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Journal of Industry, Competition and Trade
From Theory to Policy

ISSN 1566-1679

J Ind Compet Trade
DOI 10.1007/s10842-018-0279-2

Springer

J Ind Compet Trade
https://doi.org/10.1007/s10842-018-0279-2

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Received: 27 February 2018 / Revised: 18 April 2018 / Accepted: 3 May 2018

Abstract This study investigates the level of competition among commercial banks in Kenya over the period 2001 to 2014. The study used a balanced panel data set from 36 commercial banks, the performance dynamics approach and the generalized method of moments to estimate the resulting dynamic panel models. The investigation established that the level of competition among commercial banks in Kenya is low and characterized by 93.9 per percent persistence in profitability. Arising from the study findings, it is important that the government intervenes to rectify the intermediation inefficiency occasioned by ineffectiveness of competition. It is also important that small sized banks in the sector voluntarily merge with other smaller banks in order to exert substantial competition to the large and medium sized banks.

Keywords Exceptional bank profitability · Profit persistence · Intermediation inefficiency

JEL Classification G21 · L11

1 Introduction

1.1 Importance of Bank Competition

Competition among commercial banks is critical in enhancing intermediation efficiency. In the long run, competition corrects the negative feature of intermediation inefficiency that

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Published online: 25 May 2018

manifests in the form of exceptional bank profitability driven by high interest rates and wide interest rate spreads (Flamini et al. 2009). Inherently, therefore, competition among commercial banks determines the level of entrepreneurial activities, access to finance, allocation of capital, development of the productive sector, level of economic growth and banking sector stability (Chronopoulos et al. 2015). For these reasons the competitive environment in the banking sector receives both national and international attention.

Theoretically economists posit that in the long run, competition should be able to equalize returns to all economic activities through a dynamic process. Therefore, existence of exceptional profits above or below the competitive norm is a purely short run affair, which is simply a transitory condition showing the direction that resources should take for efficient allocation (Chronopoulos et al. 2015). From a theoretical perspective, therefore, there should be a tendency for excessively high profits to fall and excessively low profits to rise toward a competitive norm (Pakes 1987; Mueller 1977).

Applying the theoretical proposition to commercial banking, then the underpinning argument is that exceptional bank profitability driven by wide interest rate spreads manifested in terms of high lending rates and low deposit rates is a short run affair. Such a phenomenon would be corrected by competition in the long run (Chronopoulos et al. 2015). Globally, banks in Africa have been found to be more profitable though the continent continues to experience low levels of financial intermediation (Flamini et al. 2009). This situation holds in all respects whether by country, country income group or individual banks. This paradox of more profits and less banking is a pointer to issues with competition and intermediation efficiency in Africa.

A closer examination of banking in Africa reveals that the low levels of banking are not proportionately distributed. There exists a wide disparity in terms of banking in Africa. There are a few African nations with vibrant banking. For instance, the level of financial intermediation in South Africa is nearly twice that of Uganda, Tanzania and Rwanda (Sanya and Gaertner 2012). In addition, less than one third of the population in Tanzania, Uganda and Rwanda have access to finance compared to two thirds in Kenya and South Africa. Since the low levels are an average, the disparities mean that in some African nations banking is almost non existent. The cross cutting issue irrespective of the level is the paradox of exceptional profits amidst low levels of financial intermediation.

Within Africa South of the Sahara (SSA)[1], South Africa's banking sector is dominant followed by that of Kenya (Central Bank of Kenya 2015). Though playing second fiddle to South Africa, the share of East Africa's banking in SSA has been growing with that of Kenya exceeding the SSA average between 2011 and 2014 (Central Bank of Kenya 2015). Therefore, in addressing the state of banking in SSA the status of banking in Kenya cannot be ignored.

1.2 Banking In Kenya

The banking sector in Kenya comprises of the Central Bank of Kenya (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 (Central Bank of Kenya 2015). In terms

[1]There is now a growing liberation challenge that "Sub Saharan Africa" is no synonym to "Africa South of Sahara", the former being considered socially demeaning and the latter geographically placing. See information to authors in http://www.jpanafrican.org/submission.htm

of commercial banks, Kenya had three government owned banks between 2000 and 2014 (Central Bank of Kenya 2001, 2015). Domestic privately owned banks were 38 in 2005 and 27 between 2010 and 2014 (Central Bank of Kenya 2006, 2015). Private foreign banks were 11 in 2005 and 13 between 2010 and 2014 (Central Bank of Kenya 2006, 2015). This shows that the Kenyan banking sector is dominated by domestic privately owned banks in terms of numbers. In addition, it implies that bank competition can take the dimension of ownership other than the usual rivalry expected between individual banks.

In terms of bank size, the CBK has categorized the banks into three categories: large, medium and small banks using a composite market share index (CMSI). The index consists of deposits, net assets and advances (Central Bank of Kenya 2011). A bank with a CMSI greater than five per percent is considered large, that with a CMSI between one per percent and five per percent is medium and those with a CMSI of less than one per percent are regarded as small. Based on this classification, there were six large banks, 15 medium sized banks and 23 small banks between 2010 and 2014 (Central Bank of Kenya 2015). The evolution of bank market share based on the CMSI index among these three categories for the period 2010 to 2014 is shown in Figure 1.

Figure 1 shows that large sized banks consistently had a large market share between 2010 and 2014. However, the share gradually decreased from 56.1 per percent in 2006 to 49.9 per percent in 2014. The contraction in the market share for the large banks is associated with an expansion in the market share for the medium sized banks. The market share for the medium sized banks gradually rose from 34.5 per percent in 2006 to 41.7 per percent in 2014. Therefore, although the large banks dominate commercial banking in Kenya, competition across the sizes is apparent. The fact that the medium sized banks have managed to wrestle a market share of about seven per percent from the other tiers means that competition among the commercial banks in Kenya is intensifying. Figure 1 further shows that the market share of small sized banks marginally declined from 9.4 per percent in 2010 to 8.4 per percent in 2014. This implies that though the small banks are the majority in

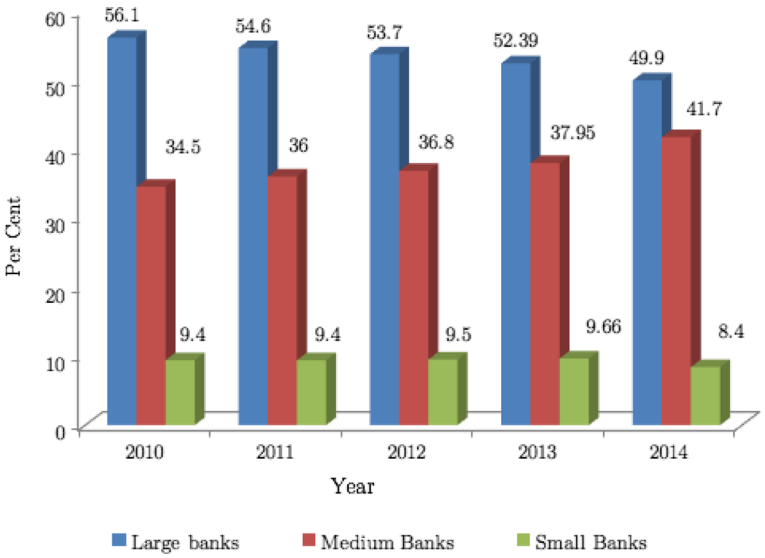

Fig. 1 Market share by bank size

terms of numbers in the banking sector, they may not be contributing much to the intensity of competition.

As observed earlier, competition among commercial banks determines the efficiency of the intermediation process. Competition for deposits and lending leads to increased deposit rates and low lending rates and therefore, increased intermediation efficiency which is evidenced by low interest rate spreads and profitability consistent with the competitive norm (Berger et al. 2009). The prevailing levels of bank competition in Kenya shaped interest rate spreads and profitability as illustrated in Fig. 2.

Figure 2 shows that interest rate spread was 14.24 per percent in 2000 and 9.18 per percent in 2014. The spread sharply declined between 2002 and 2005 due to improvement in macroeconomic management occasioned by regime change in 2002. Between 2010 and 2011, the spread increased considerably due to the tough monetary policy stance adopted during the currency crisis of 2010 (Central Bank of Kenya 2011). After 2011, the spread declined gradually and assumed a long run trend. The spread remained relatively stable but high compared to monetary instruments signals such as the central bank rate during periods of stable macroeconomic conditions such as 2005 and 2010. The fact that the interest rate spread, the measure of intermediation efficiency, is larger than the central bank rate and persistently so even in periods of stable macroeconomic stability means that Kenyan commercial banks are inefficient. Indeed, wide interest rate spreads are a cause of concern since such wide rates are symptomatic with systemic problems such as bank unsoundness and a lack of adequate competition (Randall 1998).

Figure 2 further shows that commercial banks profitability and interest rate spread are highly correlated during periods of macroeconomic stability and tough monetary policy stance. The relative stable interest rate spread between 2005 and 2009 was, for example, associated with consistent increase in bank profitability. However, the overshoot in interest rate spread between 2010 and 2011 was associated with a jump in profitability. Therefore, persistence and overshoot of interest rate spreads is associated with continued rise in bank profitability. After the shock in interest rate spreads in 2010, bank profitability rose to

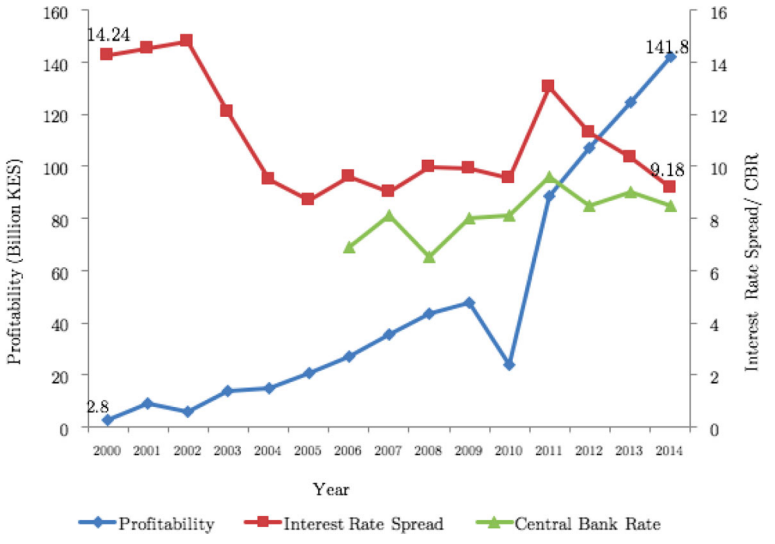

Fig. 2 Trend in Bank profitability and Interest rate spread

even exceptional levels, underscoring the importance of high lending rates and low deposit rates in driving bank profitability in Kenya. The close association between wide interest rate spreads and commercial banks profitability means that high cost of credit causes high profitability in the Kenyan banking sector.

The trends illustrated in Fig. 2 clearly show that commercial banking in Kenya has wide spreads and exceptional profitability. Therefore, commercial banking in Kenya is bedeviled by the negative feature of intermediation inefficiency that manifests in the form of exceptional bank profitability driven by high interest rates and wide interest rate spreads. Further, the trends confirm the problem of banking in Africa: low levels of financial intermediation with high profitability (Flamini et al. 2009). As per economic theory this negative feature should be corrected by competition (Chronopoulos et al. 2015). Though competition dealing with this negative phenomenon is apparent, its level is unknown. The knowledge of the level would be significant in informing policy and appropriate interventions. This study, therefore, sought to ascertain the level of bank competition among commercial banks in Kenya over the period 2001 to 2014.

2 Literature Review

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 et al. 2013).

Two approaches arise from the neoclassical theory of markets on the measurement of the power of a firm to influence. The performance dynamic approach (sctructure conduct and performance or the Schumpetarian view) and non-performance dynamics approach. The non-performance dynamics approach include the Lerner Index (LI) and the Ponzar and Rosse statistic (H statistic) (Elzinga and Mills 2011; Panzar and Rosse 1987) while the performance dynamics constitute the Mueller's (1977) approach.

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 enough 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 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, the profit generating process equation 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 Eq. 1 is stationary since firms cannot fully retain all their previous period profits. Therefore $|\lambda_i| < 1$.

Previuos 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 et al. (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, Sanya and Gaertner (2012) who assessed bank competition in four of the five East African Community (EAC) countries banking sectors and Chronopoulos et al. (2015) who studied the dynamics of bank profitability in the US arising from regulatory changes during the period 1984-2010.

The reviewed literature reveals that the level of competition is determined by the dynamic component, firm and macro level variables. These determinants include inflation and national income, and time invariant firm covariates such as bank size, asset growth, bank risks exposures, diversification, liquidity, bank capital, ownership structure and regulations. Much of the reviewed empirical literature is based on developed countries. The ones on developing countries are cross country and, therefore, cannot be relied upon for country specific conclusions. The present study is specific to Kenya for precise conclusions on bank competition. Domestically, previous studies on the banking sector in Kenya have investigated efficiency and productivity (Kamau 2009); analyzed value effects of banking institutions' mergers and acquisitions in Kenya (Muniu et al. 2015); and studied the role of capital requirements on bank competition and stability in Kenya for the period 2000-2011 (Gudmundsson et al. 2013). The study by Gudmundsson et al. (2013) attempted to estimate bank competition but using non-performance dynamic approaches. None of these studies have estimated a pin point estimate of competition among commercial banks in Kenya. Therefore, the present study sought to fill this literature gap by estimation of the level of competition among commercial banks in Kenya

3 The Empirical Approach, Data and Diagnostics

3.1 Empirical Approach

To ascertain the level of competition among commercial banks in Kenya, the level of persistence of profitability in the sector was estimated first. The persistence of profit estimating (1) was modeled and operationalized on a simple $AR(1)$ process. However, profits of all firms slowly converge with the profitability at one point being directly related to its past profit values even extending the time span far into the past (Pakes 1987). Assuming that α_i and λ_i are industry rather than firm specific parameters and a furthest past of p periods, Eq. 1 was expressed as an $AR(p)$ process as shown in Eq. 2.

$$\pi_{it} = \beta + \lambda_1 \pi_{it-1} + \lambda_2 \pi_{it-2} + \lambda_3 \pi_{it-3} + \ldots + \lambda_p \pi_{it-p} + e_{it} \quad (2)$$

Where:

e_{it} is white noise error term,
β is the permanent component of profits to the industry and
λ_i are the coefficients of the various lags of bank profitability [2]

However, bank profitability is not just a function of the dynamic component (previous levels of profitability) and the market structure. According to Cantwell (2000), Mitra-Kahn (2005) and Gudmundsson et al. (2013) profitability is as well determined by risks faced by a bank, macroeconomic factors and bank characteristics. In the context of the present study, the risks faced by commercial banks were either macro or micro in nature. According to Chronopoulos et al. (2015) and Flamini et al. (2009), the macro risks relevant to banks are movements in macro variables such as inflation and economic growth. In terms of micro risks, the most relevant to banks according to Chronopoulos et al. (2015) and Flamini et al. (2009) are credit, liquidity and capitalization risks.

With regard to firm characteristics, firm size, ownership structure and product offering can influence profitability of a firm (Varian 2014). With respect to banking, ownership structure manifests in the form of domestic or foreign ownership and public or private ownership. Product offering manifests in the form of diversification in types of products offered by a bank. Therefore, other than the determinants of profitability developed in the previous sections, the present study also considered bank profitability as function of static macro, micro and bank characteristics. Considering this transformation (2) is specified as in 3.

$$\pi_{it} = \beta + \lambda_1 \pi_{it-1} + \lambda_2 \pi_{it-2} + \lambda_3 \pi_{it-3} + \ldots + \lambda_p \pi_{it-p} + \beta_1^{'} IND_t + \beta_2^{'} X_{it} + \theta_i + u_{it} \quad (3)$$

Where:

$IND_t = [\textit{Economic growth, Technological change, Inflation and Consolidation}]^{'}$,
$X_{it} = [\textit{Risk exposures, Size, Diversification, Capital, Ownership structure, Liquidity}]^{'}$,
$\theta_i =$ individual bank specific effects which could be random or fixed

[2] Being industry wide measures the λ_i are assumed to be common for all the commercial banks

When more than one lag of profitability is introduced as in Eqs. 2 and 3, the short run industry wide level of persistence of profits is given by the sum of coefficients of the lags of profits as shown in equation 4 and as put forward by Gschwandtner (2005).

$$\lambda = \sum_{i=1}^{p} \lambda_i \tag{4}$$

To obtain the level of bank competition among commercial banks in Kenya, the estimated value of λ in Eq. 4 was considered. Theoretically and empirically λ lies between zero and one (Yurtoglu 2004). A value of λ close to zero implies high or strong level of competition while a value close to one implies low or weak competition. In literature, Gschwandtner (2003), Yurtoglu (2004), Gschwandtner (2005), Cable and Jackson (2008) and Goddard et al. (2011), values of λ greater than 0.5 (50 per percent) are interpreted as low competition while values less than 0.5 (50 per percent) are interpreted as high competition. Following this interpretation, the level of competition in this study was given by equation 5.

$$Level\ of\ Competition\ = \begin{cases} Low, & \lambda > 50\% \\ Moderate, & \lambda = 50\% \\ High, & \lambda < 50\% \end{cases} \tag{5}$$

3.2 The Data and Definition of Variables

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 defined as shown in Table 1.

3.3 Diagnostics

Chronopoulos et al. (2015), Cable and Jackson (2008), Flamini et al. (2009) and Goddard et al. (2011) show that the first diagnostic is the adjustment of the profits using the cross-sectional industry profits in a particular year. Therefore, to estimate the linear dynamic panel data models, the dependent variable, bank profits, was adjusted for cross-sectional industry profits.

Equations 3 is a linear dynamic panel data model. This affected the estimation method as well as the diagnostic tests conducted. The presence of the lagged profits on the right hand side causes endogeneity problems. To address the problem, the Generalized Method of Moments (GMM) was used. Therefore, diagnostics dealing with precision of the GMM estimates, specification of the AR process, over identification restrictions, autocorrelation and validity of instruments were conducted. There is limited literature defining large and small T in identifying macro and micro panels. Samples with a less than 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

Table 1 Definition and measurement of variables

Variable	Definition	Measurement
Profits π_{it}	Return on assets of bank i in year t	Percentage normalized return on assets $\pi_{it} = \frac{ROA_{it} - \overline{ROA_t}}{\overline{ROA_t}}$
Industry Characteristics (IND_t)		
Economic Growth, EG	Is the percntage change in the 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 share 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
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
Firm Characteristics (X_{it})		
Bank Size, BS	The total assets of bank i in 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 percent
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 percent
Bank capital, BC	Banks' contribution to capital	The ratio of equity to total assets in percent
Ownership structure, OS	A dummy variable that shows ownership structure of a bank with category of domestic ownership	Takes a value of 1 if more than 50% of a bank's shareholding is foregn and zero
Liquidity, L	The liquidity and lending specialization of a bank	The ratio of loans to assets in percent

stationarity of the variables. To test for the correct AR process, the specification test put forth by Roodman (2006) was used. The correct AR specification was arrived at when the assumption of first order serial correlation in the error term and no higher order serial correlation held. Further, the coefficients of the chosen lags of the dependent variable have to be significant.

4 Results

4.1 Descriptive Statistics

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

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 percent. When the period was considered as a whole, ROA ranged from -6.5 per percent to 9.5 per percent 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 percent. However, the risk exposure varied over the period from 0.1 per percent to 77.1 per percent 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 percent and a standard deviation of 10.11 with a range from zero to 58.81 per percent. 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 percent and a standard deviation of 9.521, with a range from 5.6 per percent to 76.51 per percent. 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 percent. Finally, Table 2 shows that the mean outstanding loan to net assets ratio was 59.51 per percent with a standard deviation of 22.15 and a spread from 19.77 per percent to 185.73 per percent. 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 Summary statistics of bank characteristics

Variables	Unit of measurement	Mean	SD	Min	Max
Bank Size	KES mn	32594	53779	502.3	383038
ROA	Percentage	2.81	2.15	−6.5	9.5
Normalized ROA	Percentage	0.318	1.22	−4.64	6.82
Bank Risk Exposures	Percentage	10.21	12.15	0.1	77.10
Diversification	Percentage	16.03	10.11	0	58.81
Bank Capital	Percentage	16.87	9.52	5.6	76.51
Liquidity	Percentage	59.51	22.154	19.77	185.73

Table 3 Summary statistics of industry characteristics

Variable	Mean	Std deviation	Min	Max
Economic Growth	4.242	1.062	2.5	7.1
Herfindahl-Hirschman Index	0.071	0.01	0.059	0.092
Number of ATMs	1287.85	949.56	166	2613
Inflation	8.1	3.96	2	15.1

The economic environment that the banks operated in was defined by the economic growth, concentration of commercial banks, number of ATMs and inflation rate. The summary statistics for these time variant but bank invariant variables are given in Table 3.[3]

Table 3 shows that the average economic growth for the period 2001 to 2014 was 4.24 per percent, with a standard deviation of 1.062 per percent. The minimum growth rate over the period of analysis was 2.5 per percent while the maximum was 6.1 per percent. 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 4.2 also show 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.

4.2 Diagnostics Tests

4.2.1 Stationarity Test

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 4.3 presents a summary of the findings.

Table 4 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 4 shows that the test statistics for testing the null (presence of the unit root) against the alternative (stationarity) for bank covariates had a p-value less than 0.01. The test statistics are greater than the critical values for all the covariates at one per percent 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 4 shows that the test statistics have p-values less than 0.01 for all tests and, therefore, greater than the critical values at one per

[3]This was necessitated by the fact that summary statistics of pooled series understate the standard deviation of firm invariant but time variant variables

Table 4 Stationarity test

Variable	Common unit root test Levin, Lin & Chu	Individual tests Im, Pesaran and Shin 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***
Key:		***P-value less than 0.01		

percent 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 assumed 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.

4.2.2 Choice of Optimal Lags and Number of Instruments

The criteria put forth by Roodman (2006) was employed to establish the optimal lag length of the $AR(p)$ process. The initial point of comparison began with the first lag of the dependent variable. Thereafter, extra lags of the dependent variable were introduced. The optimal lag structure was up to the lag preceding an insignificant lag of the dependent variable and one where the assumption of presence of first order serial correlation and absence of second order and any other higher order serial correlation held (Roodman 2006).

Table 5 shows the introduction of the first to the fourth lags of normalized return on assets in model (3). The estimated coefficients of the lagged dependent variable lie between those of the fixed effects and naïve 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 4.4 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.

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 6 shows the results of the sensitivity analysis.

Table 6 shows that the lags of instruments used notwithstanding, the assumptions for the application of GMM hold for the $AR(3)$ specification. 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. 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 $\cup$ 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

Table 5 Determination of optimal lags of normalized return on assets

VARIABLES	AR(1)	AR(2)	AR(3)	AR(4)
1^{st} lag of Normalized Return on Assets	0.817***	1.666***	2.245***	2.359***
	(0.0220)	(0.0313)	(0.0610)	(0.0768)
2^{nd} lag of Normalized Return on Assets		−0.738***	−1.793***	−1.995***
		(0.0273)	(0.106)	(0.147)
3^{rd} lag of Normalized Return on Assets			0.502***	0.625***
			(0.0493)	(0.0980)
4^{th} lag of Normalized Return on Assets				−0.0143
				(0.0269)
Economic Growth	−0.311	−0.470***	0.326***	0.161***
	(0.189)	(0.111)	(0.0565)	(0.0589)
Herfindahl-Hirschman Index	27.34***	2.512	−81.54***	21.47
	(8.043)	(5.240)	(8.889)	(18.10)
Growth in Technology	0.518***	0.473***	−0.922***	−0.0542
	(0.180)	(0.120)	(0.105)	(0.151)
Inflation	−0.0196**	−0.0198***	0.0930***	−0.0180
	(0.00818)	(0.00579)	(0.00976)	(0.0190)
Bank Size	0.313	−0.0322	−0.00538	0.0236
	(0.207)	(0.0740)	(0.0363)	(0.0484)
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)	(0.000579)	(0.000645)
Diversification	−0.00275	0.000398	−0.000495	−0.000236
	(0.00289)	(0.000903)	(0.000612)	(0.000426)
Bank Capital	0.00329	−0.000446	0.000109	0.000759*
	(0.00299)	(0.00111)	(0.000539)	(0.000379)
Liquidity	−0.00189	−0.000375	−0.000422	−0.000206
	(0.00202)	(0.000592)	(0.000280)	(0.000447)
i.Foreign Domestic Bank	−0.0726	0.0478	0.00548	0.00567
	(0.0740)	(0.0291)	(0.0162)	(0.0219)
i.Private Public Bank	0.186**	0.0353	0.0270	0.0238
	(0.0795)	(0.0419)	(0.0210)	(0.0179)
Constant	−6.009***	−1.142	9.746***	−1.825
	(1.612)	(0.859)	(1.022)	(2.080)
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
Number of id	36	36	36	36

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 Determination of optimal number of instruments

VARIABLES	Lag(1 1)	Lag(1 2)	Lag(1 3)	Lag(1 7)	Lag(1 13)
1^{st} lag of Normalized Return on Assets	2.125***	2.161***	2.192***	2.236***	2.245***
	(0.105)	(0.0776)	(0.0693)	(0.0603)	(0.0610)
2^{nd} lag of Normalized Return on Assets	−1.637***	−1.687***	−1.723***	−1.781***	−1.793***
	(0.167)	(0.127)	(0.116)	(0.105)	(0.106)
3^{rd} lag of Normalized Return on Assets	0.444***	0.465***	0.477***	0.498***	0.502***
	(0.0760)	(0.0588)	(0.0534)	(0.0486)	(0.0493)
Economic Growth	0.272***	0.288***	0.301***	0.321***	0.326***
	(0.0637)	(0.0566)	(0.0563)	(0.0560)	(0.0565)
Herfindahl-Hirschman Index	−74.52***	−76.57***	−78.45***	−81.02***	−81.54***
	(9.339)	(8.806)	(8.675)	(8.880)	(8.889)
Growth in Technology	−0.823***	−0.852***	−0.877***	−0.913***	−0.922***
	(0.116)	(0.106)	(0.104)	(0.105)	(0.105)
Inflation	0.0851***	0.0875***	0.0895***	0.0924***	0.0930***
	(0.0107)	(0.00987)	(0.00962)	(0.00974)	(0.00976)
Bank Size	0.0980	0.0702	0.0461	0.00696	−0.00538
	(0.0812)	(0.0676)	(0.0553)	(0.0396)	(0.0363)
Bank Size Squared	−0.00364	−0.00233	−0.00132	0.000440	0.00101
	(0.00376)	(0.00318)	(0.00258)	(0.00190)	(0.00175)
Bank Risk Exposures	0.00229	0.00206	0.00144	0.000725	0.000432
	(0.00166)	(0.00140)	(0.00110)	(0.000652)	(0.000579)
Diversification	−0.000627	−0.000728	−0.000555	−0.000510	−0.000495
	(0.00119)	(0.00103)	(0.000852)	(0.000633)	(0.000612)
Bank Capital	0.000697	0.000466	0.000342	0.000130	0.000109
	(0.00114)	(0.000996)	(0.000760)	(0.000565)	(0.000539)
Liquidity	−0.000956	−0.00106*	−0.000755	−0.000546*	−0.000422
	(0.000775)	(0.000618)	(0.000497)	(0.000304)	(0.000280)
i.Foreign Domestic Bank	0.00997	−0.0103	0.00299	0.00172	0.00548
	(0.0371)	(0.0276)	(0.0230)	(0.0164)	(0.0162)
i.Private Public Bank	0.133	0.108*	0.0824	0.0417	0.0270
	(0.0816)	(0.0624)	(0.0501)	(0.0247)	(0.0210)
Constant	8.243***	8.681***	9.046***	9.605***	9.746***
	(1.315)	(1.144)	(1.077)	(1.042)	(1.022)
Observations	396	396	396	396	396
Number of id	36	36	36	36	36
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
Over identifying Restrictions	35	52	74	80	36
Satisfaction of bounds	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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).

4.3 The Level of Competition among Commercial Banks in Kenya

To ascertain the level of competition among commercial banks in Kenya, an $AR(3)$ variant of the persistence of profits model (3) was estimated and the results reported in Table 7.

Table 7 shows dynamic fixed effects, system GMM estimates and the naïFve OLS estimates of $AR(3)$ variant of the persistence of profits model. The dynamic fixed effects model and the naïve OLS establish the bounds where the coefficients of the efficient system GMM model should lie. Table 4.6 shows that the coefficients of lagged dependent variable in the system GMM model lie between those of the dynamic fixed effects estimates and the naïFve OLS estimates. Therefore, the estimates fell within required range (bound). The system GMM coefficients of first, second and third lag of normalized return on assets were 2.161, -1.687 and 0.465, respectively with the corresponding p-values less than 0.01. Therefore, the coefficients were significantly different from zero at one per percent level of significance. The sum of these coefficients is 0.939 (see Eq. 4). Therefore, cumulatively the banks are able to maintain 93.9 per percent of their profitability from the past three years.

Substituting the sum of the coefficients of the lagged normalized return on assets in the competition estimating (5) yields the level of competition. The persistence of commercial banks profitability λ was 93.9 per percent. This level of persistence is greater than 50 percent. Therefore, the level of competition among commercial banks in Kenya over the period 2001 to 2014 was low. The low level of commercial bank competition in Kenya may be explained by the domination of the banking sector by few large sized banks that experience inadequate competition from the many small banks in the Republic of Kenya (2008).

The findings that the level of persistence in bank profitability in Kenya was high and the level of competition was low are in consonance with the dynamic approach of measuring commercial banks competition (Mueller 1977). The dynamic approach posits an inverse relationship between persistence of profitability and competition (Mueller 1977; Goddard et al. 2011; Chronopoulos et al. 2015). Therefore, the findings support the logical flow put forward by the performance dynamics approach of measuring commercial banks competition.

The findings, however, contradict as well as support empirical findings by previous studies. For instance, the findings that commercial banks in Kenya are able to retain 93.9 per percent of the three previous periods profits are consistent with the findings by Flamini et al. (2009) who found out that commercial banks in SSA retain a moderate proportion of previous periods profits. However, the current study and that of Flamini et al. (2009)) differ on the extent of explanation. The fact that commercial banks were able to retain 93.9 per percent of the three previous periods profitability shows that past values of profitability profoundly explain 'todays' commercial banks' profits in Kenya. Therefore, the present study found an immoderate level of influence of past bank profitability on 'todays' profitability unlike Flamini et al. (2009) who found a moderate influence. The difference on the extent of influence may be explained by the different approaches adopted by the studies. The present study adopted a country specific approach whereas Flamini et al. (2009) adopted a cross country approach. The second possible explanation for the difference in the extent of influence lies on the period of focus by the studies. The present study focused on the period between 2001 and 2014 whereas Flamini et al. (2009) focused on the period 1998 to 2006.

Further, the finding that competition among commercial banks in Kenya was low contradicts the finding by Goddard et al. (2011) who established that bank competition in

Table 7 Persistence of Bank Profits in Kenya

VARIABLES	Fixed Effects	GMM	Naive OLS
1^{st} lag of Normalized Return on Assets	2.053***	2.161***	2.280***
	(0.0400)	(0.0778)	(0.0345)
2^{nd} lag of Normalized Return on Assets	−1.520***	−1.687***	−1.834***
	(0.0661)	(0.128)	(0.0599)
3^{rd} lag of Normalized Return on Assets	0.376***	0.465***	0.518***
	(0.0324)	(0.0589)	(0.0284)
Economic Growth	0.250***	0.288***	0.339***
	(0.0682)	(0.0567)	(0.0729)
Herfindahl-Hirschman Index	−72.17***	−76.57***	−83.68***
	(5.982)	(8.830)	(6.423)
Growth in Technology	−0.786***	−0.852***	−0.946***
	(0.0972)	(0.106)	(0.105)
Inflation	0.0792***	0.0875***	0.0951***
	(0.00800)	(0.00990)	(0.00849)
Bank Size	−0.0476	0.0702	−0.0165
	(0.0530)	(0.0678)	(0.0368)
Bank Size Squared	0.00309	−0.00233	0.00140
	(0.00245)	(0.00318)	(0.00180)
Bank Risk Exposures	0.000279	0.00206	0.000362
	(0.000808)	(0.00140)	(0.000441)
Diversification	0.000710	−0.000728	−0.000374
	(0.000851)	(0.00104)	(0.000367)
Bank Capital	0.00139	0.000466	−0.000129
	(0.00118)	(0.000998)	(0.000507)
Liquidity	−0.000734*	−0.00106*	−0.000455**
	(0.000427)	(0.000619)	(0.000216)
i.Foreign Domestic Bank		−0.0103	−0.000414
		(0.0276)	(0.00591)
i.Private Public Bank		0.108*	0.0227**
		(0.0625)	(0.00885)
Constant	8.834***	8.681***	10.06***
	(0.804)	(1.147)	(0.839)
Observations	396	396	396
R-squared	0.986		0.995
Number of id	36	36	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

developing countries is greater than that in the developed countries. The findings by Goddard et al. (2011) was contrary to expectations on three accounts. First, developed economies are naturally considered to be more competitive than less developed ones

(Gschwandtner 2005). It is expected, therefore, that bank competition would be low in developing than developed countries. Second, Goddard et al. (2011)'s study was a cross country study that used industry level data to draw conclusions. Flamini et al. (2009) observed that strong conclusions or policy implications cannot be arrived at from a cross country study. Third, industry level data used by Goddard et al. (2011) involved aggregation of data for non-homogeneous products, which is empirically incorrect as observed by Mueller (1977). The present study corrects the finding that bank competition in developing countries is greater than that in the developed countries by presenting a developing country, Kenya, that has a severely low level of competition among commercial banks.

When the findings were considered in light of the non-performance dynamics approach measures of commercial banks competition, they led to important conclusions and implications. The Lerner Index, for instance, posits that low competition is a sign of an imperfectly competitive industry that is able to mark up the price above the marginal costs (Elzinga and Mills 2011). Therefore, the low level of commercial banks competition in Kenya implies that the commercial banking industry is not perfectly competitive and is able to markup (increase) lending rates above the base rates such as the central bank rate (CBR) and the Kenya bank reference rate (KBRR).

The implication that the commercial banking industry in Kenya is not perfectly competitive and is able to markup (increase) lending rates above the base was arrived at when the findings were also considered in light of the performance dynamics approach. Unlike in a monopoly, in a perfectly competitive market, firms or an industry cannot retain their previous period profits (Mueller 1977; Goddard et al. 2011; Chronopoulos et al. 2015). Thus unlike in a monopoly market where firms maintain almost all their previous period levels of profitability in a perfectly competitive market, the level of profit persistence is zero (Mueller 1977). The present study found that the level of profit persistence is 93.9 per percent implying that the banking industry in Kenya is imperfect and has monopoly tendencies of retaining high proportions of previous periods' profitability.

5 Conclusion

Following the low level of bank competition coupled by the high persistence in bank profits in Kenya over the period 2001 to 2014, the study concludes that the banking industry in Kenya is imperfectly competitive with previous levels of profitability, immoderately (profoundly) explaining 'todays' bank profitability. This implies that the market forces (competition) correcting the persistence of interest driven exceptional bank profitability in the banking sector are ineffective. From a theoretical perspective this is a negative phenomenon since it is expected that the level of bank competition should be large enough to bring back bank profitability to the competitive norm. Indeed, low levels of bank competition are bad for the achievement of social objectives (Vives 2010). Low competition threatens the achievement of high levels of entrepreneurial activities, access to finance, allocation of capital, development of the productive sector and economic growth (Chronopoulos et al. 2015).

Though the low level of bank competition and high persistence in profitability are bad for the society they are good from a private perspective (Vives 2010). In particular, the low level of competition and high persistence in profits make it easy for commercial banks to handle the coordination problem between the depositors and investors. Further, the market imperfection lowers banks incentives to take in more risks thereby reducing its probability of failure. Thus, from a commercial banks perspective the imperfection is attractive and should be maintained for their stability.

The ineffectiveness of competition among commercial banks to rectify the inefficiency of interest driven exceptional bank profitability in Kenya is a justification for intervention. However, the interventions should be implemented with the competition and stability trade off in mind. The interventions should optimally align the social objectives of high levels of entrepreneurial activities, access to finance, allocation of capital, development of the productive sector and economic growth with the private objectives of a stable banking system.

This can be done by the government or the commercial banks themselves. In the short term the government can easily achieve this through a price (lending and deposit) rate policy. In the medium term, the government could further intervene by acting as a direct competitor to commercial banks. As a long term measure, the small banks should be incentivized to voluntarily merge with other small sized commercial banks in order to exert substantial competition to the large and medium sized banks.

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