Competition & Banking Sector Soundness: Empirical Evidence on Jamaican Data

Sherene Bailey-Tapper[1]
Financial Stability Department
Bank of Jamaica

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Abstract

This paper utilizes a simultaneous equation framework to analyze the inter-relationship between competition and banking sector soundness for Jamaican banks over the period March 2000 to June 2008. The study also explicitly accounts for inefficiency by estimating deviations of a banking firm's total costs from a minimum cost frontier. For merchant banks and building societies, results suggest that greater competition is accompanied by lower capitalization and increased insolvency risk in these sectors. For the commercial banks, the findings show that greater competition contributes to improvements in insolvency risk. In addition, an important concern for regulators is that for the commercial banks and building societies, there is a ***U-shaped*** relationship between loan growth and the ratio of non-performing loans (NPLs) to total loans, the proxy for loan quality. This finding supports the hypothesis that at low loan growth rates, loan growth has a negative effect on the number of bad loans. However, at high loan growth rates the amount of bad loans increases with loan growth rate. This finding conforms to regulatory perception that banks with high rates of loan growth, tend to warrant additional supervisory attention.

JEL Classification Numbers: **D40; G21**
Keywords: competition; inefficiency; ZSCORE Index

[1] The views expressed are those of the author and do not necessarily reflect those of the Bank of Jamaica.

Table of Contents

1. INTRODUCTION

Banking systems around the globe have become increasingly liberalized and integrated, which is largely reflective of a progressive process towards greater product and service deregulation. The continuing integration of financial systems has also led to enhanced competition. Many countries have encouraged greater levels of competition given the potential for increasing consumer welfare through more favourable pricing policies and improved services. Nonetheless, a number of studies point to a negative trade-off between competition and bank soundness (e.g. Keeley, 1990; Hellmann, Murdock and Stiglitz, 2000; and Hauswald and Marquez, 2006). Based on this view, more bank competition *erodes* market power, decreases profit margins and results in reduced franchise, making banks more susceptible to greater risk taking.[2] Banks play a crucial role in the process of mobilizing and allocating society's savings by intermediating between borrowers and lenders. As a consequence, research on the implications for financial stability arising from competitive bank behaviour bears important policy implications. Some regulators, when faced with a more competitive environment, have strengthened prudential regulation in an effort to safeguard the soundness of their financial systems. As a result, due to regulatory and in some instances market pressures, some institutions have come under pressure to boost their capitalization.

The liberalization of the Jamaican banking sector started in the mid-1980s.[3] This process contributed to an increase in the number of financial institutions and engendered a higher level of risk-taking in the banking sector. However, the rapid promulgation of non-bank financial institutions without the requisite prudential supervision, coupled with the unstable domestic macroeconomic conditions, precipitated the financial sector distress during the late 1990s. The Jamaican banking sector experienced a significant structural adjustment following the distress period, largely as a consequence of changes in the ownership structure and degree of concentration. Subsequent to this period, the structure of the banking sector has become increasingly duopolistic. However, since the consolidation in the sector, intermediation margins have fluctuated within a narrow band despite a trend decline in policy rates since 2000.

[2] The view that competition increases the incentives for greater risk-taking among financial institutions stems from the underlying idea that when banks compete heavily in the deposit market, interest rates fall and franchise value decreases (Keeley, 1990). Because banks have less to lose in the case of default, their incentives to take on extra risk increase.
[3] The Jamaican banking sector is comprised of commercial banks, merchant banks and building societies.

Against this background, a number of recent studies on the Jamaican banking sector have recommended the need for increased competition. White (2004) and Bailey (2007) recommended the need for increased competition in reducing margins in the commercial banking sector. Both papers highlighted that increased competition could be effective in reducing cost of funds, stimulating economic growth and improving consumer welfare. However, despite substantial improvements in the regulatory framework subsequent to the crisis period, it is still relevant to question whether increased competition would improve or erode banking system soundness in Jamaica.

Some studies investigate the impact of competition on bank soundness by modelling the implications concerning efficiency. A number of these studies provide evidence that efficiency plays a role in the transmission from competition to bank soundness. Utilizing data on European and U.S. banks over the period 1995 – 2005, Cihak and Schaeck (2008), utilized a two-pronged approach to investigate the transmission from competition to bank soundness. They provide evidence that competition increases bank soundness through the efficiency channel.

This paper examines the dynamics between competition and bank soundness by explicitly accounting for efficiency. The findings will help to provide answers as to whether increased competition can enhance consumer welfare without eroding banking system stability. Furthermore, based on the findings, what should be the appropriate response by policymakers? The paper is structured as follows: Section 2 examines the theoretical underpinnings of the link between competition and banking sector soundness. Section 3 discusses the methodology and the data employed. Section 4 presents the findings of the model. The policy implications of the results and the conclusion are outlined in section 5.

2. PREVIOUS LITERATURE

2.1 The Relationship between Competition & Bank Soundness

Studies investigating the impact of competition on bank soundness have largely yielded conflicting results. As such, economic theory has failed to achieve a consensus on the implication of competition for banking sector stability. Some studies have shown that there is a negative trade-off between competition and bank soundness. For example, Hellman et al. (2000) showed that in a dynamic model of moral hazard,

competition can have a negative impact on prudent bank behaviour. They examined the interaction between financial liberalization and prudential regulation. One conclusion from their study was that capital requirements may not be enough to control risk. Also using a dynamic framework, Bolt and Tieman (2004) found that more stringent capital adequacy requirements led to banks developing stricter acceptance criteria for granting loans. They also concluded that increased competition in the banking industry led to riskier bank behaviour, contributing to increased insolvency risk.

Berger, Klapper and Turk-Ariss (2009), using a data set of 23 developed countries and covering 8235 banks, provided evidence that banks with a higher degree of market power have less overall risk exposure and greater stability. They also posited that increased risk exposure could be offset in part by higher equity ratios. Using an adverse selection model, Smith (1984) illustrated how increased competition for deposits tends to heighten banking sector fragility despite the presence of a 'lender of last resort', and despite the absence of any need for 'deposit insurance'. Smith (1984) also concluded that the regulation of deposit interest rates is an appropriate response to 'instability' in the banking system. Similar evidence that competition increases fragility was found in work by Besanko and Thakor (1993). Their work examined the consequences of inter-bank competition on the portfolio choices of banks and the welfare of borrowers in a regulatory environment of complete deposit insurance. Boyd et al (2004) employed a monetary, general equilibrium model where the banking industry exists to provide inter-temporal insurance to risk-averse depositors. In this study, they modelled the banking industry as either a monopoly bank or a perfectly competitive banking industry. They illustrated that the probability of a costly banking crisis is always higher under competition than under monopoly.

However, a number of recent papers have challenged this widely held view that has shaped the regulatory and supervisory environment within which financial institutions operate. Bordo, Reddish and Rockoff (1995), analyzed the performance of the Canadian and US banking systems between 1920 and 1980. During this period, they observed greater stability (in terms of failure rates) of Canadian banks compared to US banks and posited that this may be partly explained by the oligopolistic structure of Canadian banking. Schaeck et. al (2009) also provided empirical evidence that increased competition is significantly positively associated with increased banking stability. More specifically, they showed that policies promoting competition among banks, if well executed, have the potential to improve systemic stability.

Koskela and Stenbacka (2000) found evidence that there need not be a trade-off between lending market competition and financial fragility. They showed that the introduction of loan market competition is shown to reduce lending rates and to generate higher investments without increasing the equilibrium bankruptcy risk of borrowers. Finally, Allen and Gale (2004) highlighted that the relationship between competition and financial stability is multifaceted and that there is no simple trade-off between competition and stability.

Some studies examine the role of efficiency in the relationship between competition and banking system soundness. The link between competition, efficiency and bank soundness is explained by two contrasting competing hypotheses.[4] Proponents of the 'Competition-Efficiency' hypothesis posit that increases in competition precipitate increases in efficiency. Under this hypothesis, competition forces banks to minimize costs and offer services at lower prices.[5] More intensive competition also encourages lending institutions to improve loan screening and monitoring procedures, whereas banks in monopolistic markets spend less time monitoring. These banks are also less likely to suffer from high levels of non-performing loans. Additionally, this outcome is achieved because less risky borrowers have an incentive to obtain financing from a bank which is able to distinguish between good and bad credit risks. The incentive for these banks is that they are able to reap benefits in the sense of better access to credit and higher credit lines. As a consequence, institutions that maintain efficient monitoring and screening procedures are able to avoid additional costs that arise in inefficient institutions due to resource intensive monitoring of delinquent borrowers, analysis of workout arrangements and collateral disposal procedures. Kwan (1997) showed that unsound banks suffer from high levels of inefficiency. Koetter and Porath (2007) demonstrated that more efficient banks in Germany have lower risks and are sounder than their less efficient counterparts. More specifically, their results showed that improvements in efficiency reduces the probability of default and increases profits.

Alternatively, under the 'Competition-Inefficiency' hypothesis, greater competition leads to declines in bank efficiency. This occurs because higher competition contributes to less stable, shorter relationships between customers and banks (Boots and Schmeits, 2005), given the increased propensity for customers to switch to other providers in more competitive environments.

[4] See Berger and De Young, (1997), Williams, (2004) and Petersen and Rajan (1995)). The industrial organization literature also provides evidence that competition increases the efficiency of firms (see Tirole, 1998).
[5] As a result, efficient banks, i.e. banks with superior management and production technologies, will increase in market share and profitability at the expense of less efficient banks.

This results in banks incurring greater expenses in retaining old customers and attracting new customers through investments in ATMs, new information system and aggressive marketing efforts. Under this hypothesis, such institutions are preoccupied with retaining existing customers and attracting new customers at any expense. As a result of higher level of inefficiency, insufficient resources are allocated to underwriting standards and screening and monitoring borrowers giving rise to unsound bank operations. Berger and De Young (1997) provide evidence that poor management, reflected in banking inefficiencies, precedes high levels of non-performing loans. Based on the foregoing arguments, it is important to account for efficiency when examining the relationship between competition and banking system soundness.

3. METHODOLOGICAL FRAMEWORK & DATA

3.1. Seemingly Unrelated Regressions

A seemingly unrelated regression (SUR) framework is employed in investigating the inter-relationship between competition and bank soundness.[6] A SUR system comprises several individual relationships that are linked by the fact that their disturbances are correlated. SUR models are usually used to gain efficiency in estimation by combining information on different equations and the second is to impose and/or test restrictions that involve parameters of different equations.

The traditional SUR model with *M* equations can be written as:

$$y_t = x_i \beta_i + \varepsilon_i \qquad i = 1, 2, ..., \quad M$$

where y_i is the T-dimensional vector of observations on a dependent variable, x_i is the (TxK_i) matrix of observations on K_i non-stochastic explanatory variables, possibly including a constant term, β_i is a K_i dimensional vector of unknown coefficients that is to be estimated and e_i is a T-dimensional unobserved random vector. The M equations can be expressed as:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_M \end{bmatrix} = \begin{bmatrix} X_1 & & & \\ & X_2 & & \\ & & \ddots & \\ & & & X_M \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_M \end{bmatrix} + \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_M \end{bmatrix}$$

[6] Zellner (1962) provided seminal work in this area. Three stage least squares was considered but was not employed because of concerns related to the validity of instruments since these would have been largely confined to the balance sheet and income statements of the banks.

where *Y* is of dimension *(TMx1)*, X is of dimension (*TMxK*), with $K = \sum_{i-1}^{m} K_i$, the vector β is *(Kx1)* and e is given by $e = N(0, \Sigma \otimes I_T)$.

Therefore, the errors in each equation are homoskedastic and there is contemporaneous correlation between the errors in the different equations. The variance of the *i*-th equation is denoted by σii , the i-th diagonal element of Σ . The covariance between two corresponding error in different equations (say *i* and *j*), we write as σij ; the σij appear as off-diagonal elements of Σ .

3.2 Data & Variables Employed

To conduct the empirical analysis, pooled data of quarterly observations for the institutions in the Jamaican banking sector covering the period March 2000 – June 2008 is used. The Lerner Index is used as a measure of the degree of competition in each sector. The ZSCORE Index represents the proxy for banking sector soundness, while inefficiency is computed as deviations from a stochastic cost frontier.

3.2.2 Lerner Index[7]

The Lerner Index is defined as the ratio of the difference between the price of output (assets) and marginal cost, to price (see equation 1), where the price of assets is computed as total revenues divided by total assets.

$$LI_i = \frac{p_i - MC_i}{p_i} \qquad (1)$$

The marginal cost is based on the estimation of the cost function below[8]:

[7] The Lerner Index ranges between zero and one, whereby larger values indicate less competition and more market power. See **Appendix A, Figure 4**, for Lerner Indices on the Jamaican banking sector.

[8] Cost functions in this paper are estimated using FRONTIER®, an econometric software package designed to provide maximum likelihood estimates for a variety of stochastic frontiers.

$$\ln(TC_i) = \alpha_0 + \alpha_1 \ln A_i + \frac{1}{2}\alpha_k (\ln A_i)^2 + \sum_{j=1}^{3} \beta_j \ln w_{ji} + \frac{1}{2}\sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} \ln w_{ji} \ln w_{ki}$$
$$+ \frac{1}{2}\sum_{j=1}^{3} \gamma_j \ln A_i \ln w_{ji} + \mu_1 trend + \mu_2 \frac{1}{2} trend^2 + \mu_3 trend \ln A_i \qquad (2)$$
$$+ \sum_{j=1}^{3} \lambda_j trend \ln wji + \ln u_i$$

where TC_i denotes total costs, A_i total assets, where $i = 1...14$ representing the number of institutions in the sector. On the other hand, w_j is the price of the factors of production, and jk is the cross-product of the price of input, $\forall\ j,k = 1...3$, where: $w_1 =$ price of labour: personnel costs/total assets, $w_2 =$ price of physical capital: operating costs/fixed assets and $w_3 =$ price of deposits: financial costs/deposits.

The cost function is estimated by including fixed individual effects to capture the influence of variables specific to each bank. A trend component was also used to capture the influence of technical change leading to shifts in the cost function over time. As usual, the estimation is done under the restrictions of symmetry and homogeneity in the prices of inputs.

The estimated coefficients of the cost function are then used to compute the marginal cost:

$$MC = \frac{TC_i}{A_i} \cdot \frac{d \ln TC_i}{d \ln A_i} \qquad (3)$$

where *MC* is the derivative of the logarithm of the total cost with respect to the logarithm of output and the derivative of the cost function in equation (2) with respect to total assets is given by:

$$\frac{d\ln TC_i}{d\ln A_i} = \alpha_j + \alpha_k \cdot \ln A_i + \frac{1}{2}\sum_{j=1}^{3} \gamma_j \cdot \ln w_{ji} + \mu_3 \cdot trend \qquad (4)$$

3.2.3 Inefficiency

Inefficiency for each bank was computed based on the translogorithmic cost function specified in equation 5:

$$\ln tc = \alpha_0 + \sum_{i=1}^{2} \alpha_i \ln(y_i) + \sum_{j=1}^{3} \beta_j \ln(p_j) + 1/2 \sum_{i=1}^{2}\sum_{k=1}^{2} \alpha_{ik} \ln(y_i)\ln(y_k) + \\ + 1/2 \sum_{j=1}^{3}\sum_{h=1}^{3} \beta_{jh} \ln(p_j)\ln(p_h) + \sum_{i=1}^{2}\sum_{j=1}^{3} \delta_{ij} \ln(y_i)\ln(p_j) + \in \qquad (5)$$

where tc is total operating and interest costs, y_1 is total loans, y_2 is all other earning assets, and p_1, p_2, p_3 are the respective prices of labour, capital and borrowed funds.[9] Estimates provide a measure of deviations of a banking firm's observed total operating costs from a minimum cost frontier. However, because the deviations from the minimum cost frontier actually measure the degree of inefficiency rather than efficiency, this variable is called inefficiency.

3.2.4 The Z-score Index[10]

The Z-score index was used as a measure of a bank's financial soundness. The ratio is calculated as:

$$Z = \frac{(ROA + E/A)}{\sigma ROA} \qquad (6)$$

[9] It is assumed that a higher quality of management translates into a profitable composition of assets and a low cost composition of liabilities. For further discussion on the estimation of technical inefficiencies using the translogorithmic cost function in equation (15) above see Bailey (2007).

[10] For Z-scores on the Jamaican banking sector see **Appendix A**, **Figures 1 to 3**.

where *ROA* is the bank's return on assets, *E/A* is its regulatory capital to asset ratio and σROA is its standard deviation of return on assets computed over the sampling period. The formula combines the bank's buffer (profit and regulatory capital) with the risks the firm faces, measured as the standard deviation of returns. The Z-score is inversely related to the probability of a financial institution's solvency.

In other words, the Z-score measures the number of standard deviations a return realization has to fall in order to deplete equity. A higher Z-score implies a lower probability of insolvency, providing a direct measure of banks' soundness that is superior to analyzing only banks' leverage.

3.3 Modelling Framework

The following simultaneous equations system consists of four linear equations that capture the interrelationships between competition, inefficiency and bank soundness and represents the empirical model to be estimated.

$$BADLOAN_{t,i} = c1 + a1*ZSCORE_{t,i} + b1*COMPETITION_{t,i} + d1*INEFFICIENCY_{t,i} + e1*PERLOAN_{t,i} + f1*CILOAN_{t,i} + g1*GROWTH_{t,i} + h1*GROWTHSQ_{t,i} \quad (7)$$

$$COMPETITION_{t,i} = c2 + a2*BADLOAN_{t,i} + b2*\ ZSCORE_{t,i} + d2*\ INEFF_{t,i} + e1*\ SIZE_{t,i} + f2*REGULATORY\ DUMMY \quad (8)$$

$$ZSCORE_{t,i} = c3 + a3*BADLOAN_{t,i} + b3*\ COMPETITION_{t,i} + d3*\ INEFF_{t,i} \quad (9)$$

$$INEFF_{t,i} = c4 + a4*BADLOAN_{t,i} + b4*COMPETITION_{t,i} + d4*\ ZSCORE_{t,i} \quad (10)$$

Subscripts t and i indicate periods and banks, respectively.

where:

BADLOAN = ratio of NPLs to total loans (this is a measure for loan quality);
ZSCORE = proxy for banking sector soundness
INEFF = the measure for firm specific inefficiency from the stochastic cost frontier;
PERLOAN = ratio of real estate loans to total loans;
CILOAN = ratio of commercial and industrial loans to total loans;
GROWTH = one-year growth rate of total loans;

GROWTHSQ = square of one-year growth rate of total loans;

SIZE = log of total assets;

DUMMY = this is a proxy for regulatory reform that could impact competitiveness in the sector;

COMPETITION = proxied by the Lerner Index

Equation 7 captures the impact of competition, inefficiency and bank soundness on loan quality. In this equation, the ratio of commercial and industrial loans to total loans and the ratio of real estate loans to total loans are also included as explanatory variables as the amount of past due loans is expected to be related to the composition of the loan portfolio. Two variables capturing loan growth are included. These variables are the one-year growth in loans and the squared value of the one-year growth in loans and are intended to allow for the possibility of a ***U-shaped*** relationship between loan growth and the number of bad loans. This means that as the loan growth rate increases, its effect on bad loans diminishes, but at a high growth rate, the amount of bad loans increases with loan growth. Equation 8 represents the effect of competition on loan quality, bank soundness and inefficiency. In addition, a size variable is included to account for the relationship between changes in asset size and competition. A dummy variable was also included as a proxy for regulatory reform in the sector. Equations 9 covers the impact of banking sector soundness on competition, loan quality and inefficiency while and equation 10 represents the effect of loan quality, competition and banking sector soundness on inefficiency.

4. ESTIMATION RESULTS[11]

4.1 Commercial Banks

Dependent Variable - Inefficiency:

The main finding from the inefficiency equation is that there is a significant inverse relationship between the Lerner Index and the inefficiency variable (see **Table 1**). This is consistent with the 'Competition-Inefficiency' hypothesis, in that with increased competition firms are likely to allocate substantial additional resources to retain and/or attract customers, resulting in an increase in inefficiency. There is also a significant inverse relationship between the Z-score Index and inefficiency, indicating that greater bank soundness is associated with lower inefficiency.

[11] Results are robust to different specifications of the model.

Dependent Variable – Past Due Loans (NPLs)[12] to TL (loan quality measure):

Of importance is that there is a significant inverse relationship between the Lerner Index and the ratio of NPLs to total loans. This means that higher competition in this sector contributes to deterioration in loan quality. As a result of the additional resources to maintain existing customers and/or attracting new customers, sufficient resources are not allocated towards the loan screening and monitoring process, resulting in higher NPLs. The results from this equation also point to a negative and significant relationship between bank soundness and loan quality, suggesting that improvements in bank soundness would be reflected in improvements in loan quality in the sector. In addition, at a low growth rate, there is an inverse relationship between loan growth and the number of bad loans. However, at high growth rates the amount of bad loans increases with loan growth. This confirms apriori expectations that banks in high growth situations tend to be more risk prone and warrant additional supervisory attention.

Dependent Variable – Bank Soundness (Z-score):

All coefficients for the Z-score equation for commercial banks are significant (see **Table 1**). Of importance is that the coefficient for the competition variable in this equation is negative, indicating that greater competition contributes to improvement in bank soundness in this sector. Furthermore, deterioration in these variables erodes bank soundness and this is by way of the profitability channel. Against this background, the negative relationship between the competition variable and the Z-score Index may be reflective of higher capitalization in the sector.

Dependent Variable – Competition (Lerner Index):

All coefficients for the competition equation are also significant. Of note, as well, is that the findings show that increases in asset size and stability contribute to increased competitiveness in the sector. This result points to a lower tendency for collusion in the sector. The results also highlight that there is a positive relationship between the inefficiency variable and the Lerner index. This means that higher inefficiency reduces competitiveness. A possible explanation for this is that, in this sector, inefficient institutions are more likely to pass on their inefficiency to consumers in the form of higher margins in order to maintain profitability.

[12] PDLs are defined as principal and interest payments outstanding 3 months and over.

Table 1 - SUR Results - Commercial Banks				
	Coefficient	**Std. Error**	**t-Statistic**	**P-value**
Dependent Variable: Z-SCORE				
CONSTANT	61.282	2.383	25.719	0.000
NPL:TL	-64.805	12.674	-5.113	0.000
INEFFICIENCY	-52.848	3.945	-13.395	0.000
COMPETITION	-7.702	2.425	-3.176	0.002
Dependent Variable: NPL:TL				
CONSTANT	0.067	0.007	9.479	0.000
Z-SCORE	0.000	0.000	-15.420	0.000
INEFFICIENCY	0.024	0.004	5.800	0.000
COMMERCIAL LOANS	0.043	0.005	9.025	0.000
PERSONAL LOANS	-0.005	0.008	-0.663	0.507
GROWTH (LOANS)	-0.031	0.003	-9.810	0.000
GROWTHSQUARED (LOANS)	0.004	0.001	5.867	0.000
COMPETITION	-0.051	0.005	-9.501	0.000
Dependent Variable: INEFFICIENCY				
CONSTANT	0.369	0.008	48.345	0.000
NPL:TL	-0.028	0.035	-0.809	0.419
Z-SCORE	-0.003	0.000	-380.503	0.000
COMPETITION	-0.012	0.007	-1.645	0.100
Dependent Variable: COMPETITION				
CONSTANT	3.514	0.092	38.279	0.000
NPL:TL	-1.434	0.062	-23.260	0.000
Z-SCORE	0.000	0.000	-3.502	0.001
INEFFICIENCY	0.294	0.024	12.133	0.000
LOGASSETS	-0.388	0.013	-29.974	0.000
Determinant residual covariance	1.34E-41			

4.2 Merchant Banks

Dependent Variable - Inefficiency:

In contrast to the commercial banks, results for the merchant banks show that there is a positive and significant relationship between the Lerner Index and inefficiency (see **Table 2**). This result is consistent with the 'Competition-Efficiency' hypothesis. For the merchant banks, competition forces these institutions to minimize costs in order to increase market share. A possible explanation for this is that the customer base in this sector is predominantly corporate clients and these customers may be exhibit greater sensitivity to price changes. This is reflected in improvements in efficiency. In addition, similar to the commercial banks, an increase in the Z-score Index is associated with improvements in efficiency.

Dependent Variable - Loan Quality (NPLs to TL):

As in the case of the commercial banks, results for the merchant banks show a significant inverse relationship between competition and loan quality. This suggests that despite improvements in efficiency, sufficient resources are not allocated towards the loan screening and monitoring process, contributing to higher NPLs. However, in contrast to the findings for commercial banks, findings for the FIAs suggest that low growth in loans is related to increases in bad loans. However, higher loan growth rates are associated with improvements in loan quality. This suggests that at higher loan growth rates, there is more intensive loan screening and monitoring in this sector, contributing to improvements in default risk.

Dependent Variable - Bank Soundness (Z-score):

For the merchant banks, the findings show that stronger competition leads to deterioration in bank soundness. However, based on the above results, competition leads to improvement in efficiency which improves merchant bank soundness via the profitability channel. Despite this result, competition may have fuelled the deterioration in the Z-score Index, and as such, bank soundness, by stimulating lower capitalization in the sector.

Dependent Variable – Competition (Lerner Index):

All the coefficients for this equation are significant. Of note, however, is that unlike for the commercial banks, an increase in asset size and banking stability contributes to lower competitiveness, pointing to greater potential for collusion in this sector.

Table 2 - SUR Results - Merchant Banks				
	Coefficient	**Std. Error**	**t-Statistic**	**P-value**
Dependent Variable: Z-SCORE				
CONSTANT	43.607	3.068	14.214	0.000
NPL:TL	106.167	45.029	2.358	0.019
INEFFICIENCY	-81.080	7.390	-10.971	0.000
COMPETITION	60.596	6.690	9.057	0.000
Dependent Variable: NPL:TL				
CONSTANT	-0.002	0.024	-0.064	0.949
Z-SCORE	0.000	0.000	-2.619	0.009
INEFFICIENCY	0.130	0.010	12.383	0.000
COMMERCIAL LOANS	0.016	0.024	0.640	0.522
PERSONAL LOANS	0.174	0.034	5.127	0.000
GROWTH (LOANS)	0.001	0.000	2.242	0.026
GROWTHSQUARED (LOANS)	0.000	0.000	-2.292	0.022
COMPETITION	-0.044	0.006	-7.708	0.000
Dependent Variable: INEFFICIENCY				
CONSTANT	0.067	0.015	4.360	0.000
NPL:TL	1.239	0.211	5.870	0.000
Z-SCORE	-0.004	0.000	-19.215	0.000
COMPETITION	0.702	0.028	25.453	0.000
Dependent Variable: COMPETITION				
CONSTANT	-144.097	2.262	-63.690	0.000
NPL:TL	71.403	7.805	9.148	0.000
Z-SCORE	0.054	0.013	4.037	0.000
INEFFICIENCY	-2.614	1.523	-1.716	0.087
LOGASSETS	24.263	0.221	109.604	0.000
Determinant residual covariance	9.70E-07			

4.3 Building Societies

Dependent Variable: Inefficiency:

Similar to the merchant banks, results for the building societies show a positive and significant relationship between competition and inefficiency (see **Table 3**). However, in contrast to findings for the commercial banks and merchant banks, there is a positive and significant relationship between the Z-score Index and inefficiency. Due to the relatively low levels of inefficiency in this sector, despite an improvement in stability, these institutions will exhibit a lower incentive to improve efficiency.

Dependent Variable: Loan Quality (NPLs: TL):

Based on the NPLs to total loans equation, greater competition contributed to improvement in loan quality. The explanation for this is consistent with the 'Competition-Efficiency' hypothesis whereby competition encourages more intensive loan screening and monitoring procedures in the sector, contributing to lower NPLs.[13] Similar to the commercial banks, results for the building societies show that relatively low loan growth is related to improvements in loan quality; however as loan growth increases this is associated with deterioration in loan quality.

Dependent Variable - Bank (Z-score):

Similar to the merchant banks, there is a positive and significant relationship between competition and bank soundness. This means that stronger competition increases insolvency risk in the sector. Of note, however, is that greater competition leads to lower inefficiency and stronger loan quality, which improves building society soundness by way of the profitability channel. As such, these findings suggest that competition contributes to deterioration in the Z-score Index by encouraging lower capitalization in the sector.

Dependent Variable: Competition (Lerner Index):

Similar to the merchant banks, an increase in asset size weakens competitiveness in this sector, pointing to greater potential for collusion this sector. In addition, similar to the commercial banks, inefficient institutions in this sector are more likely to pass on their inefficiency to consumers in the form of higher margins in order to maintain profitability.

[13] In addition, lower NPLs would further help in minimising costs.

Table 3 - SUR Results - Building Societies				
	Coefficient	**Std. Error**	**t-Statistic**	**P-value**
Dependent Variable: ZSCORE				
CONSTANT	57.640	3.588	16.064	0.000
NPL:TL	-413.027	63.221	-6.533	0.000
INEFFICIENCY	-48.927	77.652	-0.630	0.529
COMPETITION	216.830	81.739	2.653	0.008
Dependent Variable: NPL:TL				
CONSTANT	0.033	0.012	2.716	0.007
ZSCORE	0.000	0.000	-11.754	0.000
INEFFICIENCY	-1.173	0.167	-7.024	0.000
COMMERCIAL LOANS	0.044	0.013	3.486	0.001
PERSONAL LOANS	0.031	0.012	2.586	0.010
GROWTH (LOANS)	-0.102	0.011	-9.398	0.000
GROWTHSQUARED (LOANS)	0.064	0.012	5.146	0.000
COMPETITION	1.271	0.167	7.590	0.000
Dependent Variable: INEFFICIENCY				
CONSTANT	0.000	0.001	0.787	0.432
NPL:TL	-0.013	0.007	-1.982	0.048
ZSCORE	0.000	0.000	0.346	0.730
COMPETITION	1.002	0.003	349.771	0.000
Dependent Variable: COMPETITION				
CONSTANT	-134.056	0.985	-136.032	0.000
NPL:TL	-136.257	7.835	-17.391	0.000
ZSCORE	-0.008	0.003	-2.521	0.012
INEFFICIENCY	25.154	2.658	9.463	0.000
LOGASSETS	20.039	0.050	400.250	0.000
Determinant residual covariance	2.55E-23			

5. CONCLUSION:

In this paper, the relationships between competition, inefficiency and stability are investigated in a simultaneous equation setting using data on the Jamaican banking sector. The results suggest that for the merchant banks and building societies, higher competition increases insolvency risk in these sectors. Findings also suggest that competition may have stimulated lower capitalization in both sectors. As such, stronger competition in the merchant banking and building society sectors will necessitate closer on-site and off-site supervision for both new and existing institutions. In addition, regulatory authorities will need to closely monitor capital adequacy in these sectors, and take steps, when necessary, to improve capitalization and bolster stability. It may also be important for policy makers to structure a risk-based deposit insurance scheme for these sectors in order to increase the incentive for institutions to minimize risk.

Another area of concern for regulators is that, for the building societies, low loan growth rates are associated with improvements in loan quality, while higher growth rates fuel deterioration in loan quality. This confirms a priori expectations that firms in high growth situations, which could be influenced by stronger competition, tend to be more risk prone, and will warrant additional supervisory attention. However, for the merchant banks, low and high loan growth rates contribute to declines in the ratio of NPLs to total loans. This suggests that at higher loan growth rates, there is more intensive loan screening and monitoring in this sector, contributing to improvements in default risk. At the same time, greater asset size in both sectors is associated with reduced competitiveness. In this respect, competition policy in the sector should be geared towards making it difficult for firms to gain excessive market power.[14]

For the commercial banks, findings show that greater competition contributes to improvements in the insolvency index, and is reflective of greater capitalization in the sector. Nonetheless, competition also contributes to increased inefficiency and deterioration in loan quality. In this regard, stronger competition in this sector will also necessitate tighter prudential supervision. Similar to the building societies, results for the commercial banks show that regulatory authorities should closely monitor the prudential indicators for these institutions during periods of high loan growth given the positive relationship between high loan growth and the NPLs to total loan ratio.

[14] Competition policy refers to the set of rules designed to promote and protect competition and restrict monopoly practices and these include oversight of mergers, prohibition of price fixing and agreements (tacit or explicit) for sharing the market and other behaviour that might restrain competition.

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Appendix A

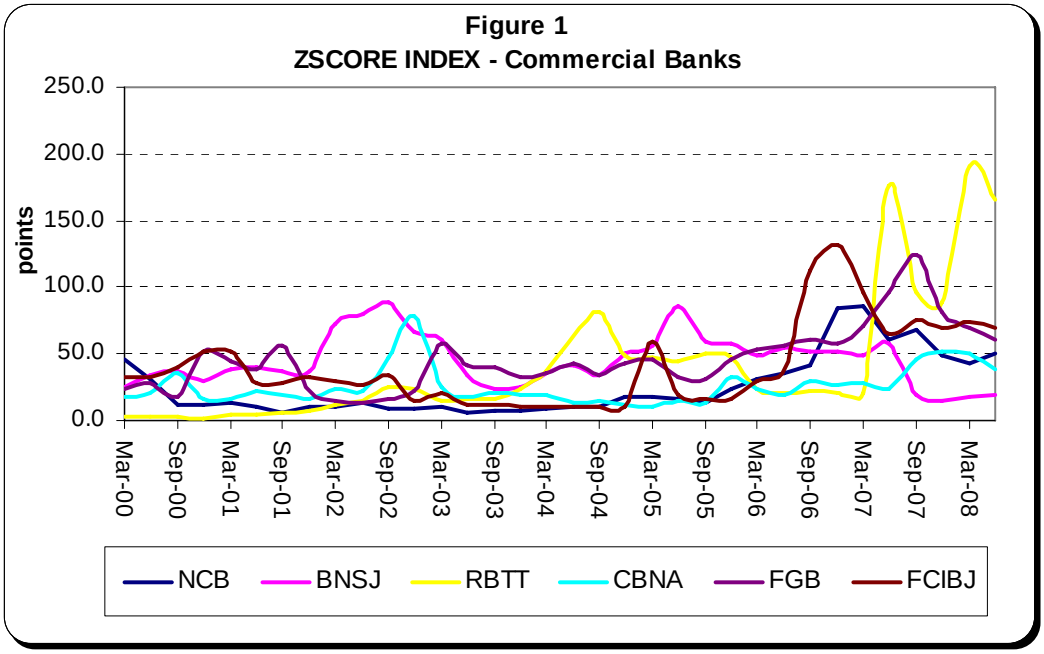
Figure 1
ZSCORE INDEX - Commercial Banks
250.0
200.0
150.0
100.0
50.0
0.0
points
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
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NCB
BNSJ
RBTT
CBNA
FGB
FCIBJ

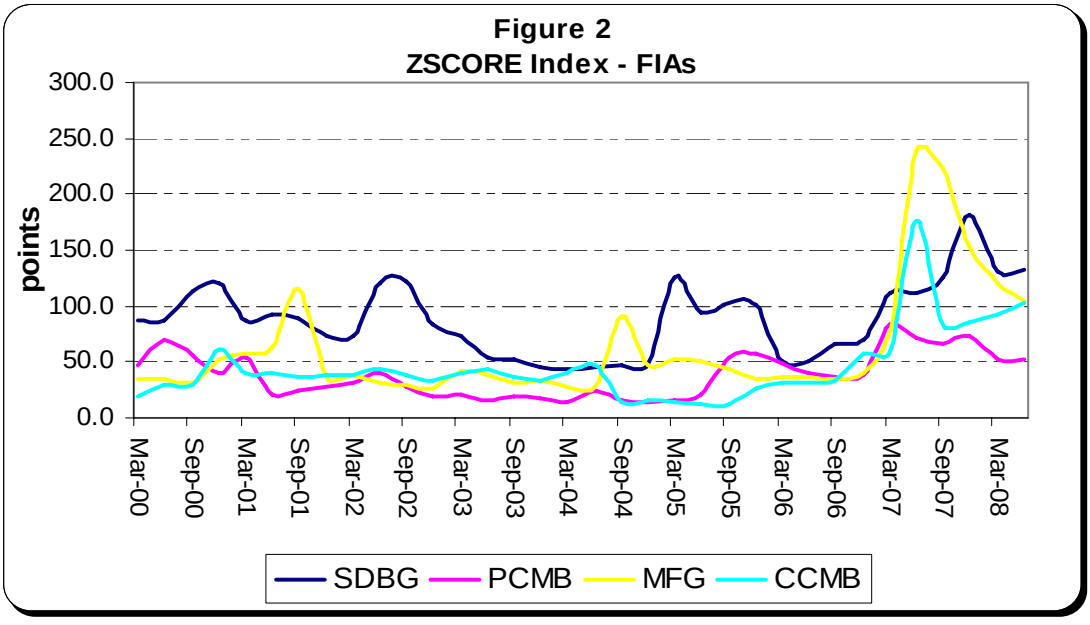
Figure 2
ZSCORE Index - FIAs
300.0
250.0
200.0
150.0
100.0
50.0
0.0
points
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
SDBG
PCMB
MFG
CCMB

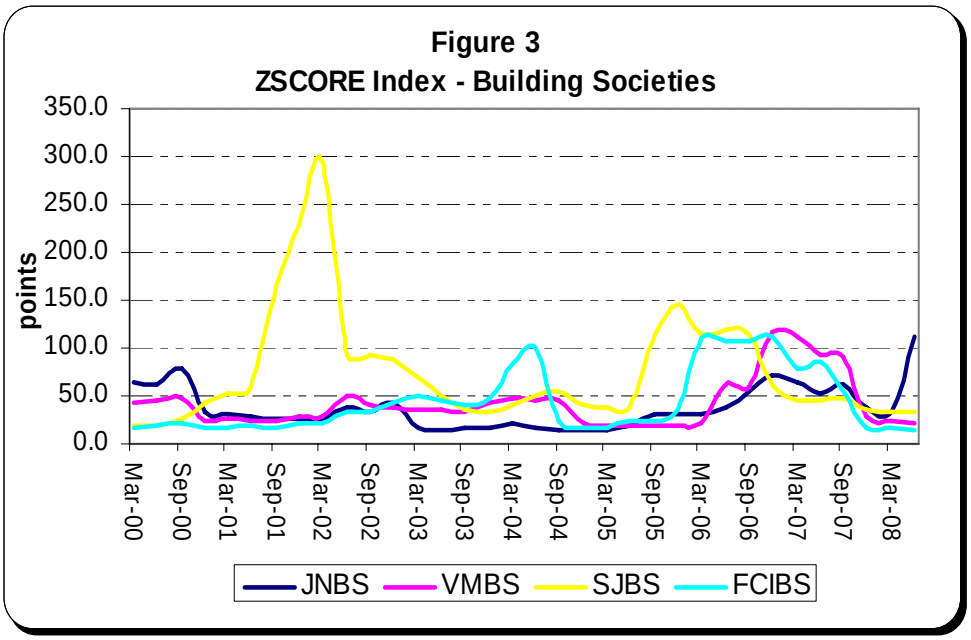
Figure 3
ZSCORE Index - Building Societies
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
points
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
JNBS
VMBS
SJBS
FCIBS

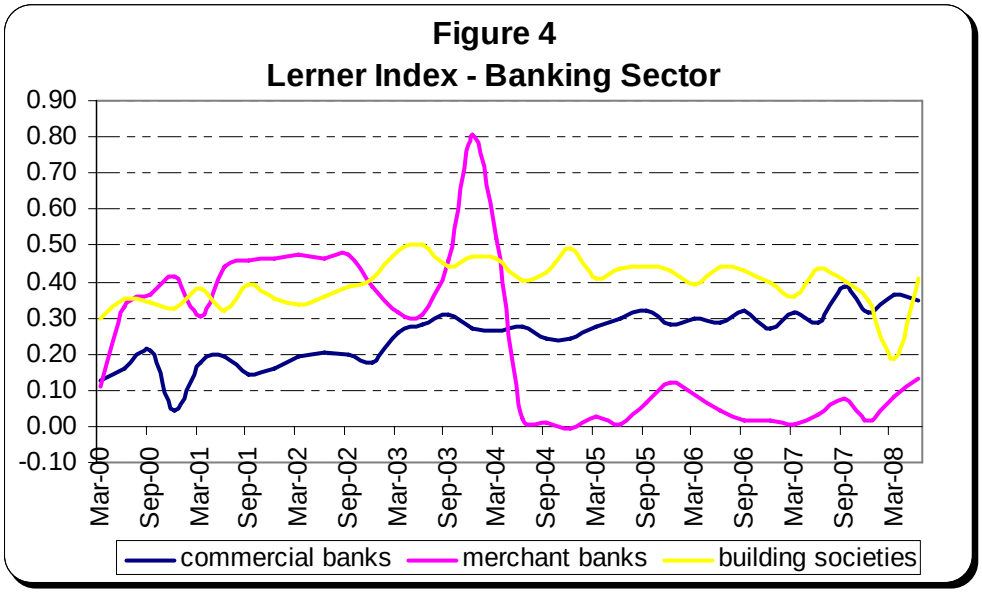
Figure 4
Lerner Index - Banking Sector
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
Mar-00
Sep-00
Mar-01
Sep-01
Mar-02
Sep-02
Mar-03
Sep-03
Mar-04
Sep-04
Mar-05
Sep-05
Mar-06
Sep-06
Mar-07
Sep-07
Mar-08
commercial banks
merchant banks
building societies