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Bank competitive landscape and competition in the banking sector in Kenya

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Abstract

This study investigates the evolution of competition among commercial banks in Kenya with changes in the bank competitive landscape. Employing system GMM and the performance dynamics approach, the study establishes that bank consolidation has an inverted U effect on competition in the banking sector in Kenya, growth in technology spurs competition among commercial banks in the short run but is impotent in the long run and the progressive increase in the core capital requirement for commercial banks from KES250 million in 2008 to KES1 billion in 2012 slowed competition in Kenya's banking sector by 3.3 percentage points. Arising from the findings the study concludes that consolidation of commercial banks is a short to medium term instrument for promoting competition in the banking sector in Kenya, growth in technology is effective in promoting competition in Kenya's banking sector in the short run rather than in the long run and blind increases in the core capital requirements can lead to undesired outcome of reduced competition in the banking sector in Kenya.

Keywords: Bank competitive landscape; Intermediation efficiency; Exceptional profits.

1. Introduction

Competition among commercial banks in Kenya has been a core concern to the regulator, the central of Bank of Kenya (CBK), and policy makers. Competition in the banking sector is viewed as a solution to the perennial problem of intermediation inefficiency (Republic of Kenya, 2008). In Kenya, intermediation inefficiency has manifested in the form of high interest rate spreads and lending rates coupled by persistent exceptional bank profits.

The position held by the regulator and policy makers is theoretically sound. Economic theory posits that that in the long run, competition should be able to equalize returns to all economic activities through a dynamic process (Mueller, 1977). Mueller's (1977) starting point is in the short run and with a firm earning exceptional profits above or below the competitive norm. The competitive process begins with attraction of resources into activities earning more than the competitive norm and flow of resources from activities earning less than the competitive norm. In the long run, the flow of resources into and from an activity brings back profitability which is at the level of the competitive norm.

Applying these theoretical propositions to commercial banking, the underpinning argument is that intermediation inefficiency is a shortrun affair. With free entry and exit the phenomenon of exceptional bank profitability driven by high interest rates and wide interest rate spreads should be corrected in the longrun (Chronopoulos, Liu, McMillan and Wilson, 2015). The dynamic process would go on until no new bank is enticed to join or exit the market.

Incumbents enjoying exceptional profits frustrate the dynamic process by erecting barriers to the competitive process. Those experiencing profitability less than the competitive norm enhance the process by adopting more competitive strategies in order to survive. On the other hand, regulators and policy makers implement institutional, legal and policy reforms to achieve intermediation efficiency. These counteracting measures by the market players alter the bank competitive landscape. It is the effect of these alterations in the bank competitive landscape on competition in the banking sector that is of interest in this study.

2. Bank competitive landscape in Kenya

The banking sector in Kenya comprises of the CBK, as the regulator, 43 commercial banks, one mortgage finance company, eight representative offices of foreign banks, nine microfinance banks, two credit reference bureaus, 13 money remittance providers and 87 foreign exchange bureaus (CBK, 2015). The commercial banks compete in terms of size and ownership.

Between 2000 and 2015 there were three government owned banks, 27 domestic privately owned banks and 13 foreign private banks (CBK, 2016). Therefore, banking in Kenya is dominated by domestic privately-owned banks in terms of numbers. The domestic privately-owned banks lead with a market share of 64 per cent, followed by foreign private banks at 31 per cent and finally the government owned banks at five per cent (CBK, 2015). Though this is the situation as at 2015, the market share fluctuated within the period 2000 to 2014. For instance, the market share of private foreign banks reduced considerably from 43 per cent in 2006 to 31 per cent in 2014 (CBK, 2007, 2015). That of government owned banks shrank marginally from 5.7 per cent in 2006 to 5 per cent in 2014. The shrinking in the market shares of the foreign privately owned and government banks was associated with an expansion in the market share for private domestically owned banks from 51.3 per cent in 2006 to 64 per cent in 2014. Therefore, competition among commercial banks is apparent in terms of ownership.

Based on size, commercial banks in Kenya are categorized in terms of the composite market share index (CMSI) (CBK, 2011). A bank with a CMSI of over five per cent is considered large, that with a CMSI between one per cent and five per cent is medium and those with a CMSI of less than one per cent are regarded as small. Arising from this classification, there were six large banks, 15 medium sized banks and 23 small banks in 2010. These numbers remained constant till 2014 (CBK, 2015). On average, between the period 2010 and 2014 53.3 per cent of the banking sector in Kenya was controlled by large sized banks. However, the market share of medium sized banks has gradually increased from 34.5 per cent in 2010 to 41.7 per cent in 2014 whereas that of large sized banks has gradually declined from 56.1 per cent in 2010 to 49.9 per cent in 2014 (CBK, 2011, 2015). Therefore, between the period 2010 to 2014, competition has intensified and the medium sized banks are gradually catching up with the large banks. The market share of small sized banks marginally declined from 9.4 per cent in 2010 to 8.4 per cent in 2014 (CBK, 2011, 2015). This implies that though the small banks are the majority in terms of numbers in the banking sector, they do not pose much competition to the large and medium sized banks.

Overall, over the period 2000 and 2014 commercial banking has been dominated by domestic privately-owned banks in terms of ownership and large banks in terms of size. Therefore, it is expected that efforts to spur and derail competition in the banking sector would imply a wrestling (retention) of market share from the domestic private banks and large banks. It is the effects of the tools (efforts) used to alter the bank competitive landscape on competition among commercial banks in Kenya that is of interest to this study.

3. Evolution of the bank competitive landscape in Kenya

Firms slow competition through blocking imitation, retarding or blocking entry and consolidation (Chronopoulos *et al.*, 2015). The government on the other hand, slows or spurs competition through legal barriers (Goddard, Liu, Molyneux, and Wilson, 2011). This is no different in Kenya. Independently, commercial banks have been altering the bank competitive landscape through adoption of new technologies and financial innovations while the government has been achieving it through legal reforms.

Between 2000 and 2014 the notable legal reforms were motivated by the country's economic blue print: *The Kenya Vision 2030*. The vision acknowledges that Kenya's banking sector is highly segmented and dominated by a few large banks, resulting in reduced competition and high credit costs (Republic of Kenya, 2007). To spur competition the government intervened through creation of incentives for the small banks to consolidate. Consolidation of the small banks was meant to enhance their capacity to compete with large banks and enable them to reap economies of scale in their operations and thereby help in improving intermediation efficiency.

The first medium-term plan (2008-2012) of the *Kenya Vision 2030* altered the bank competitive landscape through consolidation. The medium-term plan operationalized the desire to consolidate the banking sector by progressively enhancing the capital base from KES250 million in 2008 to KES1 billion by 2012 (Republic of Kenya, 2008). To this end, the Banking Act (Cap 488) laws of Kenya was amended in 2008 (CBK, 2009). The amendment progressively increased the core capital requirement for commercial banks from KES250 million in 2008 to KES1 billion in 2012. The rationale of the amendment was that high capital requirements would motivate the small banks to merge or seek other forms of consolidation. It was envisaged that the resulting banks from the mergers would be efficient due to economies of scale and enhanced capacity to compete with large banks. The upward revision of core capital to KES1 billion triggered four mergers and acquisition between 2008 and 2014. The consolidation activities reduced the number of commercial banks from 45 in 2008 to 43 in 2012 (CBK, 2009, 2013). Therefore, the enhancement of the core capital did not effectively address segmentation in the banking sector. Though, the segmentation reduced by a small margin it is important to establish the extent to which consolidation influenced the level of competition among commercial banks since this was the primary objective of the intervention. Further, to judge on the effectiveness of the regulatory change it is significant to establish the effect of change in the core capital requirements on the level of competition.

To protect and improve their positions commercial banks have been leveraging on the technological developments by diversifying their products and improving on service delivery. The common forms of technology adopted by Kenyan commercial banks include Automated Teller Machines (ATM), bank websites, online bill payments, ATM cheques and cash deposits, branchless banking, mobile banking, credit and debit cards and internet banking (CBK, 2014). The motivating factors for adoption of new technologies include extension of banking hours, improving service delivery, connecting customers to the bank system networks during and after working hours, branchless banking, decongesting banking halls and maintenance of big market shares. The most predominant form of technology used by commercial banks in Kenya is the automated teller machines (ATMs). The ATM system has evolved to become alternative delivery channel for services such as cash and cheques deposits and loan applications and processing. Between 2009 and 2014, the number of ATMs rapidly increased from 1,827 in 2009 to 2,613 in 2014 (CBK, 2015). The extent to which this unprecedented growth in the number of ATMs has increased or decreased competition among commercial banks is unclear. This study sought to empirically ascertain the effect.

Overall, therefore, this study sought to establish the effect of changes in the bank competitive landscape on competition among commercial banks in Kenya. Specifically, the study sought to establish the effect of changes in consolidation, technology and regulation (enhancement of the capital requirement) on competition among commercial banks in Kenya.

4. Literature review

4.1. Theoretical literature review

To establish the effect of changes in the bank competitive landscape on competition among commercial banks, the level of competition in the banking sector must be established first. The measurement of competition is generally based on the neo-classical theory of markets. The theory argues that depending on a firm's or buyer's ability to influence price, markets can either be competitive, oligopolistic, monopolistic competition, monopsony or monopoly

(Varian, 2014). The two extreme cases in the continuum are perfect competition and monopoly. Under perfect competition neither the buyer nor seller (firm) has the ability to influence the price given quantity while under monopoly, the seller (firm) has absolute power to set the price given quantity. According to the neo-classical theory of markets, therefore, the measurement of competition is a measure of a firm's power to influence price (Gudmundsson, Ngoka and Odongo, 2013).

Two approaches arise from the Neo-classical theory of markets on the measurement of the power of a firm to influence price. The performance dynamic approach (structure conduct and performance or the Schumpeterian view) and non-performance dynamics approach. The non-performance dynamics approach includes the Lerner Index (LI) and the Panzar and Rosse statistic (H statistic) (Elzinga and Mills, 2011; Panzar and Rosse, 1987) while the performance dynamics approach constitute the Muller's approach (Mueller, 1977).

The performance dynamics approach is more relevant to the present study unlike the non-performance dynamics approach. The approach is due to Mueller (1977). The measurement of competition is conceptualized for markets with free entry and exit. Entry and exit are, in this context considered sufficient to bring profitability quickly in line with the competitive norm (Mueller, 1977). Mueller's starting point is in the short run and with a firm earning exceptional profits above or below the competitive norm. According to Mueller (1977), the competitive process begins with attraction of resources into activities earning more than the competitive norm and flow of resources from activities earning less than the competitive norm. In the long run, the flow of resources into and from an activity brings back profitability to the competitive norm. When the competitive norm is achieved, no firm is enticed to enter or exit an activity (Mueller, 1977).

Pakes (1987) argues, however, that the competitive process is not sudden but smooth. Profits earned in a particular period provide resources to maintain profits into the future. This occurs as firms erect barriers to entry through alterations in the bank competitive landscape. Therefore, profits of all firms slowly converge to the competitive norm with the profitability at one point being directly related to its past profit values even extending the time span far into the past. As such, a firm's evolution of profitability is a measure of competition in an industry (Mueller, 1977). The dependence of profits at one point on past values makes profitability a data generating process (Mueller, 1977). The process has memory and converges to a long run value overtime. Therefore, the profit data generating process is a stationary autoregressive (AR) process. Formally, firm *i*'s profit generating process is given by:

$$\pi_{it} = \alpha_i + \lambda_i \pi_{it-1} + e_{it} \tag{1}$$

where:
e_{it} is white noise error term,
α_i is the permanent component of profits to the firm and
λ_i is the coefficient of profitability in the previous period for the firm

The coefficient of profitability in the previous period (λ_i) shows the proportion of profits in the previous period (t-1) that are retained in the current (*t*) period. This effectively makes this parameter of persistence the measure of competition (Cable and Jackson, 2008). Whatever is not retained is assumed to have been eroded by competition. If (λ_i) is close to one, profits persist and the level of competition is weak. When (λ_i) is close to zero profits do not persist and competition is high. The process in equation 1 is stationary since firms cannot fully retain all their previous period profits. Therefore $|\lambda_i|<1$.

Previous studies on the level of competition among firms using performance dynamics approach and relevant to this study include, Yurtoglu (2004) who studied the persistence of firm level profitability in Turkey, Flamini, Schumacher and McDonald (2009), who studied the determinants of profitability of 389 commercial banks in 41 SSA countries, Goddard *et al*. (2011), who carried out a cross-country study on persistence of bank profitability for a sample of 65 countries from developing and developed countries for the period 1997 to 2007, and Chronopoulos *et al.* (2015), who studied the dynamics of bank profitability in the US arising from regulatory changes during the period 1984-2010.

4.2. Empirical literature review

Yurtoglu (2004) studied the persistence of firm level profitability in Turkey using 172 of the largest manufacturing firms. The study estimated the level of competition (profit persistence) among the firms using Muller's approach. To establish the effect of the changes in the bank competitive landscape on the level of competition, the study regressed the parameters of equation 1 against firm and industry wide covariates. Therefore, the study used a two-stage process. In the first stage, the study estimated the parameters of equation 1 while in the second the estimated parameters were regressed against firm and industry wide characteristics as follows:

$$\lambda_i = f(IND_t, X_{it}) \tag{2}$$

where:

IND is a vector of variables capturing industry and economy wide covariates, X_{it} is a vector of firm characteristics

This approach is similar to that of Gschwandtner (2005), who studied profit persistence in the long run using 85 survivors and 72 non-survivor firms drawn from various industries in the US economy for the period 1950-1999, and Goddard *et al*. (2011), who carried out a cross country study on persistence of bank profitability for a sample of 65 countries from developing and developed countries. The approach treats the estimation of profit persistence as first stage and its determination as second stage. The present study follows the inclusion of firm and industry wide covariates such as market share, size of company assets, company growth rates and industry concentration in estimating the effect of changes in the bank competitive landscape on the level of competition among commercial banks in Kenya. However, the present study differs with the separation of the processes in two stages. The specification in equation 2 ignores the autoregressive nature of profits. It assumes that the profit data generating process acts independent of the control variables. A view that is against the performance dynamics approach (Pakes, 1987; Cable and Jackson, 2008).

Flamini *et al.* (2009) studied the determinants of profitability of 389 commercial banks in 41 SSA countries. Using Muller's (1977) approach, this study sought to unravel why banks in SSA were more profitable than the rest of world yet the region posted weak economic performance. The study further sought to establish whether the high bank returns were a negative feature of financial intermediation in SSA countries. The study used regression analysis to investigate the impact of firm, industry and macroeconomic variables on bank returns using annual bank and macro level data. The firm characteristics included bank size, activity and diversification, and ownership structure. Industry characteristics comprised regulations and technological changes whereas the macroeconomic variables included inflation and income. Rather than estimate the level of persistence first, Flamini *et al*. (2009) included the control variables directly in equation 1. This approach differs with that of Yurtoglu (2004), Gschwandtner (2005) and Goddard *et al.* (2011). However, the approach is similar to that of Chronopoulos et al. (2015) who studied the dynamics of bank profitability in the US arising from regulatory changes during the period 1984 to 2010 and Eklund and Desai (2013) who carried out a cross country study on the effects of entry regulations on competitive markets and the speed of elimination of abnormal profits for 59 countries during the period 1998-2011. Flamini *et al.* (2009), Chronopoulos *et al*. (2015) and Eklund and Desai (2013) augmented static determinants of bank profitability as control variables in equation 1. These studies used the bank and industry level covariates used by Flamini *et al*. (2009) with the addition of bank risks exposures, liquidity, bank capital and concentration using the Herfindahl Hirschman Index (HHI). Therefore Flamini *et al*. (2009), Chronopoulos *et al.* (2015) and Eklund and Desai (2013) used the following specification:

$$\pi_{it} = \alpha_i + \alpha_1 \pi_{it-1} + \alpha_2' BR_t + \alpha_3' (BR_t \times \pi_{it-1}) + \alpha_4' IND_t + \alpha_5' X_{it} + \gamma_i + e_{it} \quad (3)$$

where:

BR is a vector of variables capturing regulatory change,

IND is a vector of variables capturing industry and economy wide covariates,

X_{it} is a vector of bank characteristics and

γ_i is an Individual bank effects which could be random or fixed

The present study adopts the specification in equation 3. This specification treats the profit generating process as an autoregressive process and prevents any bias resulting from the omission of control variables in equation 1. In addition, the approach augments the two stages of persistence and determinants of persistence. A scenario that best describes the real situation in various contestable markets. Importantly, the specification assumes that regulatory changes, *BR*, do not directly affect a bank's profitability. Rather regulation acts through retention of previous period profits. Therefore, to capture the impact of regulatory change, this approach introduces dummies and interacts them with the lagged value of profits.

Though the present study borrows model specification and some covariates from the mentioned studies, it differs from them on two accounts. First, unlike Yurtoglu (2004), Gschwandtner (2005), Eklund and Desai (2013) and Chronopoulos *et al*. (2015), the present study establishes the effects of changes in the bank competitive landscape on competition in the banking sector in a developing rather than a developed country setup. Second, unlike the cross-country study by Flamini *et al.* (2009) the present study is country-specific. Cross-country studies have a weakness that strong conclusions or policy recommendations cannot be arrived at. Therefore, this study presents a case specific to Kenya or a developing country that can be used to make strong conclusions and policy recommendations.

5. The empirical approach

5.1. The models

The objectives of this study are three-fold but achieved using the following two models. The model follows the performance dynamics approach used by Flamini *et al*. (2009), Chronopoulos *et al.* (2015) and Eklund and Desai (2013). Model 3 is extended as shown in model 4.

$$\pi_{it} = \beta + \sum_{j=1}^{p} \lambda_j \pi_{it-j} + \beta_4 BR_t + \sum_{j=1}^{p} \beta_j (BR_j \times \pi_{it-j}) + \beta_5' IND_t + \beta_6' X_{it} + \theta_i + u_{it} \tag{4}$$

where:

IND_t is an industry wide vector of variables comprising of economic growth, technological change, inflation and consolidation.

X_{it} is a vector of bank specific covariates which comprise of bank risk exposures, bank size, diversification, bank capital, bank ownership structure and liquidity.

θ_i is individual bank specific effects which could be random or fixed.

Unlike equation 1 and 3 equation 4 is generalized up to j^{th} lag following Cable and Jackson (2008) who proposed the use of an appropriate lag length. Further, equation 4 assumes an industry view by making the permanent component of profits, β, bank invariant.

The inclusion of lags of profitability on the right-hand side of equation 4 makes it a shortrun equation.[1] Therefore, equation 4 gives the shortrun effect of consolidation, growth in technology and regulation. To obtain the long run effect of consolidation and growth in technology[2] the following model is estimated.

$$\pi_{it} = \beta_0 + \beta_1' IND_t + \beta_2' X_{it} + u_{it} \tag{5}$$

Equation 5 drops the dynamic component making it the long run model. To capture the effect of consolidation and growth in technology the short run and the long run coefficients from model 4 and 5 are interpreted. To capture the effect of the enhancement of the core capital requirement the coefficient of interest in equation 4 is $\sum_{j=1}^{p}(\lambda_j + \beta_j BR_j)$. When the regulation is in force BR_j is equal to one. Therefore, the coefficient of interest is $\sum_{j=1}^{p}\lambda_j + \sum_{j=1}^{p}\beta_j$. To get the effect of the body of regulations on bank profitability the signage of $\sum_{j=1}^{p}\beta_j$ was considered. If

[1] partial adjustment processes only occur in the short run (Verbeek, 2008)

[2] regulations act through the dynamic component and, therefore, their effect can only be experienced in the shortrun

the overall effect is negative, then BR would have enhanced competition. If the sign is positive the regulation will have reduced competition.

5.2. Models diagnostics

Equation 4 is a linear dynamic panel data model since it includes the lags of the dependent variable on the right-hand side. This affected the estimation method as well as the diagnostic tests conducted. The presence of the lagged profits on the right-hand side of equation 4 causes endogeneity problems. As such, ordinary panel data estimation methods such as pooled ordinary least squares (POLS), random effects and fixed effects model yield inconsistent estimates (Blundell and Bond, 1998). To address the problem, the Generalized Method of Moments (GMM) was used. The GMM estimator reduces potential bias and asymptotic imprecisions (Arioglu and Tuan, 2014). As such, equation 4 was estimated using GMM. Equation 5 is a static panel model. This means that it can be estimated using Fixed Effects (FE) and Random Effects (RE) models depending on the assumption on the one-way error component (Baltagi, 2008). To discriminate between the FE and RE models the Hausman test was used.

To test the precision of the GMM estimates, the results were compared with those of Pooled Ordinary Least Squares (POLS) and FE. The GMM estimate of the coefficient of lagged dependent variable lies between that POLS and FE (Roodman, 2006). The POLS estimate biases the estimate upwards whereas the fixed effect estimate biases the estimate downwards (Roodman, 2006). For precision of the estimates in the study, the coefficients of the lagged dependent variable were considered admissible if they lay between the dynamic fixed effects estimates and naive OLS estimates. Further, due to the GMM specification, relevant tests on the specification of the process were conducted. Specifically, over identification restrictions and validity of instruments tests were conducted using Hansen test as put forth by Roodman (2006).

The dependent variable and the lagged dependent variables in equations 4 and 5 are normalized. The normalization does away with macroeconomic cycles and, therefore, most studies on persistence of profits and competition report stationarity (Crespo Cuaresma and Gschwandtner, 2006).[3] This fact was further supported by the case of large individuals (*N*) than time period (*T*). However, there is limited literature defining ‘large’ and ‘small’ *T*. Samples with a less than

[3] Non-stationarity would imply that exceptional profits persist unduly. A fact inconsistent with theory and expectations.

10 years or waves are classified as micro while those with a more than 20 years or waves are classified as macro (Blackburne and Frank, 2007). This leaves studies with $10 < T < 20$ in a tepid situation. The present study had 14 years and, therefore, in the inconclusive situation. To authoritatively use the dynamic panel approach, the study had to verify and confirm the level of stationarity of the ratio scaled variables used.

The use of GMM in estimation of linear dynamic models such as 4 is anchored on the assumption of first order serial correlation in the error term only (Roodman, 2006). The GMM permits instruments from the second lag of the dependent variable if the assumption of first order serial correlation only holds (Roodman, 2006). Therefore, higher order serial correlation invalidates the use of instruments Baltagi (2008). As such, a test for first order and higher orders of serial correlation is both a test for autocorrelation and specification. For application of GMM, first order serial correlation should be present and second order serial correlation onwards absent in the error terms Roodman (2006).

To test for autocorrelation, and therefore, specification, Arrellano and Bond (1991) test of first and second order serial correlation was used. To arrive at the correct specification, deeper lags of the dynamic component of model 4 were explored with a starting point of an AR(1) process. The optimal lag length of the AR(p) process was obtained when the assumption of presence of first order serial correlation and absence of second order serial correlation or any other higher order serial correlation held. Further, all the lags admissible under this assumption had to be statistically significant (Roodman, 2006). The use of GMM is based on moment conditions (Roodman, 2006). The moment conditions proliferate with the number of instruments used. This can sometimes cause imprecision in estimation (Roodman, 2006). As such, the study tested whether the moment conditions established by a particular number of instruments were over identified. Hansen test for over identifying restrictions was used.

5.3. The data and definition ovariables

The study used published panel data for 36 commercial banks that continually existed during the period 2001 to 2014. Data on bank size, asset growth, bank risks exposures, diversification, liquidity, bank capital, ownership structure, technological change and regulations was obtained from bank supervision annual reports from the CBK as well as published financial statements from individual commercial banks. Data on inflation and economic growth was obtained from statistical abstracts published by the Kenya National Bureau of Statistics (KNBS). The variables were measured and defined as shown in Table 1.

TABLE 1: DEFINITION AND MEASUREMENT OF VARIABLES

Variable	**Definition**	**Measurement**
Profits, π_{it}~	Returns on Assets (ROA) of bank i in year t	Percentage normalized annual returns on assets $\pi_{it} = \frac{ROA_{it} - \overline{ROA_t}}{\overline{ROA_t}}$
	Industry Characteristics *(IND_t)*	
Economic Growth, (EG)	Is the percentage change in national income in a given year	Percentage change in national income
Concentration, (HHI)	A measure of the degree of concentration in the banking industry.	Sum of the squares of each bank's market shares of each year
Technological change, (TC)	Growth in the number of ATMs	Percentage change in the number of ATMs
Inflation (INF)	The continuous rise of the general price level of goods and services.	Percentage change in the general price level of goods and services
	Firm Characteristics *(XI_t)*	
Bank size, (BS)	The total assets of bank i at time t	The total assets of bank i in period t in Kenya Shillings
Bank risk exposures, (BRE)	Banks' exposure to credit risk	The ratio of net charge offs to gross loans in percentage form
Diversification, (D)	A banks dependence on other sources of income rather than the core business of lending	The ratio of non-interest income to total operating income in percentage form
Bank capital, (BC)	Banks contribution to capital	The ratio of equity to total assets in percentage form
Ownership structure, (OS)	A dummy variable that shows ownership structure of a bank with reference category of domestic ownership.	Takes a value of 1 if more than 50% of a bank's shareholding is foreign and zero otherwise
Liquidity, (L)	The liquidity and lending specialization of a bank	The ratio of loans to assets in percentage form
	Regulatory Covariates	
Body of regulations, (BR)	A dummy variable showing the amendment of the Banking Act (Cap 488) that increased the core capital requirement for commercial banks from KES250 million in 2008 to KES1 billion in 2012.	Sets to one when the regulation is in force and zero otherwise

6. Results

The adjacency and spread of bank level characteristics is shown in Table 2.

Table 2: Overall Summary Statistics of Ratio Scaled Variables

Variables	Unit of Measurement	N=nxT	Mean	SD	Min	Max
Bank Size	KES mn	504	32,594	53,779	502.3	383,038
ROA	Percentage	504	2.81	2.151	-6.5	9.5
Normalized ROA	Percentage	504	0.318	1.219	-4.64	6.82
Bank Risk Exposures	Percentage	504	10.21	12.15	0.1	77.1
Diversification	Percentage	504	16.03	10.11	0	58.81
Bank Capital	Percentage	504	16.87	9.521	5.6	76.51
Liquidity	percentage	504	59.51	22.154	19.77	185.73
Economic Growth	percentage	N/A	4.242	1.062	2.5	7.1
Herfindahl-Hirschman Index	Sum of squared market share	N/A	0.071	0.01	0.059	0.092
Number of ATMs	Count numbers	N/A	1287.85	949.56	166	2613
Inflation	Percentage	N/A	8.1	3.959	2	15.1

Table 2 shows that the mean bank size for the pooled data is KES32.6 billion with the smallest and largest banks for the entire period having net assets worth KES502.3 million and KES383 billion, respectively. Therefore, in terms of size, as proxied by net assets the sample had markedly dissimilar commercial banks, a fact that is consistent with the population under study. The ROA for the sample over the period 2001 to 2014 was on average 2.81 per cent. When the period was considered as a whole, ROA ranged from -6.5 per cent to 9.5 per cent with the observations approximately 2.151 standard deviation units from each other. Thus, the sample obeys the criterion for diminishing outliers in the data adopted by the study.

The summary statistics presented in Table 2 further show that on average, pooled bank risk exposures series had a mean of credit risk up to 10.21 per cent. However, the risk exposure varied over the period from 0.1 per cent to 77.1 per cent with a standard deviation of 12.15. Therefore, irrespective of the bank and time, the levels of risk exposures have a vast spread for the sample over the period 2001 to 2014 with the observations approximately 12.15 standard deviation units from each other. With regards to diversification, the data presentation in Table 2 shows that the pooled data for diversification had a mean of 16.03 per cent and a standard deviation of 10.11 with a range from zero to 58.81 per cent. Therefore, over the period, some banks concentrated on core business of lending money while others supplemented their interest income with non-interest income.

Further, the data summarized in Table 2 shows that pooled bank capital series had a mean of 16.87 per cent and a standard deviation of 9.521, with a range from 5.6 per cent to 76.51 per cent. This means that over the period 2001 to 2014, the assets that shareholders had a residual claim on were on average 16.87 percent and had a spread of 70.91 per cent. Finally, Table 2 shows that the mean outstanding loan to net assets ratio was 59.51 per cent with a standard deviation of 22.15 and a spread from 19.77 per cent to 185.73 per cent. On average, therefore, over the period 2001 to 2014, commercial banks' lending did not exceed their net assets. Since the ratio of outstanding loans to net assets was a proxy of liquidity risk, the fact that commercial banks' lending did not exceed their net assets implies that over the period of analysis liquidity risk was moderate. As such, commercial banks could have met a sudden liquidity need through a fire up sale of assets.

Table 2 shows that the average economic growth for the period 2001 to 2014 was 4.24 per cent, with a standard deviation of 1.062 per cent. The minimum growth rate over the period of analysis was 2.5 per cent while the maximum was 6.1 per cent. Therefore, the economic growth over the study period was moderate presenting the commercial banks with a moderate room for growth. The summary statistics in Table 3 also shows that on average the banking sector had a concentration of 0.071. This figure is slightly greater than zero and by far less than one. Therefore, the banking sector was characterized by a large number of commercial banks over the study period. The maximum value and the minimum value of commercial bank concentration were 0.09 and 0.06, respectively. Thus, the spread of bank concentration over the period was 0.03, revealing that the number of banks in the banking sector in Kenya had no substantial changes over the period 2001 to 2014.

6.2. Diagnostic tests

6.2.1. Stationarity tests

The study used a dynamic panel estimation approach that assumes that the variables are stationary. The study tested this assumption for both bank characteristics and industry characteristics. The tests were individual and common for bank characteristics and individual for industry wide characteristics.

Im, Pesaran and shin, ADF-Fisher chi-square and PP-Fisher chi-square tests were used to test the null hypothesis to ensure that the conclusions arrived at were robust. Table 3 presents a summary of the findings.

Table 3: Stationarity Test Results

Common Unit Root Test		Individual Tests		
Variable	**Levin, Lin &Chu**	**Im, Pesaran and Shin (IPS) Test**	**ADF Fisher chi-Square Test**	**PP-Fisher Chi-square test**
Normalized return on Assets	-8.520***	-4.611***	137.877***	329.520***
Economic Growth		-3.040***	110.888***	259.586***
Herfindahl-Hirschman Index		-3.106***	111.485***	297.865***
Growth in technology		-3.526***	117.836***	284.402***
Inflation		-3.323***	117.737***	277.223***
Bank Size	-4.731***	-3.892***	123.346***	303.701***
Bank risk Exposures	-8.366***	-4.373***	135.634***	291.233***
Diversification	-10.234***	-5.513***	159.288***	358.680***
Bank capital	-2.810***	-3.644***	123.913***	305.096***
Liquidity	-8.739***	-7.748***	192.790***	318.678***

Note: ***P-value less than 0.01

Table 3 shows the summary of the findings on stationarity. All the tests have a null hypothesis of presence of a unit root. Therefore, a rejection of null hypothesis would imply that the series in question was stationary. Table 3 shows that the test statistics for testing the null (presence of the unit root) against the alternative (stationarity) for bank covariates had p-value less than 0.01. The test statistics are greater than the critical values for all the covariates at one per cent level of significance, leading to the rejection of the null hypothesis. This finding is consistent for all the tests and, therefore, robust. Thus, each bank covariate is stationary per bank and as a pooled sample series.

With respect to industry wide covariates, Table 3 shows that the test statistics have p-values less 0.01 for all tests and, therefore, greater than the critical values at one per cent level of significance. Thus, all the unit root tests reject the null hypothesis of a unit root making this finding robust. Thus, the industry wide covariates are stationary for the period 2001 to 2014.The stationarity of bank and the industry wide characteristics satisfies the inherent assumption of stationarity required by micro-panels. Therefore, the study can safely apply the generalized method of moments (GMM) in the estimating models without the fear of spurious results.

TABLE 4: DETERMINATION OF OPTIMAL LAGS OF NORMALIZED RETURN ON ASSETS

VARIABLES	AR(1)	AR(2)	AR(3)	AR(4)
1st lag of Normalized return on Assets	0.817***	1.666***	2.245***	2.359***
	(0.0221)	(0.0314)	(0.0611)	(0.0770)
2nd lag of Normalized return on Assets		-0.738***	-1.793***	-1.995***
		(0.0273)	(0.106)	(0.147)
3rd lag of Normalized return on Assets			0.502***	0.625***
			(0.0495)	(0.0983)
4th lag of Normalized return on Assets				-0.0143
				(0.0269)
Economic Growth	-0.311	-0.470***	0.326***	0.161***
	(0.189)	(0.111)	(0.0567)	(0.0591)
Herfindahl-Hirschman Index	27.34***	2.512	-81.54***	21.47
	(8.061)	(5.253)	(8.913)	(18.15)
Growth in Technology	0.518***	0.473***	-0.922***	-0.0543
	(0.180)	(0.121)	(0.105)	(0.152)
Inflation	-0.0196**	-0.0198***	0.0930***	-0.0180
	(0.00820)	(0.00581)	(0.00978)	(0.0190)
Bank size	0.313	-0.0322	-0.00538	0.0235
	(0.207)	(0.0742)	(0.0364)	(0.0485)
Bank Size squared	-0.0115	0.00238	0.00101	-0.000605
	(0.0102)	(0.00349)	(0.00175)	(0.00234)
Bank risk Exposures	0.00782**	-0.000450	0.000432	0.000265
	(0.00302)	(0.00113)	(0.000580)	(0.000647)
Diversification	-0.00275	0.000398	-0.000495	-0.000236
	(0.00289)	(0.000905)	(0.000614)	(0.000428)
Bank capital	0.00329	-0.000446	0.000109	0.000759*
	(0.00299)	(0.00111)	(0.000541)	(0.000380)
Liquidity	-0.00189	-0.000375	-0.000422	-0.000206
	(0.00203)	(0.000594)	(0.000280)	(0.000448)
i.Foreign Domestic Bank	-0.0726	0.0478	0.00548	0.00567
	(0.0742)	(0.0292)	(0.0163)	(0.0219)
i.Private Public Bank	0.186**	0.0353	0.0270	0.0238
	(0.0797)	(0.0420)	(0.0211)	(0.0180)
Constant	-6.009***	-1.142	9.746***	-1.825
	(1.616)	(0.861)	(1.025)	(2.085)
Observations	468	432	396	360
Number of id	36	36	36	36
AB test for AR(1) in first differences	0.002	0.007	0.013	0.140
AB test for AR(2) in first differences	0.007	0.002	0.167	0.520
Satisfaction of bounds	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$,

Table 4 shows the introduction of the first to the fourth lags of normalized return on assets in model 4. The estimated coefficients of the lagged dependent variable lie between those of the fixed effects and nave OLS for all the models. However, not all the versions satisfy the Arrellano and Bond test of autocorrelation. For the *AR*(1) and *AR*(2) model, the null hypothesis that the error term has no first order and second order serial correlation is rejected. For the *AR*(3) the null hypothesis is rejected for the first differences but not rejected for the second differences. The *AR*(4) model fails to reject the null hypothesis for both the first and second order serial correlation. Estimation of dynamic panel data models using GMM is anchored on the assumption of first order serial correlation in the error term and no higher order serial correlation say of order two Roodman (2006). Therefore, based on the Arellano and Bond test of autocorrelation, the *AR* version of the estimating models that best fit these assumptions is *AR*(3). In addition, Table 4 shows that the lag preceding an insignificant lag of normalized return on assets is the third lag since the coefficient of the fourth lag of normalized return on assets is insignificant. Therefore, the study adopted an *AR*(3) framework.

6.2.3. Choice of the number of instruments

To select the number of instruments in the optimal *AR* structure a sensitivity analysis ranging from severe, moderate to no restrictions of instruments was carried out. The most severe restriction for the *AR*(3) framework of the estimating models was the use of first lag only. The no restriction was the use of the first to the 13^{th} lag since the study had 14 years (time periods). Table 5 shows the results of the sensitivity analysis. Table 5 shows that the lags of instruments used, notwithstanding the satisfaction of bounds, holds and first but not second order serial correlation is present in the error term. For instance, the AB test for *AR*(1)for lag(1 1), lag(1 2), lag(1 3), lag(1 7) and lag(1 13) has corresponding P-values of 0.031, 0.021, 0.016, 0.014 and 0.013 respectively. The P-values are all less than 0.05, therefore, at five per cent level of significance the null hypothesis of no first order serial correlation is rejected at five per cent level of significance. In addition, the AB test for *AR*(2) for lag(1 1), lag(1 2), lag(1 3), lag(1 7) and lag(1 13) has corresponding P-values of 0.214, 0.199, 0.183, 0.168 and 0.167 respectively. The P-values are all greater than 0.05, therefore, at five per cent level of significance the null hypothesis of no second order serial correlation is not rejected at five per cent level of significance. Therefore, the assumptions for the application of GMM holds for the *AR*(3) specification of the estimating models, no matter the lags of instruments used. This further supports the fitness of the *AR*(3) framework on the data.

Table 5 shows that the severely restricted number of instruments was 53 while the unrestricted number of instruments was 98. When the instruments are allowed to proliferate from 53 to 98, the coefficients of the first to the third lag increase from 2.125, -1.637 and 0.444 to 2.245, -1.793 and 0.502, respectively. Therefore, the coefficients are marginally rather than excessively sensitive to the number of instruments used. This supports the parsimonious nature of the *AR*(3) specification. Further, when the instruments proliferate, the Hansen P-value increases from 0.830 to a perfect value of one. Thus, an increase in the number of instruments from 53 to 98 leads to a strong failure of rejecting the null hypothesis of the Hansen test that the over-identifying restrictions hold.

Table 5 further shows that when the number of instruments multiplies from 53 to 98, the number of variables explaining variation in profitability other than the lagged dependent variables increases from four to six at the count of 62 instruments and finally to four at the count of 98 instruments. Thus, proliferation of instruments has an inverted U effect on the explanatory powers of variables with the maximum being at 62.

Thus, based on the facts that proliferation of instruments increases the coefficient of the three lags of normalized return on assets marginally and explanatory power of other independent variables reaches its peak at 62 instruments. The present study chose to use the first and second lags *lag*(1 2) of the dependent variables as instruments as well as the other exogenous variables (firm and industry wide covariates).

Table 5: Determination of Optimal Number of Instruments

ARIABLES	Lag(1 1)	Lag(1 2)	Lag(1 3)	Lag(1 7)	Lag(1 13)
1st lag of Normalized return on Assets	2.125*** (0.106)	2.161*** (0.0778)	2.192*** (0.0695)	2.236*** (0.0605)	2.245*** (0.0611)
2nd lag of Normalized return on Assets	-1.637*** (0.168)	-1.687*** (0.128)	-1.723*** (0.116)	-1.781*** (0.105)	-1.793*** (0.106)
3rd lag of Normalized return on Assets	0.444*** (0.0762)	0.465*** (0.0589)	0.477*** (0.0535)	0.498*** (0.0488)	0.502*** (0.0495)
Economic Growth	0.272*** (0.0639)	0.288*** (0.0567)	0.301*** (0.0564)	0.321*** (0.0562)	0.326*** (0.0567)
Herfindahl-Hirschman Index	-74.52*** (9.364)	-76.57*** (8.830)	-78.45*** (8.699)	-81.02*** (8.904)	-81.54*** (8.913)
Growth In Technology	-0.823*** (0.116)	-0.852*** (0.106)	-0.877*** (0.104)	-0.913*** (0.105)	-0.922*** (0.105)
Inflation	0.0851*** (0.0107)	0.0875*** (0.00990)	0.0895*** (0.00965)	0.0924*** (0.00977)	0.0930*** (0.00978)
Bank Size	0.0980 (0.0814)	0.0702 (0.0678)	0.0461 (0.0554)	0.00695 (0.0397)	-0.00538 (0.0364)
Bank size Squared	-0.00364 (0.00377)	-0.00233 (0.00318)	-0.00132 (0.00259)	0.000441 (0.00190)	0.00101 (0.00175)
Bank risk exposures	0.00229 (0.00167)	0.00206 (0.00140)	0.00144 (0.00110)	0.000725 (0.000653)	0.000432 (0.000580)
Diversification	-0.000627 (0.00120)	-0.000728 (0.00104)	-0.000555 (0.000855)	-0.000510 (0.000634)	-0.000495 (0.000614)
Bank Capital	0.000697 (0.00115)	0.000466 (0.000998)	0.000342 (0.000762)	0.000130 (0.000567)	0.000109 (0.000541)
Liquidity	-0.000956 (0.000777)	-0.00106* (0.000619)	-0.000755 (0.000498)	-0.000546* (0.000305)	-0.000422 (0.000280)
i.Foreign Domestic Bank	0.00997 (0.0372)	-0.0103 (0.0276)	0.00299 (0.0231)	0.00172 (0.0164)	0.00548 (0.0163)
i.Private Public Bank	0.133 (0.0819)	0.108* (0.0625)	0.0824 (0.0502)	0.0417 (0.0248)	0.0270 (0.0211)
Constant	8.243*** (1.319)	8.681*** (1.147)	9.046*** (1.080)	9.605*** (1.045)	9.746*** (1.025)
Observations	396	396	396	396	396
AB test for AR(1) in first differences	0.031	0.021	0.016	0.014	0.013
AB test for AR(2) in first differences	0.214	0.199	0.183	0.168	0.167
Number of Instruments	53	62	70	92	98
Hansen J	27.05	27.85	25.35	25.95	23.03
Hansen P	0.830	0.973	0.999	1.00	1.00
Satisfaction of Bounds	Yes	Yes	Yes	Yes	Yes
Over identifying Restrictions	35	52	74	80	36

Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05,

6.2.4. Hausman test

To determine whether the fixed or random effects estimates of the static model 5 should be interpreted, Hausman test was used and the chi statistic reported in Table 6. The results presented in Table 6 show that the Hausman Chi-statistic is 18.22 with a corresponding p-value of 0.0327. Thus, the Chi statistic is greater than the tabulated value at five per cent level of significance. Therefore, the null hypothesis of no systematic difference between the estimates of the random effects model and fixed effects model is rejected at five per cent level of significance. Thus, the Fixed Effects model should be interpreted as the long run (static) model.

6.3. The effect of changes in the bank competitive landscape on competition in the banking sector

To establish the effect of changes in the bank competitive landscape on competition in the banking sector in Kenya, an $AR(3)$ variant of model 4 and the fixed effect variant of model 5 were estimated. Table 6 reports the findings.

6.3.1. Effect of change in consolidation

To examine the effect of consolidation on competition among commercial banks in Kenya the coefficient of Herfindahl-Hirschman Index was interpreted. Table 6 shows that in the short run the coefficient of Bank concentration in the efficient GMM specification is -80.10 with a corresponding p-value less than 0.01 in the short run model. Thus, the coefficient was significantly different from zero at one per cent level of significance. The coefficient was negative indicating that an increase in concentration in the short run reduces bank profitability, and therefore increase competition among commercial banks. Therefore, in the short run, market led movement from a huge number of very small banks to a single large bank slows persistence of bank profits and therefore, increases competition among commercial banks holding other factors constant.

Table 6 further shows that in the long run the coefficient of the Herfindahl-Hirschman index in the fixed effects variant of the long run models is 31.46 with a corresponding p-value less than 0.05. Thus, the coefficient was significantly different from zero at five per cent level of significance. Thus, an increase in concentration in the long run increases bank profitability and slows competition in the banking sector. Therefore, in the long run, prolonged consolidation would enhance persistence of bank profitability and slow competition in the banking sector holding other factors constant.

Table 6: Effect of changes in the bank competitive landscape on competition in the banking sector in Kenya

VARIABLES	**Fixed effects**	**System GMM**	**Naïve OLS**	**Fixed Effects**	**Random Effects**
1st Lag of Normalized return on assets	1.903*** (0.0502)	2.079*** (0.0827)	2.115*** (0.0480)		
2nd Lag of Normalized return on assets	-1.318*** (0.0805)	-1.532*** (0.138)	-1.599*** (0.0787)		
3rd Lag of Normalized return on assets	0.313*** (0.0371)	0.401*** (0.0642)	0.429*** (0.0356)		
Body of regulations	0.0298* (0.0159)	0.00780 (0.0266)	0.0224 (0.0168)		
BR×$NROA_{t-1}$	0.311*** (0.0712)	0.356*** (0.0984)	0.327*** (0.0678)		
BR×$NROA_{t-2}$	-0.478*** (0.126)	-0.600*** (0.174)	-0.508*** (0.118)		
BR×$NROA_{t-3}$	0.165*** (0.0620)	0.277*** (0.0904)	0.215*** (0.0565)		
Economic growth	0.254*** (0.0711)	0.354*** (0.0542)	0.373*** (0.0758)	0.389 (0.476)	0.359 (0.480)
Herfindahl-Hirschman Index	-72.55*** (7.603)	-80.05*** (11.14)	-84.45*** (8.204)	31.46** (15.19)	31.53** (15.34)
Growth in technology	-0.803*** (0.118)	-0.937*** (0.132)	-1.000*** (0.128)	-0.663 (0.420)	-0.656 (0.425)
Inflation	0.0782*** (0.00899)	0.0892*** (0.0110)	0.0935*** (0.00963)	-0.000575 (0.0251)	0.00519 (0.0252)
Bank Size	-0.0329 (0.0513)	0.0826 (0.0622)	0.0257 (0.0363)	1.813*** (0.382)	1.709*** (0.374)
Bank size squared	0.00220 (0.00239)	-0.00342 (0.00289)	-0.000815 (0.00179)	-0.0781*** (0.0185)	-0.0714*** (0.0182)
Bank risk exposures	0.00111 (0.000793)	0.00217 (0.00146)	0.000523 (0.000432)	-0.0210*** (0.00504)	-0.0200*** (0.00485)
Diversification	0.000224 (0.000842)	-0.000192 (0.000849)	2.79e-06 (0.000367)	-0.00472 (0.00660)	-0.00696 (0.00593)
Bank capital	0.000524 (0.00115) (0.000409)	-0.000362 (0.000778) (0.000744)	-0.000332 (0.000491) (0.000209)	0.0817*** (0.00715) (0.00250)	0.0738*** (0.00682) (0.00242)
i. Foreign or Domestic Bank		-0.0430 (0.0295)	-0.00172 (0.00570)		0.269 (0.226)
i. Private or Public Bank		0.0951 (0.0590)	0.0211** (0.00858)		-0.0382 (0.344)
Constant	8.909*** (1.041)	9.227*** (1.468)	10.15*** (1.102)	-10.16*** (2.587)	-9.653*** (2.602)
Hausman Chi				18.22***	

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The finding that consolidation reduces persistence of profitability in the short run but not in the long run is consistent with theory and expectations. According to the neoclassical theory of markets, a move from very many small firms to few large firms increases competition and slows persistence of profitability but a movement from many small firms to one large firm increases persistence of profitability and slows competition (Varian, 2014).

The fact that consolidation reduces persistence of profitability and increases competition in the short run but does otherwise in the long run implies that consolidation has an inverted U effect. The finding points to an optimal level of consolidation beyond which profits persist and competition is reduced. This is consistent with the findings by Chronopoulos *et al*. (2015) who found that increased industry concentration leads to reduced profitability in the US banking sector in the short run. However, the results contradict those of Flamini *et al*. (2009) who established that market concentration has no direct effect on bank profitability for commercial banks in Sub-Saharan Africa. The contradiction may be explained by the different measures of concentration used by the studies. The present study used HHI while Flamini *et al*. (2009) used of overhead costs on bank profitability. In addition, Flamini *et al*. (2009) expected that market concentration would enter the regression significantly and with a negative sign just as is the case with the present study. Therefore, the finding that consolidation reduces persistence of profitability and increases competition in the short run but does otherwise in the long run is consistent with both theory and empirical literature.

6.3.2. Effect of change in technology

The results presented in Table 6 show that in the short run the coefficient of the log of the number of ATMs, shown as Growth in technology in the efficient GMM model is -0.937 with a corresponding p-value of less than 0.01. Therefore, the coefficient is significantly different from zero at one per cent. Since the number of ATMs enters model 4 in log form and normalized return on assets is in percentage form, the coefficient of the number of ATMs can be interpreted as an elasticity. Thus, other things being equal and in the short run a one per cent increase in the level of technology in the banking sector in Kenya reduces bank profitability by 0.937. Accordingly, in the short run, growth in technology increases competition holding other factors constant.

The finding that increase in level of technology increases competition and thereby reduces persistence of profits is consistent with theory and expectations.

According to the neo-classical theory of markets, a perfectly competitive market sells a homogeneous product and, therefore, consumers will purchase the product from sellers who quote the least price (Varian, 2014). In Kenya, technology makes the products offered by commercial banks to be similar and easily imitable (CBK, 2014). Thus, commercial banks in Kenya compete in terms of prices to attract customers. This leads to price reductions and subsequent reduction in profits and increased rivalry (competition) among them. Equity Bank, for example, is credited for the onset of mobile banking due to their innovative partnership with Safaricom in May 2010 (CBK, 2011). However, the product was quickly replicated by Family Bank in June 2010 as ’Pesa Pap’ and in 2014 copied by Kenya Commercial Bank and Commercial Bank of Africa through their partnerships with Safaricom (CBK, 2015).

Table 6 shows that the coefficient of log of the number of ATMs in the fixed effects variant of the static model, long run model, is -0.663 with a corresponding p-value greater than 0.05. Thus, the coefficient was not statistically different from zero at five per cent level of significance. Therefore, in the long run, changes in technology do not influence the level of profitability. This means that growth in technology neither slows persistence of profits nor increases competition in the long run. This finding is consistent with theory and a priori expectations. According to neo-classical theory of production, in the short run some factors of production are usually fixed (Varian, 2014). However, in the long run firms are able to vary the level of employment of all factors of production.

In the short run, not all commercial banks are able to adopt new technologies. However, in the long run all commercial banks are able to catch up with the frontiers of commercial banking in the industry making such technologies a common way of service provision. The banking sector in Kenya saw first movers adopt ATMs in early 2000 (CBK, 2001). However, by 2014, the use of ATMs was a conventional service delivery channel for all the commercial Banks in Kenya (CBK, 2015). Due to conventional nature of technology in the long run, it cannot help an institution gain new customers or rival its competitors. Therefore, changes in technology have effect on competition in the banking sector in the short run rather than in the long run.

The finding that technology reduces profitability, and therefore, enhance competition in the banking industry in Kenya is contrary to those of Holden and El-Bannany (2004) who established that an increase in the number of ATMs positively affected bank profitability in the UK through several factors such as reducing the labour costs and transactions costs. This may be explained by the different set ups in which the studies are conducted. Holden and El-Bannany (2004) conduct their study in a developed world setting whereas the current study is conducted in a developing country environment. This emphasizes the country specific nature of the determinants of bank profitability and competition.

6.3.3. Effect of change in regulation

The measure of the body of regulation indicates the amendment of the Banking Act (Cap 488) that progressively increased the core capital requirement for commercial banks from KES250 million in 2008 to KES1 billion in 2012. The signage of the sum of the coefficients of interaction terms between body of regulations and the lags of normalized return on assets indicate the effect of amendment of the Banking Act (Cap 488) that increased the core capital requirement for commercial banks.

Table 6 shows that the coefficients of the interactions of body of regulations and the 1st, 2nd and 3rd lags of normalized return on assets in the efficient GMM model are 0.36, -0.60 and 0.28, respectively with corresponding p-values less than 0.01. Therefore, the coefficients are significantly different from zero at one per cent level of significance. The signage of the coefficients of interactions reinforces that of the first, second and third lag of profitability. Their sum is 0.03. The signage of the sum was positive reinforcing the level of profit persistence (0.95). Therefore, the progressive increase in core capital requirement from KES250 million in 2008 to KES1 billion enhanced persistence of bank profitability and therefore, reduced competition in the banking sector in Kenya.

This finding is consistent with theory and empirical findings by Chronopoulos *et al*. (2015). The progressive increase in core capital requirement can be seen as an erection of barrier to entry. According to the neoclassical theory of markets, a market structure without free entry and exit experiences persistence of profits and less competition (Varian, 2014). In addition, the increase in the core capital requirements may have triggered forceful consolidations that were predatory rather than non-exploitative. This is so since the coefficient of consolidation in the estimating equations is negative in the short run. This implies that market led consolidations are more beneficial than regulatory induced ones. Regulatory induced consolidation does not always occasion mergers and acquisition between small banks only. Large banks prey on small banks due to compliance deadlines leading to undesired outcomes. After the progressive increase in core capital requirement from KES250 million in 2008 to KES1 billion, for example, Savings and Loans limited, a small bank, merged with a large bank, Kenya Commercial Bank. This outcome was not anticipated. Due to erection of barriers to entry and exit as well as predatory mergers and acquisitions, the progressive increase in core capital requirement increased slowed competition in the banking industry in Kenya.

6.3.4. A note on the control variable and alternative estimation models

On the control variables, Table 6 shows that economic growth and inflation enter the efficient system GMM estimation positively and significantly. However, the fixed effects model shows that the variables enter the long run relationship in a counteracting but insignificant manner. The fact that economic growth and inflation enter the model significantly in the shortrun rather than in the long run implies that variations in the macroeconomic environment affect bank profitability in the short run rather than in the longrun in Kenya. This finding is synonymous with the macroeconomic view of neutrality of firm level activities to changes in macro variables in the longrun.

With respect to firm level variables, all the covariates, with the exception of diversification and structure of bank ownership, enter the shortrun model insignificantly but significantly in the longrun. This implies that firm level characteristics are important in explaining bank profitability in the longrun rather than in the shortrun. Bank size has a positive sign while bank size squared has a negative effect. This means that size promotes bank profitability up to some point beyond which profitability declines. This finding is similar to that of Flamini *et al*. (2009) and Chronopoulos *et al.* (2015). Bank capital (*Equity/(Total Assets)*) enters the model positively meaning that the more a bank finances its loan book the higher its profitability. On the contrary, an increase in bank risk exposures ((*Net charge offs)/(Gross loans*)) reduce the profitability of the banks. This is expected since an increase in bank risk exposures imply a deteriorating loan book that negatively impacts bank profitability.

7. Conclusion

The study findings led to three key conclusions. First, premised on the finding of a negative effect on bank profitability in the short run and a positive effect in the long run, the study concludes that bank consolidation has an inverted U effect on competition in the banking sector. Consequently, a movement from very many small firms to a few large firms up to some point increases competition. Beyond this point, consolidation reduces competition among commercial banks in Kenya.

Second, based on the finding that growth in technology reduces bank profitability in the short run and not in the long run, the study concludes that growth in technology slows persistence of profits and increases competition in the banking sector in short run. Moreover, the study concludes that in the long run growth in technology is impotent on competition in the banking sector.

Third, based on the finding that interactions of body of regulations and the lags of profitability enhances the influence of the lags of profitability on 'todays' profitability, the study concludes that contrary to expectation, the progressive increase in the core capital requirement for commercial banks slowed competition in the banking sector.

The conclusions by the study imply the following: First, the study found that bank consolidation has an inverted U effect on competition in the banking sector. This implies that consolidation is effective in promoting competition and slowing persistence of exceptional bank profitability up to some point. Further, the finding implies that consolidation is a short to medium term instrument for promoting competition in the banking sector. The government, therefore, should not over use consolidation beyond the optimal level. This optimal level as established by the study lies between one large bank and many small banks. This implies few large banks are good for competition and reduction of exceptional bank profitability. To the government, therefore, consolidation is a short to medium term tool of rectifying market inefficiency by reducing the number of commercial banks from many small sized banks to few large banks. Equally, to promote a banking sector that has no interest driven exceptional profitability commercial banks should not engage in anti-competition mergers that would create one large bank. This intervention is opposite of what theory suggests. Economic theory suggests that a market should have many players such that none can influence price. However, the finding that consolidation has an inverted U effect on persistence of exceptional bank profitability and competition in the banking sector, shows that competition in the banking sector is not dependent on bank numbers but also the size of the banks. The larger a bank the better the competition but up to some point.

Second, the study found that growth in technology increases competition in the banking sector in short run but not in the long run. Therefore, as tool to promote competition, growth in technology is effective in the short run rather than in the long run. In Kenya, large sized banks control over 80 per cent of the ATMs and mobile banking in the country (CBK, 2015). Therefore, small sized banks control a paltry 20 per cent of the ATMs network and some are yet to adopt mobile banking. Therefore, as a short term measure to promote competition and reduce exceptional bank profitability, small sized commercial banks should swiftly adopt technology in form of ATMs and mobile banking to rival market share from their large peers. In addition, the government through the central bank should facilitate adoption of technology by the small banks. This would promote the rivalry that small sized banks exert to the large banks in the short run.

Third, the study found that contrary to expectation, the progressive increase in the core capital requirement for commercial banks increased persistence of bank profitability and slowed competition in the banking sector. This implies that though an increase in core capital requirements is a trigger for consolidation it can lead to undesired outcomes. In other words, an increase in core capital requirements can lead to the exact opposite of the desired outcomes based on how a regulation is structured. Whenever core capital requirements are increased, it is easily assumed that the regulation would trigger consolidation among the small sized banks. However, this is not always the case. Therefore, the government and the Central Bank should desist from blind increases in the core capital requirement for commercial banks. The regulations should be structured to incentivize consolidation and acquisitions among target tiers but not all the tiers. Therefore, as an alternative to core capital increment the government could carry out the following consolidation policies.

First, and in the short run, the government can incentivize the small sized banks to consolidate with other small and medium sized banks through rewards. The government can grant special tax concessions for expenditure incurred by small sized banks if they merge or undergo an acquisition process with small and medium sized banks. This would trigger mergers and acquisitions among the small and medium sized banks unlike in the case of blind increases in the core capital requirements. The resulting large entities would be efficient due to economies of scale and scope. This would enable the resulting large entities pose substantial competition to large and other medium sized commercial banks and therefore, reduce exceptional bank profitability.

Second, and in the short run, the government can offer to cover the consolidation expenditures for small banks that merge with medium and small sized banks. The government can achieve this by setting up a technical committee including international and national consultants to provide free consultancy to small and medium sized commercial banks interested in merging or involved in acquisitions. This would encourage small sized and medium sized banks interested in consolidation but derailed by consolidation costs to consolidate. The resulting large entities decisions would trigger strategic reactions from the large banks and therefore, increase rivalry and reduce exceptional profitability.

Third, and as a medium term measure, the government can spur consolidation among small sized and medium sized banks through a minimum market share policy. In Kenya, the market share of commercial banks is measured using the composite market share index. A bank with a CMSI of over five per cent is considered large, that with a CMSI between one per cent and five per cent is medium and those with a CMSI of less than one per cent are regarded as being small. The government can set a minimum CMSI index greater than one to trigger consolidation among small sized and medium sized banks. A legal requirement of CMSI greater than one would create a mutual interest among small sized and some medium sized commercial banks to merge. The market share policy would not trigger consolidation motives among large sized banks since they already satisfy the requirement. The resulting large commercial banks would be large enough to matter in all forms of competition and therefore, reduction of exceptional profitability.

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