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Bank diversification and performance in an emerging market

King Carl Tornam Duho
Department of Accounting, University of Ghana, Accra, Ghana and IMANI Center for Policy and Education, Accra, Ghana, and
Joseph Mensah Onumah and Raymond Agbesi Owodo
Department of Accounting, University of Ghana, Accra, Ghana

Abstract

Purpose – The purpose of this paper is to investigate the impact of diversification on profitability, profit efficiency and financial stability of Ghanaian banks.
Design/methodology/approach – The authors employed a panel regression technique on a data set of 32 banks from 2000 to 2015. The data envelopment analysis is used to compute profit efficiency scores with credit risk accounted for.
Findings – The results suggest that income diversification decreases profit, profit efficiency and financial stability. The impact on profit and stability is U-shaped. The impact of asset diversification was found to be insignificant. High competition reduces both profitability and profit efficiency which is inconsistent with the quiet-life hypothesis of Hicks (1935), but financial stability increases with competition. High investment in tangible assets is associated with poor performance. Non-banking financial institutions that later became universal banks are not financially stable. Competition, size, age, government ownership and leverage which are controlled for and a sensitivity analysis conducted also provided relevant insights.
Practical implications – The results are relevant in understanding the events in the Ghanaian banking industry in 2017–2018. Income diversification strategy is essential in determining the performance of banks. Management has to figure out the extent and scope of their diversification to benefit from the strategy.
Originality/value – The authors examined diversification from the view-point of both the income statement and statement of financial position while most prior studies focused on only one aspect. The study is one of the few studies that employed the risk-adjusted profit efficiency measure in Sub-Saharan Africa.

Keywords Ghana, Data envelopment analysis, Profit efficiency, Credit risk, Financial stability, Diversification strategy

Paper type Research paper

1. Introduction

The financial reforms that characterized African countries starting around the 1990s have led to banks strategizing to obtain income from non-traditional banking activities. Revenue from non-traditional activities known as non-interest income can cover a spectrum of income sources ranging from fees from penalties related to withdrawals and overdrafts to the sale of assets (Abuzayed *et al.*, 2018). There are statement of financial position implications of diversification in banks as much as there are income statement implications. Thus, in the quest for banks to either employ the focus (specialized) strategy or diversified strategy, items of both financial statements need to be considered. In spite of the interest of financial analysts, bankers, policy-makers and academics in corporate diversification in general, there is still a paucity of literature in Africa and Ghana to be specific (Alhassan, 2015). From corporate finance theories and empirical literature, there are arguments for profitability, efficiency and risk implications for diversification which appear to be ambiguous and inconclusive (Abuzayed *et al.*, 2018). For instance, while the conglomeration hypothesis opines that organization-wide managerial efforts are enhanced by diversifying, the strategic-focus hypothesis opines that high earnings volatility, agency costs, high monitoring costs and difficulty in monitoring are associated with diversification (Elyasiani and Wang, 2012;

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Laeven and Levine, 2007; Stiroh, 2004). The conglomeration hypothesis consequently will enhance the attainment of economies of scope as overhead costs, and fixed costs are shared among different products. It is these divergent views that provide the grounding for a possible non-linearity between diversification and bank performance metrics.

Based on this background, the current study seeks to examine the impact of diversification on profitability, profit efficiency and financial stability. The research question is thus:

RQ1. What is the impact of bank diversification on financial performance metrics?

To achieve the objective of the study, we employed a two-stage analysis. First, we estimated the performance metrics which are profitability, profit efficiency and financial stability. Return on asset is used as the proxy for profitability, profit efficiency scores are computed using the data envelopment analysis and financial stability is measured using the *z*-score. Second, the performance metrics are regressed on income and asset diversification indices while other exogenous variables are controlled for. A further quadratic model and sensitivity analysis to check for the robustness has also been presented.

The choice of the Ghanaian banking industry for this study is based on significant developments that have implications on diversification, competition, profitability, efficiency and risk. In 2017, the Bank of Ghana started to implement various regulatory supervision measures aimed at strengthening the industry (Onumah and Duho, in press). Eventually, out of the 32 banks in existence then, by January 2019, only 23 banks were in operation. In addition, since the coming into force of the Bank of Ghana Act, 2002 (Act 612)[1] and the Universal Banking licensing, competition in the industry has increased predominantly (Onumah and Duho, 2019). More so, as competition increased, there was also a number of innovating banking services provided; notably, the automated teller machine which could have increased diversification. Also, as banks seem to expand, we are currently witnessing banks setting up subsidiary firms[2]. This could possibly have statement of financial position implications on diversification as some banks may use their subsidiaries' assets or vice versa. The Bank of Ghana has been implementing measures in line with the Basel accord for bank supervision and regulation. Most essentially, the emergence of new technologies for the financial services sector and the banking industry cannot be overemphasized. The passage of the payment systems and settlement bill into law on March 2019 is a regulatory breakthrough for banks in employing emerging technologies. The results of this study thus have relevant policy insinuations for shaping banking policy in Ghana.

Overall, the results indicate that income diversification negatively affects profitability, profit efficiency and financial stability significantly. The impact on profitability and financial stability are non-linear such that it is U-shaped. In effect, although income diversification initially decreases these two metrics, it eventually increases them. The results of the impact of asset diversity are statistically insignificant. The other variables such as competition, ownership structure, size, age, leverage and tangibility have varied impacts on performance. Also, relevant results were obtained from the robustness checks. The findings have essential implications for practice, policy and future research.

The remainder of this study is organized in the following order. The next section provides a succinct review of relevant literature. Section 3 describes the methodology employed. Section 4 presents the results of the various analyses. The penultimate section provides the conclusions of the study while Section 6 provides the implication of the study.

2. Related literature

There have been various banking literature that examine the determining factors of bank profitability (Athanasoglou *et al.*, 2008; Dietrich and Wanzenried, 2011; Grigorian and Manole, 2006), efficiency (Andries, 2011; Delis and Papanikolaou, 2009; Girardone *et al.*, 2004) and

financial stability (Beck *et al.*, 2013; Onumah and Duho, 2019). The various factors that affect the three performance metrics of banks can be grouped into bank-specific, industry-specific and economy-wide factors. The results of these studies differ from one another due to the differences in the time periods, data sets, environments investigated and the countries examined. Athanasoglou *et al.* (2008), using data of Greek banks from 1985 to 2001, found that capital risk, credit risk, ownership structure and bank concentration affect bank profitability. Size does not affect profitability significantly. To be specific, similar to Berger (1995) and Tan *et al.* (2017), the study found a negative effect of concentration on profitability. Dietrich and Wanzenried (2011) also employed data on Swiss banks from 1999 to 2009 and found that capital risk, credit risk, cost-to-income ratio, size, age and ownership are relevant factors that determine profitability.

The literature on efficiency continues to grow. Girardone *et al.* (2004) examined Italian banks and found that efficient and profitable banks are those that are cost-efficient especially with regard to labor cost. The study found no clear relationship between efficiency and size. Delis and Papanikolaou (2009) also examined the determinants of bank efficiency of banks in Greece and found that size, concentration and investment environment positively affect efficiency. Andries (2011) conducted a study on seven central and East European countries and found that competition, foreign entry and regulatory and legal changes are drivers of efficiency. There are basically two techniques for computing bank efficiency evidenced in the literature, namely, non-parametric (i.e. linear programming-based) and parametric (econometrics-based). These two techniques have their idiosyncratic advantages and disadvantages. The non-parametric approach known as the data envelopment analysis estimates a corner-point efficiency score while the other approach makes use of stochastic frontier analysis (Onumah and Duho, in press). Efficiency as a performance measure has been computed in varied forms such as profit efficiency, cost efficiency, revenue efficiency, technical efficiency and allocative efficiency among others. Maudos and Pastor (2003) pointed out that an examination of profit efficiency is more revealing than cost efficiency since profit efficiency provides insight into efficiencies as a result of choice of factors of production given output prices or due to bad pricing policies. Onumah and Duho (in press) found using data set from the Ghanaian banking industry that leverage and size negatively affect profit efficiency while concentration and stock exchange listing positively affect profit efficiency. Alhassan (2015) employed the stochastic frontier analysis to measure cost and profit efficiency in Ghana and found that there is a non-linear relationship between income diversification and efficiency. The study also revealed that size is a significant factor for efficiency.

Recent studies that examined bank failure related to the 2007–2008 global financial crisis have concluded that such failures were masterminded by diversification through excessive investment in innovative financial products (Berger *et al.*, 2016; Chen *et al.*, 2018; Cole and White, 2012; DeYoung and Torna, 2013). One strand of studies found that diversification decreases performance but increases risk. For instance, Lepetit *et al.* (2008) using the data of European banks found that bank failure probability and bank risk increased with diversifying from traditional banking to non-traditional banking. Acharya *et al.* (2006) used data on Italian banks in their analysis and found that diversification of loan portfolio decreases return and increases risk. This happens since diversification is characterized by adverse selection and ineffective monitoring which eventually leads to diseconomies of diversification. Also, this can be explained by the fact that diversification leads to aggravated agency costs which come as costs which exceeded the gains. The second strand of studies found a positive impact of diversification on performance but a decreasing effect on risk. Saunders *et al.* (2014) found that banks that diversify away from interest income to non-interest income have lower insolvency risk but higher profitability. Onumah and Duho (2019) found that among other things, bank size, concentration, government ownership and foreign ownership affect the financial stability of banks in Ghana.

In a nutshell, most empirical studies on diversification, competition and ownership and their impact on profitability, profit efficiency and financial stability are concentrated outside Africa. The results of these studies are mixed and inconclusive. The current study aims to fill the paucity in the literature by examining the impact of diversification, competition and ownership on profitability, profit efficiency and financial stability in Ghanaian banks.

3. Methodology

3.1 Data envelopment analysis: profit efficiency

The data envelopment analysis drew inspirations from the works of Charnes *et al.* (1978), Farrell (1957), Shephard (1953), as well as, Debreu (1951) and is based on the concepts of linear programming. It makes use of multiple inputs and multiple outputs as well as their respective prices to compute a score to measure the level of efficiency. The current study makes use of the ratio of ratio model discussed in the study of Cooper *et al.* (2006) and applied in the studies of Onumah and Duho (in press) and Tohidnia and Tohidi (2019). For a mathematical depiction of the model, let us assume that a number of n decision-making units (DMUs) are observed. For each DMU$_j$, $j = 1, 2, \ldots, n$, m inputs, x_{ij}, $i = 1, 2, \ldots, m$ and s outputs, y_{rj}, $r = 1, 2, \ldots, s$ are consumed. Also, each of these inputs and outputs have respective prices, c_i, $i = 1, 2, \ldots, m$ and p_r, $r = 1, 2, \ldots, s$. To compute the observed profit of a specific DMU$_o$ being evaluated, we must calculate the observed cost and the observed revenue for that DMU. The observed cost can be expressed as $cx_o = \sum_{i=1}^{m} c_i x_{io}$, while the observed revenue can be expressed as $py_o = \sum_{r=1}^{s} p_r y_{ro}$. The ratio of the observed revenue to observed cost will yield the observed profit ratio given as py_o/cx_o.

The profit efficiency can be obtained by computing the ratio of observed profit to the optimal profit. The optimal profit can be computed in the production possibility set by changing the input–output mix. Therefore, profit efficiency can be expressed as $PE(x_o,y_o) = (py_o/cx_o)/(py^*/cx^*)$. The optimal profit py^*/cx^* can be computed by solving the fractional programming model (Cooper *et al.*, 2006) identified as follows:

$$py^*/cx^* = \max \sum_{r=1}^{s} p_r y_r / \sum_{i=1}^{m} c_i x_i, \tag{1}$$

s.t.:

$$y_r = \sum_{j=1}^{n} \lambda_j y_{rj} \geqslant y_o, \quad r = 1, 2, \ldots, s,$$

$$x_i = \sum_{j=1}^{n} \lambda_j x_{ij} \leqslant x_o, \quad i = 1, 2, \ldots, m,$$

$$\sum_{j=1}^{n} \lambda_j = 1,$$

$$\lambda_j \geqslant 0, \quad j = 1, 2, \ldots, n.$$

The current study follows the financial intermediation approach of Sealey and Lindley's (1977) study since this approach considers the entire cost and is better than the production approach which focuses on production cost minimization. The focus on overall cost is in line with the profit maximization. The current study builds on the input and output choices in

the studies of Onumah and Duho (in press), Moffat and Valadkhani (2011) and Das and Ghosh (2009). The focus, in this case, is to account for credit risk and so the net of loans and advances are used instead of gross loans and advances. Table I provides descriptive statistics of the data set used for computing profit efficiency. The inputs and outputs are all significantly related positively and thus the isotonicity condition is met, which justifies the appropriateness of using the data envelopment analysis[3].

3.2 Bank diversification

The current study employs two different diversification measures employed in the literature. One of the measures rates the extent of income diversification while the other rate the extent of asset diversity. The respective equations are modeled after the work of the study of Laeven and Levine (2007). The two measures are presented in the mathematical format as follows:

$$\text{IDIV} = 1 - \left| \frac{(\text{net interest income} - \text{other operating income})}{\text{total operating income}} \right|, \tag{2}$$

$$\text{ADIV} = 1 - \left| \frac{\text{net loans} - \text{other earning assets}}{\text{total earning assets}} \right|, \tag{3}$$

where IDIV is the income diversification measure and ADIV an asset diversity measure. The diversification measures described in (2) and (3) have scores that range from 0 to 1. Higher values signify greater level of diversification and lower values signify a lower level of diversification. These metrics are complementary for measuring diversification since the income diversification metric provides an income statement measure while the asset diversity provides a statement of financial position measure. In effect, the two key financials in line with IAS 1: Presentation of Financial Statements of the banks are considered.

3.3 Econometric model

To test the hypothesized impact of diversification, competition and ownership structure on profitability, profit efficiency and financial stability of banks, the current study is modeled after the works of Chen *et al.* (2018), Elyasiani and Wang (2012) and Pennathur *et al.* (2012).

Variable	Obs	Mean	SD	Min.	Max.
Inputs and input costs					
Deposits (X1)	356	5.03e+08	7.07e+08	532,000	4.66e+09
W1	356	0.296	4.014	0.014	75.811
Staff cost (X2)	356	2.45e+07	3.79e+07	49,094	2.60e+08
W2	356	0.031	0.014	0.001	0.097
PPE (X3)	356	2.06e+07	3.18e+07	59,111	2.53e+08
W3	356	1.731	1.868	0.151	21.319
Outputs and output prices					
Net loans and advances (Y1)	356	3.22e+08	4.95e+08	153,000	4.75e+09
P1	356	0.205	0.087	0.016	0.710
Investments (Y2)	356	1.75e+08	2.91e+08	61,000	2.04e+09
P2	356	0.181	0.089	0.002	0.684

Notes: W1 is the interest expense to deposits; *W*2 the staff cost to total assets; W3 the other operating expenses to property, plant and equipment (PPE); P1 the interest income from loans to net loans and advances and P2 the interest income from investments to investments

Table I.
Descriptive statistics for DEA inputs, outputs, costs and prices

The mathematical model is expressed as follows:

$$\text{PERF}_{i,t} = \alpha + \beta_1 \text{DIV}_{i,t} + \beta_2 \text{COMP}_t + \sum_{j=1}^{2} \delta_j \text{OWN}_{i,t} + \sum_{k=1}^{4} \varphi_k \text{CONTROLS}_{i,t} + \varepsilon_{i,t}, \quad (4)$$

where PERF represents the performance metrics such as profitability, profit efficiency and financial stability. Since the study is employing a panel data set, i, t signifies a variable of bank i in time t. DIV represents two diversification measures, namely, the asset diversification and the income diversification; COMP an industry-wide competition; OWN a vector of two static variables for ownership and original status. The CONTROLS are a vector of control variables, namely, bank size, leverage, age and asset tangibility. These variables are included in the model so as to separate their effect from the effect of the main variables of interest. The term ε is the error term.

3.4 Description of variables

The description of the various variables used has been presented in Table II. Apart from profit efficiency, the return on asset is used to measure profitability of banks in line with the studies of Onumah and Duho (2019) and Tan *et al.* (2017). The *z*-score which has been employed in many bank insolvency risk studies is employed to measure financial stability in line with the studies of Tan *et al.* (2017) and Tan and Floros (2013)[4].

Likewise, apart from the diversification measures, competition is measured by 1 less the H-H index of banks[5]. The expectation of the study is that competition will drive financial stability but inhibit profitability and profit efficiency. The effect of ownership and original license on performance is also examined by developing a dummy. The expectation is that privately-owned banks should have higher performance and be more financially stable as compared to the government-owned ones. Also, original license, a dummy to differentiate non-banking financial institutions that later obtained the Universal banking license from initially licensed Universal banks is used. This is a very insightful factor to consider in the Ghanaian context having that non-banking institutions seek to apply for Universal banking license after operating for a number of years with strides. Bank size is measured as the natural logarithm of total assets. Age is also

Variable	Definition	Measurement
ROA	Return on asset	Profit after tax/total assets
RPE	Risk-adjusted profit efficiency	Equation (1)
IR	Insolvency risk	*z*-score
IDIV	Income diversification	Equation (2)
ADIV	Asset diversity	Equation (3)
COMP	Competition	1 less the sum of squares of each bank's market share (loans)
GOV	Government ownership	Dummy of 1 if government owned, otherwise 0
ORIG	Original license	Dummy of 1 if the bank started as a full bank and 0 if as NBFI
SIZE	Size of bank	Natural logarithm of total assets
LEV	Leverage	Total liabilities/total assets
AGE	Age of bank	Natural logarithm of bank age
TANG	Asset tangibility	Property plant and equipment/total assets

Notes: NBFI stands for non-banking financial institutions which are regulated in Ghana under the Financial Institutions (Non-Banking) Law, 1993 (PNDCL. 328). The law excludes credit unions under this definition but deposit-taking institutions (other than discount houses), non-deposit-taking institutions in credit business, discount houses and venture capital fund companies are included

Table II. Description of second-stage variables

measured as the natural logarithm of the age of banks. Leverage, the ratio of total liabilities to total assets, is used to control for risk while asset tangibility, the ratio of PPE to total assets, is used.

3.5 Model specification

There have been mixed views on the regression model to employ in second-stage performance analysis. In the efficiency literature, for instance, the ordinary least squares, Tobit, fractional and truncated regression methods have been employed. Simar and Wilson (2007) also developed an innovative bootstrap technique to carry out such analysis. The ordinary least squares method has been criticized for being biased and inconsistent since panel data structure may be exposed to heteroscedasticity or serial correlation or both which may result in wrong inferences. Yet, the innovative bootstrap approach has also been criticized as requiring more bootstrap replications, computational burdens for bootstrapping and larger samples to achieve convergence (Banker and Natarajan, 2008; Ramalho *et al.*, 2010). A recent study by Banker *et al.* (2019) provided evidence that supports the ordinary least squares approach over bootstrap approaches. In line with this, the current study employs the ordinary least squares' panel corrected standard error approach of Beck and Katz (1995) which corrects for heteroscedasticity and serial correlation.

3.6 Data sources

The study employs an unbalanced panel data set of 32 banks that operated in Ghana from 2000 to 2015. This includes banks that later became defunct and those that are currently going concern. The data are sourced from the Banking Supervision Department of the Bank of Ghana. The information on the age and ownership structure are sourced from the annual reports of the banks.

4. Results

4.1 Descriptive statistics

The descriptive statistics of the variables used for the analysis are presented in Table III. The results indicate that, on average, return on asset of banks is 3.1 percent with a

Variable	Obs	Mean	SD	Min.	Max.
ROA	356	0.031	0.040	−0.171	0.181
RPE	356	0.794	0.251	0.001	1.000
IR	356	5.447	3.887	−5.107	30.965
IDIV	356	0.717	0.199	0.040	1.000
ADIV	356	0.631	0.242	0.001	1.000
COMP	356	0.910	0.035	0.817	0.944
GOV	356	0.135	0.342	0.000	1.000
ORIG	356	0.975	0.157	0.000	1.000
SIZE	356	19.534	1.586	13.692	22.608
TA (GH¢)	356	7.52e+08	1.00e+09	884,000	6.60e+09
LEV	356	0.828	0.174	0.090	1.938
AGE	356	2.640	1.157	0.000	4.787
AGE (years)	356	25.430	28.623	1.000	120.000
TANG	356	0.034	0.029	0.001	0.273

Notes: ROA, return on asset; RPE, risk-adjusted profit efficiency; IR, insolvency risk; IDIV, an income diversification measures; ADIV, an asset diversity measure; COMP, a measure of competition; GOV, a dummy for government ownership; ORIG, a dummy for banks that started as banking institutions; SIZE and TA, measures of bank size; LEV, leverage; AGE, the age of banks; TANG, the asset tangibility

Table III.
Descriptive statistics

variation of 4 percent. Risk-adjusted profit efficiency is 79.4 percent, on average, signifying that Ghanaian banks operate 20.06 percent lower than efficient banks operating on the frontier. This result is similar to the result obtained by Onumah and Duho (in press). The *z*-score of the banks recorded an overall average of 5.45 with standard deviation of 3.89. Income diversification recorded a mean of 71.7 percent. The asset diversity recorded an average of 63.1 percent. The competition measure recorded an average of 0.91. In total, 13.5 percent of the banks in the data sample are government-owned while 97.5 percent were registered to operate initially (i.e. as a mainstream banking business) as banks and not initially as non-banking financial institutions. On average bank size records 19.53 (GH¢ 752m) and the average age is 2.64 (25.43 years). Leverage recorded an average of 0.828 signifying the high leverage that is usually characterized in the banking industry. Tangibility records an average of 3.4 percent which means that only 3.4 percent of the assets of banks are PPE.

4.2 Test for multicollinearity

The curse of multicollinearity can have practical consequences and eventually result in wrong inferences. The results of the pairwise correlation are presented in Table IV. The results indicate that the data do not suffer from the problem using the rule of thumb of 0.7 proposed by Kennedy (2008). To be more certain on the conclusion, a variance inflation factor test was conducted. The results revealed the highest variance inflation to be 3.86 and the highest average being 1.83. These values are below the rule of thumb of 10 proposed by Wooldridge (2016), thus we conclude that the sample used does not suffer from the curse of multicollinearity and proceed with our regression analysis.

4.3 Regression results

4.3.1 Income diversification. The results of the basic linear regression and the basic quadratic regression models are presented in Table V. From the first set of estimates which concerns income diversification, the results indicated that the impact of income diversification has a negative significant impact on profitability, profit efficiency and the *z*-score. The results have a level of significance of 1 percent except for profit efficiency which is at 5 percent. These results suggest that income diversification inhibits both profitability, profit efficiency and financial stability. The negative relationship between income diversification with profitability and efficiency is consistent with the results of Alhassan (2015) and Elyasiani and Wang (2012). However, this was inconsistent with the positive relationship evidenced in the study of Saunders *et al.* (2014). The result of the financial stability model is also consistent with the studies of Lepetit *et al.* (2008) and Acharya *et al.*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) IDIV	1.000								
(2) ADIV	−0.044	1.000							
(3) COMP	−0.122**	−0.290***	1.000						
(4) GOV	−0.031	0.051	−0.066	1.000					
(5) ORIG	0.095*	0.151***	−0.123**	0.064	1.000				
(6) SIZE	−0.041	−0.169***	0.689***	0.191***	−0.095*	1.000			
(7) LEV	0.198***	0.061	−0.063	−0.032	−0.055	0.065	1.000		
(8) AGE	0.035	0.109**	0.029	0.418***	0.183***	0.506***	0.213***	1.000	
(9) TANG	0.098*	−0.136**	−0.111**	−0.034	0.019	−0.292***	0.042	−0.196***	1.000

Notes: IDIV, an income diversification measures; ADIV, an asset diversity measure; COMP, a measure of competition; GOV, a dummy for government ownership; ORIG, a dummy for banks that started as banking institutions; SIZE, measure of bank size; LEV, leverage; AGE, the age of banks; TANG, the asset tangibility. *,**,***Significant at 10, 5 and 1 percent levels, respectively

Table IV.
Pairwise correlations

Table V.
Diversification and performance metrics

Variable	(1) ROA	(2) RPE	(3) IR	(4) ROA	(5) RPE	(6) IR
IDIV	−0.026*** (0.009)	−0.143** (0.068)	−3.884*** (1.050)	−0.147*** (0.052)	−0.464 (0.354)	−19.826*** (6.685)
$IDIV^2$				0.096** (0.040)	0.252 (0.276)	12.559** (4.919)
SIZE	0.013*** (0.002)	0.022 (0.016)	−0.737*** (0.250)	0.013*** (0.002)	0.023 (0.016)	−0.682*** (0.243)
AGE	0.004* (0.002)	0.031** (0.016)	0.254 (0.222)	0.005** (0.002)	0.035** (0.016)	0.437* (0.243)
LEV	0.004 (0.011)	−0.132* (0.075)	−4.831*** (1.213)	0.004 (0.010)	−0.130* (0.075)	−4.774*** (1.154)
TANG	−0.436*** (0.074)	−0.857 (0.578)	−10.457 (7.135)	−0.412*** (0.075)	−0.793 (0.577)	−7.250 (6.856)
COMP	−0.559*** (0.084)	−2.059*** (0.571)	53.672*** (8.961)	−0.565*** (0.082)	−2.074*** (0.569)	52.941*** (8.685)
GOV	−0.016*** (0.005)	−0.091** (0.037)	0.023 (0.478)	−0.018*** (0.005)	−0.097** (0.038)	−0.274 (0.492)
ORIG	0.012 (0.008)	−0.041 (0.098)	2.183*** (0.674)	0.017* (0.009)	−0.029 (0.102)	2.796*** (0.983)
_cons	0.301*** (0.051)	2.452*** (0.381)	−24.668*** (5.112)	0.322*** (0.051)	2.509*** (0.386)	−21.806*** (5.171)
Obs.	356	356	356	356	356	356
Banks	32	32	32	32	32	32
R^2	0.372	0.098	0.256	0.385	0.100	0.279
Wald χ^2	162.24***	39.84***	72.30***	165.16***	40.51***	76.85***
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ADIV	0.006 (0.008)	0.080 (0.058)	0.988 (0.802)	−0.027 (0.040)	−0.094 (0.303)	0.884 (4.053)
$ADIV^2$				0.028 (0.033)	0.145 (0.242)	0.087 (3.338)
SIZE	0.012*** (0.002)	0.020 (0.016)	−0.799*** (0.261)	0.012*** (0.002)	0.020 (0.016)	−0.800*** (0.262)
AGE	0.004* (0.002)	0.031* (0.016)	0.274 (0.224)	0.004* (0.002)	0.031** (0.016)	0.274 (0.224)
LEV	−0.002 (0.011)	−0.167** (0.076)	−5.731*** (1.334)	−0.002 (0.011)	−0.168** (0.076)	−5.732*** (1.335)
TANG	−0.446*** (0.078)	−0.838 (0.577)	−11.666 (7.722)	−0.449*** (0.079)	−0.856 (0.578)	−11.677 (7.764)
COMP	−0.521*** (0.086)	−1.780*** (0.580)	59.551*** (9.665)	−0.514*** (0.087)	−1.740*** (0.581)	59.575*** (9.740)
GOV	−0.015*** (0.005)	−0.087** (0.038)	0.126 (0.473)	−0.015*** (0.005)	−0.085** (0.038)	0.127 (0.475)
ORIG	0.008 (0.009)	−0.073 (0.092)	1.493*** (0.484)	0.011 (0.009)	−0.058 (0.096)	1.502** (0.600)
_cons	0.262*** (0.052)	2.134*** (0.397)	−30.821*** (5.419)	0.262*** (0.052)	2.136*** (0.398)	−30.820*** (5.419)
Obs.	356	356	356	356	356	356
Banks	32	32	32	32	32	32
R^2	0.358	0.091	0.223	0.359	0.092	0.223
Wald χ^2	157.40***	36.13***	75.42***	161.23***	37.52***	75.49***

Notes: ROA, return on asset; RPE, risk-adjusted profit efficiency; IR, insolvency risk; IDIV, an income diversification measures; ADIV, an asset diversity measure; COMP, a measure of competition; GOV, a dummy for government ownership; ORIG, a dummy for banks that started an banking institutions; SIZE, measure of bank size; LEV, leverage; AGE, the age of banks; TANG, the asset tangibility. Standard errors are in parenthesis. *,**,***Significant at 10, 5 and 1 percent levels, respectively

(2006) but inconsistent with the study of Saunders *et al.* (2014). A further analysis conducted using the quadratic model revealed that profitability, profit efficiency and financial stability decrease with income diversification but at a certain point it starts to increase. The U-shape relationship between diversification, profitability and financial stability is statistically significant at 1 percent.

The results on the impact of competition on profitability and profit efficiency indicate that there is a negative nexus which is significant at 1 percent level. This suggests that higher competition reduces both profitability and profit efficiency. This is in opposition to the quiet-life hypothesis of Hicks (1935) which argues that industry concentration leads to managerial slacks which results in lower performance. In addition, there is evidence of a positive and significant relationship between competition and financial stability which is similar to the results of Onumah and Duho (2019). The results suggest that government-owned banks are less profitable and less profit efficient than private-owned banks. Banks that commenced as full banks from inception are more profitable than those that were non-banking financial institutions before transmitted later to the banking status. Also, the banks that commenced as full banks are more financially stable than those that transitioned.

4.3.2 Asset diversity. The results of the impact of asset diversity on profitability, profit efficiency and financial stability are also reported in Table V. In this case, similar to the earlier presentations, both the linear and the quadratic models are employed. The results for the linear model indicated that asset diversity has a positive impact on profitability, profit efficiency and financial stability but at an insignificant level. This insignificant effect is similar to the result of Abuzayed *et al.* (2018) which found that asset diversification does not enhance financial stability. In the quadratic model, the insignificant results are also evidenced. Further analysis will be conducted in the preceding section on the robustness check to investigate what factors can drive the asset diversification metric to become statistically significant or remain the same. The results of the impact of competition and ownership structure are generally similar to that reported for the income diversification models.

4.3.3 Control variables. The results of the control variables employed in the linear and quadratic models accompany the results. On the impact of these variables on profitability, profit efficiency and financial stability, the results indicated that bank size has a positive impact on profitability with a significance level of 1 percent. This suggests that larger banks are more profitable than smaller banks. Size has a positive but insignificant impact on profit efficiency. On the contrary, bank size has a negative impact on financial stability at 1 percent significance level. The significant results in the case of profitability and financial stability support the argument by Brighi and Venturelli (2014) that size matters in examining the impact of diversification on performance. There is evidence to suggest that bank age has a positive impact on profitability, profit efficiency and financial stability of banks. These results are statistically significant at 10 percent except for the result of financial stability in the linear model. This suggests that older banks are more profitable, more profit efficient and more financially stable. Leverage has a positive and insignificant impact on profitability. However, for-profit efficiency and financial stability, there is a significant negative impact at 10 and 1 percent levels of significance, respectively. These results suggest that a high level of leverage (i.e. lower level of equity capital) inhibits profit efficiency and financial stability. This can be explained by the agency problem that may exist between the interests of bank managers and the shareholders of banks. There is an indication that sub-optimal decisions relating to loan pricing, deposit management, portfolio management and risk management are taken by highly leveraged banks. The results of the impact of asset tangibility reveal that high investment in tangible assets is associated with

lower profitability, profit efficiency and financial stability. The impact is statistically significant at 1 percent level in the case of profitability but not in the case of the other metrics. These explained the need for focus on intellectual capital (intangible asset) management in the quest to enhance performance in banks (Duho and Onumah, 2018; Onumah and Duho, 2019).

4.4 Robustness checks

We proceed to perform a battery of sensitivity analysis on the interaction between diversification and performance metrics such as profitability, profit efficiency and financial stability. To be specific, the results of the interactions on profitability are presented in Table VI, that of profit efficiency in Table VII and that of financial stability in Table VIII. In doing this, all the independent variables have interacted with the diversification metrics[6].

As regards the impact of income diversification on profitability of banks reported in Table VI, the negative relationship is still evidenced except for the case of interacting size as well as leverage. The interaction of leverage, asset tangibility and competition with income diversification has a significant effect on profitability. The positive impact in the case of leverage suggests that highly leveraged banks are able to benefit from diversification as compared to less leveraged banks. In the same vein, more asset tangibility exerts a positive impact on profitability suggesting that banks with more tangible assets could benefit from income diversification than those with more intangibles in their asset structure. High competition in the industry does not benefit from income diversification to enhance profitability rather less competition fosters that.

The results of the impact of asset diversity with profitability are more consistent with the quadratic equation than the linear equation. The interaction of size, age, original license, competition and government ownership produced a negative effect of asset diversification on profitability with statistically significant impacts except for the cases of the last two variables just identified. This means that when such variables interact with asset diversification, there is the propensity of exertion of a negative effect on profitability. The interaction impacts of these variables are positive and significant except for competition. This suggests that they contribute to enabling diversification to enhance profitability. A positive impact of asset diversification on profitability is evidenced with the interaction of leverage and tangibility, a result which is similar to that found in the case of income diversification.

The impact of the interaction between diversification and profit efficiency with the interaction of diversification with the independent variables is presented in Table VII. On the impact of income diversification on profit efficiency, the direction of the impact varies but the only two statistically significant effects are negative which is in line with the basic regression model. As regards the interaction variables, the impact of leverage, asset tangibility and ownership structure are statistically significant. The results indicated that leverage and asset tangibility enters the profit efficiency model as positive and significant at 5 percent level of significance. This suggests that diversification enhances the ability of highly geared banks and banks with more tangible assets to have high profit efficiency. The interaction of income diversification on government ownership enters the profit efficiency model with a negative impact with 1 percent level of significance. This suggests that income diversification hampers the ability of government-owned banks to be highly profit efficient as compared to private-owned banks.

The interaction of asset diversification with the independent variables also produced varied impacts on profit efficiency different from the basic model. In this case, there is evidence suggesting that when the interaction between diversification and competition is controlled, the effect of asset diversification on profit efficiency is negative and statistically significant at 1 percent. Also, the interaction of asset diversification with competition yields a positive impact on profit efficiency. This suggests that asset diversification drives the

Table VI. Sensitivity analysis: diversification and profitability

	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA	(7) ROA
IDIV	0.097 (0.120)	−0.040** (0.019)	−0.151*** (0.045)	−0.071*** (0.020)	0.424* (0.229)	−0.024** (0.010)	−0.034 (0.021)
IDIV×SIZE	−0.006 (0.006)						
IDIV×AGE		0.006 (0.008)					
IDIV×LEV			0.160*** (0.055)				
IDIV×TANG				1.500** (0.646)			
IDIV×COMP					−0.494** (0.251)		
IDIV×GOV						−0.014 (0.023)	
IDIV×ORIG							0.009 (0.024)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	356	356	356	356	356	356	356
R^2	0.375	0.373	0.391	0.398	0.379	0.373	0.372
ADIV	−0.317*** (0.095)	−0.050*** (0.017)	0.093* (0.049)	0.032*** (0.012)	−0.252 (0.205)	−0.000 (0.008)	−0.029* (0.017)
ADIV×SIZE	0.016*** (0.005)						
ADIV×AGE		0.022*** (0.006)					
ADIV×LEV			−0.106* (0.057)				
ADIV×TANG				−0.772*** (0.294)			
ADIV×COMP					0.282 (0.224)		
AD(IV×GOV						0.067*** (0.022)	
ADIV×ORIG							0.037* (0.019)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	356	356	356	356	356	356	356
R^2	0.381	0.384	0.367	0.378	0.360	0.371	0.360

Notes: ROA, return on asset; IDIV, an income diversification measure; ADIV, an asset diversity measure; COMP, a measure of competition; GOV, a dummy for government ownership; ORIG, a dummy for banks that started an banking institutions; SIZE, measure of bank size; LEV, leverage; AGE, the age of banks; TANG, the asset tangibility. Standard errors are in parenthesis. *,**,***Significant at 10, 5 and 1 percent levels, respectively

Table VII.
Sensitivity analysis: diversification and profit efficiency

	(1) RPE	(2) RPE	(3) RPE	(4) RPE	(5) RPE	(6) RPE	(7) RPE
IDIV	0.720 (0.816)	0.007 (0.144)	−0.667** (0.261)	−0.333*** (0.107)	0.102 (1.694)	−0.076 (0.076)	0.139 (0.251)
IDIV×SIZE	−0.045 (0.042)						
IDIV×AGE		−0.070 (0.055)					
IDIV×LEV			0.670** (0.327)				
IDIV×TANG				6.270** (3.067)			
IDIV×COMP					−0.269 (1.861)		
IDIV×GOV						−0.445*** (0.155)	
IDIV×ORIG							−0.304 (0.261)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	356	356	356	356	356	356	356
R^2	0.101	0.102	0.107	0.109	0.098	0.112	0.102
ADIV	−0.490 (0.712)	0.105 (0.141)	0.170 (0.310)	−0.034 (0.086)	−4.402*** (1.670)	0.065 (0.060)	0.189 (0.220)
ADIV×SIZE	0.029 (0.036)						
ADIV×AGE		−0.010 (0.046)					
ADIV×LEV			−0.109 (0.360)				
ADIV×TANG				3.325* (1.915)			
ADIV×COMP					4.903*** (1.828)		
ADIV×GOV						0.167 (0.173)	
ADIV×ORIG							−0.117 (0.228)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	356	356	356	356	356	356	356
R^2	0.093	0.091	0.091	0.100	0.111	0.093	0.092

Notes: RPE, risk-adjusted profit efficiency; IDIV, an income diversification measure; ADIV, an asset diversity measure; COMP, a measure of competition; GOV, a dummy for government ownership; ORIG, a dummy for banks that started an banking institutions; SIZE, measure of bank size; LEV, leverage; AGE, the age of banks; TANG, the asset tangibility. Standard errors are in parenthesis. *,**,***Significant at 10, 5 and 1 percent levels, respectively

Table VIII. Sensitivity analysis: diversification and financial stability

	(1) IR	(2) IR	(3) IR	(4) IR	(5) IR	(6) IR	(7) IR
IDIV	−15.124 (11.889)	−7.663*** (2.137)	−31.994*** (4.915)	−8.817*** (2.237)	48.176** (24.062)	−4.485*** (1.190)	0.559 (0.591)
IDIV×SIZE	0.584 (0.601)						
IDIV×AGE		1.753** (0.748)					
IDIV×LEV			35.962*** (5.899)				
IDIV×TANG				162.618*** (57.304)			
IDIV×COMP					−57.152** (26.682)		
IDIV×GOV						3.945** (1.999)	
IDIV×ORIG							−4.792*** (1.324)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	356	356	356	356	356	356	356
R^2	0.259	0.267	0.361	0.288	0.267	0.261	0.260
ADIV	−23.989** (9.535)	−4.262** (1.844)	11.733* (6.094)	0.836 (1.301)	14.223 (22.588)	0.385 (0.848)	−0.323 (0.567)
ADIV×SIZE	1.272*** (0.475)						
ADIV×AGE		2.091*** (0.612)					
ADIV×LEV			−12.960* (6.974)				
ADIV×TANG				4.478 (26.766)			
ADIV×COMP					−14.480 (24.789)		
ADIV×GOV						7.025*** (1.717)	
ADIV×ORIG							1.397 (1.028)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	356	356	356	356	356	356	356
R^2	0.238	0.247	0.238	0.223	0.224	0.239	0.223

Notes: IR, insolvency risk; IDIV, an income diversification measure; ADIV, an asset diversity measure; COMP, a measure of competition; GOV, a dummy for government ownership; ORIG, a dummy for banks that started an banking institutions; SIZE, measure of bank size; LEV, leverage; AGE, the age of banks; TANG, the asset tangibility. Standard errors are in parenthesis. *,**,***Significant at 10, 5 and 1 percent levels, respectively

ability of competition in the industry to enhance the profit efficiency of banks. Similar to earlier results, asset tangibility enters the profit efficiency model as positive and significant at 10 percent level of significance. This suggests that asset diversification enhances the ability of banks with more tangible assets to have high-profit efficiency.

The results of the sensitivity checks in the case of the financial stability model are presented in Table VIII. The results indicated that depending on the interaction term used, the impact of income diversification on financial stability could be either positive or negative. Specifically, all the significant results except for the model with the interaction of income diversification and leverage controlled for enter the financial stability model with a negative impact. This is consistent with the basic model. The results indicate that the interaction terms of age, leverage, tangibility and government ownership entered the regression model with a positive significant impact. This suggests that income diversification drives such variables to enhance financial stability. On the other hand, income diversification interacts with leverage and original license to inhibit financial stability.

The impact of asset diversification on financial stability in the sensitivity analysis also produced varied relationships based on the independent variable being interacted. Asset diversification enters the financial stability model with a negative nexus when either the interaction of asset diversification with bank size or bank age is controlled for but positive when the interaction with leverage is controlled for. The interaction of size, age and government ownership with asset diversification has a positive impact on financial stability at 1 percent level of significance. This suggests that asset diversification influences these variables to have a favorable effect on financial stability. On the other hand, the interaction term of leverage or competition with asset diversification has a negative impact on financial stability. This suggests that asset diversification is a contributing factor in enabling these variables to hamper the financial stability of the banks.

5. Conclusions

There have been growing interests in bank diversification following the over two decade's financial liberalization in Africa as well as the growing competition and increasing focus on risk management. However, there is still a number of insights that ought to be obtained on the impact of diversification on profitability, profit efficiency and financial performance in banks. The aim of this study is to fill the dearth in the literature by examining these nexuses using a data set of 32 Ghanaian banks from 2000 to 2015. Overall, the results indicate that income diversification negatively affects profitability, profit efficiency and financial stability significantly. The impact on profitability and financial stability seems to be non-linear such that it is U-shaped. In effect, although income diversification initially decreases these two metrics, it eventually increases both profitability and financial stability. The results of the impact of asset diversity are statistically insignificant. To further obtain insights as to how diversification variables interact with some firm-specific variables to affect the three metrics employed as dependent variables, we provided a robustness checks. The results in the first sensitivity model suggest that leverage, asset tangibility and competition interact with income diversification to significantly affect profitability. Also, asset diversification interacts with all the control variables except competition to statistically impact profitability. In the second sensitivity model, it is evidenced that when income diversification interacts with leverage, tangibility and government ownership, it has a significant effect on profit efficiency. Government ownership and competition interact with asset diversification to significantly affect profit efficiency. In the third sensitivity model, the result indicates that apart from banks size, all other control variables interact with income diversification to have a statistically significant impact on financial stability. Again, it was found that size, age, leverage and government ownership interact with asset diversity to have a resultant impact on financial stability at a statistically significant level.

In general, the results suggest that among all control variables, an original license is the only variable which does not interact with diversification to either drive or inhibit profitability, profit efficiency or financial stability in banks. The results also indicate that bank size and age have a positive significant effect on profitability and profit efficiency. Bank size does not, however, increase with financial stability. This suggests that the too-big-to-fail doctrine may be at play in the Ghanaian banking industry. Overall, leverage has a negative impact on profitability, profit efficiency and financial stability of banks. Competition inhibits profit and efficiency but it is a driver of the financial stability of banks. Government-owned banks have lower profitability and profit efficiency while banks that started as full banks are more financially stable.

6. Implications of the study

The current study has implications for practice, policy and future studies. Policy-wise, the study provides empirical evidence on which Bank of Ghana can base its regulatory measures on the banking industry. For instance, from the results, it is evidenced that licensing of banks needs to be reconsidered so that the capital capacity of banks is considered before granting the licenses. This is relevant since those banks that were non-banking financial institutions (NBFIs) but later obtained the banking licenses are exposed to higher risk. As NBFIs, they are not allowed to engage in off-balance-sheet transactions but once granted the universal banking license, they are allowed to. There is a threat that management may not strengthen risk management to comply with the stringent requirements of universal banking. Again, the government should take clues from the results to ensure that the bureaucracies associated with government ownership do not inhibit government-owned banks from attaining higher profit and efficiency. This is very relevant to the establishment of the Consolidated Bank of Ghana which resulted from the merger of 5 collapsing banks in 2018 (Onumah and Duho, 2019).

Practice-wise, bank managers are encouraged to consider pricing policies when it comes to the loan market. This can be appropriately done with the implementation of big data analytics. Also, the bankers, management accountants and other back office and decision support professionals of the banks need to make use of quantitative tools in making input mix and output mix decisions to ensure the highest level of efficiency is gained. It is relevant for bank managers to find out what to do to leverage on the benefits that come with intangible assets instead of over-focusing on the tangible assets which seem to be losing the ability to drive competitive advantage or even transient advantage in current times. Issues of intellectual capital and value-added accounting should be at the fore of management decisions. Even metrics such as value-added metrics and intellectual capital metrics could be inculcated in decision-making metrics of banks. Bank stability is of essence to bank management in the Ghanaian context considering the various structural changes that characterized the 2017–2018 banking years. Thus, bank managers should adopt an enterprise-wide approach to risk management. Managers should seek to implement the Basel III in issues of risk management, and in making judgment such as concerning provisions for loans. The IFRS 9 is also a key accounting standard which is meant to help in such situations. Corporate governance practices should be core at management meetings and the strategic leaders should seek to take decisions to implement best practices. This will improve profitability, profit efficiency and financial stability. With bancassurance now gaining grounds in the industry, management should monitor how diversifying into these new areas will affect their performance metrics.

On the menu of future researchers, a qualitative case of risk management in the Ghanaian context should be examined to understand the how and the why of events regarding banks internally. Areas of the implementation of Basel framework are still under-researched in Ghana and Africa, in general. There is a gap in the literature as to whether or

not the intellectual capital stance of banks drives their level of diversification; this can be explored in future studies. The Ghanaian banking industry is flooded with Nigerian banks which are very large with some services offered directly across the two jurisdictions. There is currently no study examining how the Nigerian banking industry affects the Ghanaian industry. The consequent implication of such free-flow transactions regarding taxation, transfer pricing and income shifting has also not been researched. Future studies can also expand the analysis to cover Sub-Sahara Africa. The results of the current study are useful for teaching on bank management in the universities and professional bodies.

Notes

1. The Act (612) has some weaknesses which have been addressed by the enactment of the Bank of Ghana (Amendment) Act, 2016 (Act 918).
2. Accounting for subsidiary and associates of a bank is in line with the accounting standards IFRS 10: Consolidated Financial Statements and IAS 28: Investments in Associates and Joint Ventures, respectively.
3. The results of the isotonicity test are not presented but are available upon request from the authors.
4. The *z*-score is expressed in a ratio form. It can be mathematically expressed as:

$$z - \text{score} = \frac{\text{ROA} + (E/A)}{\sigma\text{ROA}},$$

where ROA is the return on asset; σROA the standard deviation of return on asset; and E/A the ratio of equity to assets. A high ratio signifies better stability and is preferable to a lower ratio.

5. The Herfindahl Hirschman Index (H-H) has been employed in the extant literature (Onumah and Duho, 2019, in press). It is computed as the sum of squares of the loan market share of banks. The score will initially yield a concentration measure which is deducted from 1 to obtain a measure that represents competition. A high value will mean high competition and vice versa.
6. The reported outputs excluded the results of the four control variables because of the limited space. The results of the control variables are consistent with that of the basic models.

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Corresponding author
King Carl Tornam Duho can be contacted at: kctduho@gmail.com