that banks tend to hold higher capital ratios in intensely competitive banking environment.

banks become more aggressive in the granting and pricing of loans where the bulk of their interest is earned and therefore have larger loan risk exposures which in theory should attract high return and hence more revenue. This explains the consistently positive coefficient on $LOANASST$, the proxy for overall credit risk.

On the efficacy of macroeconomic factors, we note that the TBR is insignificant in all specifications. Again this finding is puzzling given the close link between the government sector and the banking industry. However, it may be explained by the fact that the TBR may be endogenous to the functioning of the banking sector. The rate of inflation is negative, as postulated and significant at 10 % except in interest revenue specification for small banks. Exchange rate effects also come out significant and positive in all specifications further reinforcing initial results obtained for the full sample.

6.2.4 Long-run equilibrium in banking

An important precondition for validity of the estimated market structure in the Panzar-Rosse approach is the assumption of long-run equilibrium in banking. In order to assess whether the results conform to this assumption, long-run equilibrium test was conducted by using return on assets as the dependent variable while retaining all right hand independent variables as in the revenue estimates. As argued above, for long-run equilibrium to hold, a bank's returns should not be correlated with input prices. Table 9 below reports results for the test of the long-run equilibrium condition. Using the Wald test, which is premised on the F-distribution, equilibrium in Zambian banking cannot be rejected at 5 %. The result is supported by the insignificance of the unit factor prices at conventional levels. Accordingly, the non-rejection of the long-run equilibrium condition attests to the fact that the reduced form revenue equations adequately capture competitive conditions in the Zambian banking industry. This means that the strengthening of the institutional and regulatory framework in the post crisis period has reshaped the environment in which banks operate. By and large, liberalisation policies aimed at improving the performance of the banking industry are engendering competitive conditions in the banking industry although the process is gradual.

Table 9: Long-run equilibrium test – all banks sample

	Dependent variable (ln(ROA))		
	Coefficient	t-statistic	p-value
Intercept	-1.773	-1.600	0.109
ln(ULC)	-0.031	-0.440	0.657
ln(UFC)	0.030	0.750	0.456
ln(UCC)	-0.041	-0.910	0.363
ln(STATRES)	-0.159	-3.740	0.000***
ln(CAPRATIO)	-0.178	-3.820	0.000***
ln(LOANSSET)	0.106	1.510	0.132
ln(INFL)	-0.344	-3.420	0.001***
ln(EXR)	0.509	2.800	0.005***
ln(TBR)	0.070	1.480	0.139
H-statistic		**-0.042**	
Null hypothesis: H=0		Equilirium	
$\chi^2(1)$		0.350	
p-value		0.557	Fail to reject
Market in long-run equilibrium			
Diagnostics			
R^2		0.027	
No. of Obs		443	
F-statistic		5.370	
p-value		0.000***	
Hausman test		26.370	
p-value		0.002***	
Reject Null of Random effects			
Normality tests			
Shapiro-Wilk W-statistic		0.990	
p-value		0.005***	
Skewness-Kurtosis		7.470	
p-value		0.024***	

Source: Bank of Zambia and author's estimations
Significance level: *** 1 %, ** 5 % and * 10 %
ln(ROA) - Log of Return on Assets (Profit before tax/Total assets)

7 Summary and conclusions

This study has addressed an important subject in the context of financial sector reforms implemented in Zambia since the early 1990s. Specifically, the study has investigated the degree of competition in the Zambian banking industry during the post-reform period. Using detailed bank-level panel data, the estimation draws on previous research by applying a model anchored in the theory of New Empirical Industrial Organisation literature. Accordingly, a reduced form revenue equation based on the Panzar-Rosse methodology is estimated, both for total income and interest revenue. The interactive effect of regulatory

burden on factor costs is also considered. This specification provides a significant improvement over previous studies in this genre of work because it enables us to obtain a modified H −statistic and compare it with that calculated from standard models.

Key findings are that Zambian banks earned their income under conditions of monopolistic competition. The H − statistic derived from the interest income specification is greater than that obtained with total income suggesting that commercial banks still regard traditional banking activities as important. On the other hand, results with regulatory intensity interaction terms only show a weak impact. Nonetheless, larger and well-capitalised banks appear to be captive to regulatory distortions and this cost is reflected in higher funding costs. To provide further robustness checks, estimations have also been conducted with respect to bank ownership and size. Estimates for bank ownership indicate that foreign banks compete more intensely than domestic banks, supporting evidence obtained from previous studies. Conversely, smaller banks appear more competitive than larger banks when total revenue is used. Considering interest income, large banks compete more strongly against each other. This may suggest that core business remains the main focus for large banks.

The results presented in preceding sections offer an opportunity to re-evaluate the policy environment under which Zambian banks operate. Specifically, they indicate that second generation reforms must aim at streamlining regulatory framework in order to further deepen competition in the banking industry. All in all, the results obtained in this paper are comparable to previous estimates. Where differences appear, these must be seen in the context of differing economic conditions and structural features defined by local conditions.

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