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Competitive Conditions in the Ghanaian Banking Sector

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Abstract
This study measures competitive conditions in the Ghanaian banking sector, from 2008 to 2012, using data relating to the total and the core output of 10 banks in Ghana. The Rosse Penzar *H*-statistics was derived and it indicated that the sector exhibited characteristics of a conjectural variation short run oligopoly. The mergers and acquisitions that occurred during the study period did not have any significant effect on competitive conditions in the sector as 45 per cent of assets in the sector are skewed towards the top five banks at the time.
Keywords: Ghanaian banking sector, Rosse Penzar *H*-statistics, conjectural variation short run oligopoly

1. Introduction

The Ghanaian banking sector has gone through a lot of reforms over the years. The 1990s witnessed a couple of reforms such as the Financial Sector Reform Programme (FINSAP), which led to the liberalisation of interest rates, abolishing of directed credits, privatization of state owned banks, liberalisation of the foreign exchange market and the beginning of a capital market with the establishment of the Ghana stock exchange in 1990. The period 2008 to 2012 also saw some reforms after a successful redenomination of the cedi in 2007.

The banking sector however continue to operate in a high interest rate environment for the best part of 2012 supported by governments demand for liquidity leading to high treasury bill rates in 2012, averaging a little over 22%. This has led to phenomenal growth in the banking sector. The growth suggests the global financial crisis did not have severe impact on the Ghanaian banking industry (Ghana Banking Survey 2009). In the light of this significant growth it will be very important to know how competitive conditions in the Ghanaian banking sector have changed during the period of growth between 2008 and 2012.

Econometric techniques will be employed to examine the nature of competitive conditions in the Ghanaian banking sector during the period 2008 to 2012. Using data relating to the total and the core output of the banks, separate estimates of the Rosse-Panzar H-statistics will be derived.

2. Literature review

Few studies have attempted to measure competitive conditions in the Ghanaian Banking sector. Buchs, and Mathisen (2005), using a 1998-2003 panel data set discovered evidence of non-competitive market structure in the Ghanaian banking sector. They suggested that, high profit ratios and high cost structure of Ghanaian banks could indicate a monopolistic banking sector. Other studies have described the Ghanaian Banking sector as operating under perfect conditions indicating no evidence of a change in competition as a result of liberalization between 1988 and 2011 (Owusu-Antwi, & Antwi, 2013).

Biekpe, (2011), also investigated the degree of bank competition and intermediation efficiency in Ghana. He concluded that there is a non-competitive market structure in the Ghanaian banking system from the year 2000 to 2007, a reflection of a monopolistic competitive banking system.

Lower economic profit reduces the incentives of banks to self-restrain from taking risk (Salas and Saurina, 2003). However in 2010 the banking sector in Ghana saw high growths as a result of capital injection by banks to meet the minimum regulatory capital requirements in 2012. This is believed to improve buffer for risk absorption in the banking sector (Ghana banking survey, 2013). There has however been some few acquisition over the period with Ecobank Ghana Limited (EBG) and Access Bank Ghana Limited (ABG) acquiring The Trust Bank Limited (TTB) and Intercontinental Bank Ghana Limited (IBG) respectively.

Table 1: Concentration Ratios and HHI for the biggest two and biggest five banks (asset based)

Year/Measure	CR2	CR5	HHI
2008	0.295	0.523	773.36
2009	0.244	0.499	697.26
2010	0.220	0.456	616.44
2011	0.220	0.462	623.98
2012	0.234	0.459	622.96

Source: Ghana Banking Survey, 2009-2013

The table above shows the CR (concentration ratios) and HHI (Herfindahl-Hirschman Index) from the period 2008 to 2012. The evidence suggests concentration has been reducing over the years under review. Even though the overall the result suggests the banking sector in Ghana was un-concentrated over the study period, the fall in concentration has been quite significant over the period from an HHI of 773.36 in 2008 to 622.96 in 2012.

The Mergers and acquisition in 2012 however led to an insignificant decrease in concentration from an HHI of 623.98 in 2011 to 622.96 in 2012. The HHI index is one of the ways of analysing competitive effects of bank mergers. It is widely used because of its importance "to market concentration as an indicator of competition and ease in calculating it" (Rhoades, 1993). Squaring the market shares of all firms in a market and then summing the squares calculates the HHI.

3. Methodology

The Structure-Conduct-Performance (S-C-P) paradigm has been used to examine the market structure of the banking sector over the years. This assumes an exogenous nature of the banking sector and a regression between profitability on concentration ratios and a number of control variables. This approach usually shows a positive relationship between profitability and concentration ratio indicating that banks in concentrated markets exercised market power. Others also use the Efficient – Structure hypothesis (ESH) in examining the market structure of the banking sector. However this approach indicates that large banks are more profitable than small banks because large banks tend to be more efficient (Berger, 1995; Berger and Humphrey, 1997, cited by Matthews, Murinde, and Zhao, 2007).

The SCP or the ESH is not sufficient in explaining bank profitability. Thus they both focus on profitability than the deviation of output price from marginal cost, which is the more desired way of analysing competitive conditions (Paul, 1999, cited by Matthews, et al., 2007). The Rosse Panzar reduced – form revenue model and the Brernahan and Lau mark-up model are the two most popular approaches in this strand of literature.

Recently the use of dynamic models to estimate competition has also gained grounds. An example to this effect is the study by Godard and Wilson (2009). Godard and Wilson identified implications of the H-Statistic of misspecification bias in the revenue equation, arising when adjustment towards market equilibrium is partial and not instantaneous. They prescribe a dynamic formulation of the revenue equation for accurate identification of the H-Statistic.

Partial adjustment necessitates the inclusion of lagged dependent variable among covariates of the revenue equation. This will make the revenue equation have a dynamic structure thus the static version without a lagged dependent variable, used in previous studies is misspecified. Applying an appropriate dynamic panel estimator to a correctly specified dynamic revenue equation permits virtually unbiased estimation of the H-Statistic. It enables the researcher to assess the speed of adjustment towards equilibrium directly through the estimated coefficient on the lagged dependent variable (Godard and Wilson, 2009).

This study uses models similar to that of Matthews, Murinde and Zhao rather than the dynamic panel model employed by Godard and Wilson. Thus using Rosse-Panzar H-statistic for ten (10) banks, which is robust in small samples than the Brernahan and Lau mark-up model (Shaffer, 2004, cited by Matthews, et al., 2007). On the other hand, employing a dynamic panel model to this study with a small sample (*N*) and time period (*T*) will lead to no valid observations after removing cross sections with estimation errors. Also a condition for running a dynamic panel model is a test for cointegration among variables used. With a small *N* and *T* there will be insufficient number of observation to conduct a panel cointegration test.

Table 2: Interpretation of the *H* - Statistic (Rosse - Penzar)

Equilibrium test	
$E = 0$	Equilibrium
$E < 0$	Disequilibrium
Competitive Conditions	
$H \leq 0$	Monopoly or conjectural short-run oligopoly.
$H = 1$	Perfect competition or natural monopoly in a perfectly contestable market or sales maximising firm subject to break even constraint
$0 < H < 1$	Monopolistic competition

Source: Hondroyiannis, Lolos, & Papapetrou (1999).

The banks were sampled from a population of 26 class one banks in Ghana. Data was sourced from Bankscope, the Ghana Banking Survey and the Annual Reports of individual banks. The sampled banks include the top five banks in Ghana as at 2012. All regressions were estimated with the Eviews software. The equations to be estimated are as follows:

$$\ln REV_{it} = \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \beta_1 \ln RISKASS_{it} + \beta_2 \ln ASSET_{it} + \beta_3 \ln BR_{it} + \gamma_1 GROWTH_t + \varepsilon_{it} \quad (1)$$

$$\ln INTREV_{it} = \alpha_0 + \alpha_1 \ln PL_{it} + \alpha_2 \ln PK_{it} + \alpha_3 \ln PF_{it} + \beta_1 \ln RISKASS_{it} + \beta_2 \ln ASSET_{it} + \beta_3 \ln BR_{it} + \gamma_1 GROWTH_t + \varepsilon_{it} \quad (2)$$

$$InROAA_{it} = \alpha_0' + \alpha_1' InPL_{it} + \alpha_2' InPK_{it} + \alpha_3' InPF_{it} + \beta_1' InRISKASS_{it} + \beta_2' InASSET_{it} + \beta_3' InBR_{it} + \gamma_1 GROWTH_t + \mu_{it} \quad (3)$$

Where REV= Ratio of bank operating income to total assets; PL= Personnel expenses to employees; PK= capital expenses to fixed assets; PF= Ratio of annual interest expenses to total loanable funds; RISKASS= Ratio of provisions to total assets, a measure of the riskiness of the banks overall portfolio; ASSET= Total assets, a proxy for size; BR= Ratio of the number of branches of each bank to the total number of branches for all banks; GROWTH= GDP growth rate; INTREV= Interest Income as a fraction of total assets; ROAA= Return on average assets. The subscripts i and t denotes number of banks and time respectively. ε_it and μ_it denotes a one-way error component.

Equation (1) and (2) are models of competitive conditions in the Ghanaian banking sector. The *H* – Statistics is given by $H = \alpha_1 + \alpha_2 + \alpha_3$. Equation (3) is a model of the equilibrium condition. The banking sector will be in equilibrium if $E = \alpha_1' + \alpha_2' + \alpha_3' = 0$ (Matthews, et al., 2007).

4. Empirical analysis and results

The reduced form functions have as the dependent variables both the logarithm of revenue (operating income) and interest income as a ratio of total assets as described in equation (1) and (2). Operating income includes non-interest income and interest income. Table 3 shows the regression output for equation (3).

With the exception of the measure of riskiness of the banks overall portfolio (RISKASSETS), which is significant at both 5% and 10% significant level but not significant at 1%, most of the explanatory variables in Table 3 where not significant. A test on the null hypothesis that the parameters on these explanatory variables are not significant was conducted using the Wald test (Appendix Table 1). This indicated that the null cannot be rejected because the p-value of the F-test was greater than 0.05 (0.5484) (Brooks, 2008). The explanatory variables together where significant in explaining the dependent variable, this is evident in the Probability F-statistic (0.025249) which is significant at 5% and 10% significant level in Table 3.

Table 3: Regression output for equations (1), (2) and (3)

	Dependent Variable		
Explanatory Variables	**LNROAA**	**LNREV**	**LNINTREV**
C	-2.473902	-0.622937	0.158082
	(0.848708)	(-0.758564)	(0.124524)
LNPL	-0.155925	0.070061	0.09593
	(-0.555866)	(1.270864)	(1.125642)
LNPK	0.186271	0.024721	0.001192
	(1.228319)	(0.606801)	(0.01892)
LNPF	-0.236289	-0.16729	-0.276631
	(-1.49766)	(-3.810771)***	(-4.076318)***
LNRISKASSETS	-0.324533	0.070184	0.064672
	(-2.624007)**	(2.194649)**	(1.308191)
LNASSETS	0.130285	-0.10858	-0.196124
	(0.593745)	(-1.8076)*	(-2.112064)**
LNBR	-0.216845	0.135879	0.332516
	(-1.175118)	(2.690381)**	(4.258905)***
GROWTH	-0.027947	-0.017134	-0.035744
	(0.952887)	(-2.186771)**	(-2.951114)***

p<0.01***, p<0.05**, p<0.10*
T-statistics in parenthesis ()
Source: Bankscope and authors estimate

Table 3 also shows the regression output for equation (1) and (2), with the log of operating income (LNREV) and net interest income (LNINTREV) as dependent variables respectively. In the Table above, the unit price of funds (PF) was very significant at 1%, 5% and 10% significant level. The variable LNRISKASSETS is significant at 5% and 10% significant level. The positive effect of RISKASSETS, the riskiness of the bank overall portfolio, supports the argument that higher risk commands a higher compensation return. The effect of LNBR on revenue indicates the increased cost of maintaining a higher branch network (Matthews, et al., 2007). GROWTH is significant in explaining the dependent variables REV and INTREV.

Table 4: Test for equilibrium and H-statistics

Test of equilibrium dependent variable LNROAA					
Period	LNPL	LNPK	LNPF	Sum *E*	H0: Sum=0
2008-2012	-0.1559	0.18627	-0.2363	-0.2059	Prob-F(1, 38) = 0.6121

H-statistics dependent variable LNREV					
Period	LNPL	LNPK	LNPF	Sum *H*	H0: Sum=1
2008-2012	0.07006	0.02472	-0.1673	-0.0725	Prob-F(1, 42) = 0.0000

H-statistics dependent variable LNINTREV					
Period	LNPL	LNPK	LNPF	Sum *H*	H0: Sum=1
2008-2012	0.09593	0.00119	-0.2766	-0.1795	Prob-F(1, 42) = 0.0000

Source: Bankscope and authors estimate

The test for equilibrium in equation (3) indicates the banking sector in Ghana was not in equilibrium during the study period. A test on the null hypothesis that the parameters on these three variables are jointly zero (E=0) was not rejected over the sample period. This is shown in Table 4 above, where the Prob-F (1, 38) = 0.6121 greater than 0.05 (Brooks, 2008).

The sum of the input price elaticities in both equation (1) and (2) shows that, the H-statistics is less than zero. Indicating a conjectural variations short-run oligopoly. This was confirmed by rejecting the restriction that H=1 as the p-values were very significant. A stability test (CUSUM of Squares) conducted on the parameters indicated that the null of stability is rejected (Appendix Figure 1, 2 and 3).

A sensitivity analysis was carried out to determine whether using a different size of test alters the conclusion. Size of test was determined at 10%, 5% and 1%. For this study the P-value is useful since it does not require the specifying of an arbitrary significance level (Brooks, 2008). Jointly the explanatory variables in equation (1) and (2) were significant at 1%, 5% and 10% significant level indicating that the conclusion of rejecting the null will be the same even if the size of the test is altered (see Table 3). The explanatory variables in equation (3), were however only significant at 5% and 10% significant level, but not significant at 1%. This indicates that the conclusion of rejecting the null will not hold if the size of the test is altered to 1% significant level.

5. Conclusion

This study measured the nature of competitive conditions among Ghanaian banks during 2008 – 2012. The sample period covered an era of growth and bank mergers and acquisition in Ghana. The evidence from the Rosse-Penzar statistics suggests that the Ghanaian banking sector operates as a conjectural variation short-run oligopoly as on average 45% of assets in the banking sector is controlled by the top 5 banks over the sample period. These findings are consistent with Buchs, and Mathissen, (2005) who attributed this to persistent domestic financing needs of the government – limiting competition between banks. The significance of LNBR indicates that the number of branches that a bank has influences the bank specific revenue and this relationship is positive. A common element is the relative explanatory power of the price of funds in both cases.

An interesting avenue for further research will be to increase the sample size and the study period and to apply a dynamic panel model to see whether the conclusion reached will be sustained.

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Appendix

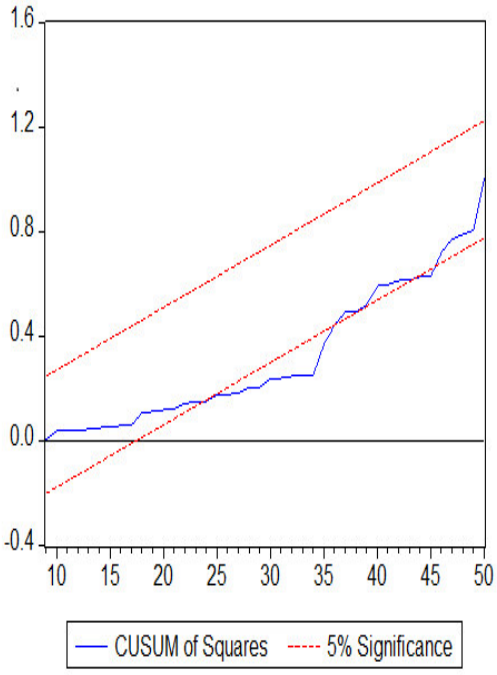

Figure 1: Stability test on LNREV
Source: Bankscope and authors estimate

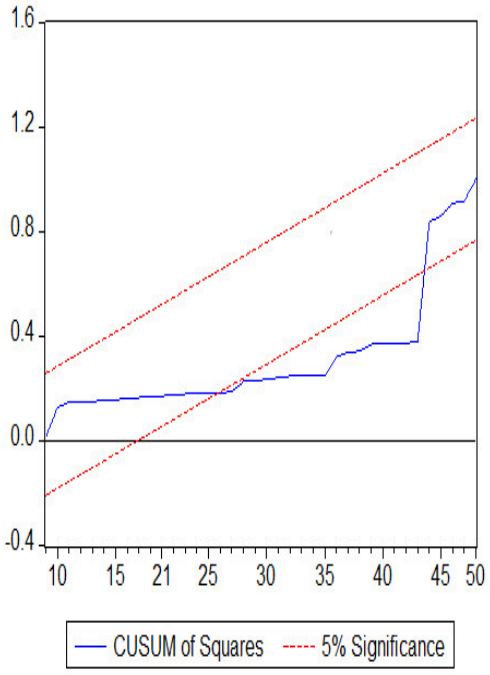

Figure 2: Stability test on LNROAA
Source: Bankscope and authors estimate

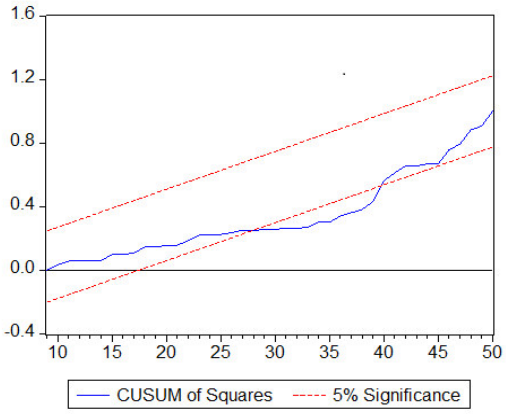

Figure 3: Stability test on LNINTREV
Source: Bankscope and authors estimate

Table 1: Parameter Estimates for ROAA

Wald Test: ROAA			
Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	0.812161	(5, 38)	0.5484
Chi-square	4.060803	5	0.5407
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(2)		-0.15593	0.280508
C(3)		0.186271	0.151647
C(6)		0.130285	0.219428
C(7)		-0.21685	0.184531
C(8)		-0.02795	0.029329
Restrictions are linear in coefficients.			

Source: Bankscope and authors estimate

Table 2: Competitive condition test on LNREV

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	-12.60633	42	0.0000
F-statistic	158.9196	(1, 42)	0.0000
Chi-square	158.9196	1	0.0000
Null Hypothesis: C(2)+C(3)+C(4)=1			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
-1 + C(2) + C(3) + C(4)		-1.07251	0.085077
Restrictions are linear in coefficients.			

Source: Bankscope and authors estimate

Table 3: Competitive condition test on LNINTREV

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	-8.968363	42	0.0000
F-statistic	80.43154	(1, 42)	0.0000
Chi-square	80.43154	1	0.0000
Null Hypothesis: C(2)+C(3)+C(4)=1			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
-1 + C(2) + C(3) + C(4)		-1.1795	0.131519
Restrictions are linear in coefficients.			

Source: Bankscope and authors estimate

Table 4: Equilibrium test on LNROAA

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	-0.511312	38	0.6121
F-statistic	0.26144	(1, 38)	0.6121
Chi-square	0.26144	1	0.6091
Null Hypothesis: C(2)+C(3)+C(4)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(2) + C(3) + C(4)		-0.2059	0.402773
Restrictions are linear in coefficients.			

Source: Bankscope and authors estimate