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Original Article

Mobile Banking: Evidence of Improved Bank Performance in the UAE

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Abstract *- The increased penetration of mobile banking is redefining banking operations in the UAE. This study examined the effect of mobile banking adoption on bank performance in the UAE by analyzing performance data spanning 2008 through 2016 from 15 selected banks. A random-effect model was applied using the pooled ordinary least squares method to estimate coefficients. The study found mobile banking adoption significantly negatively correlated with return on assets, implying that mobile banking adoption affects UAE banking performance. The analyses also showed a significant relationship between market share, expenses-income ratio, oil price, and mobile banking adoption. For banks, continuing to adopt mobile banking will be a key urgency going onward. It will help the banks advance their competitive advantages over other financial institutions and new entrants in the banking industry. This study provides scholars and practitioners with insights into how such adoption may impact bank performance.*

Keywords *- Bank Performance, Banking Technology, Mobile Banking, Return on Assets, Banking Policy*

I. INTRODUCTION

The introduction of mobile banking has drawn a fruitful wedding of two normally unrelated areas of many people's lives: banking and mobile telephone services (Tchouassi, 2012). It has become a pillar of the main banking approach of most of the financial institutions that are deploying mobile applications to cash in on the high demand from businesses and consumers. Mobile banking has become the fastest-growing section globally due to its increasing admiration, and the UAE is no exception (Mbogo, 2010).

According to the survey undertaken by Rizvi (2015), bank customers in the UAE directed a meaningful amount of their normal banking through their mobile phones. Rizvi upholds that the UAE market remains very branch-driven, but high usage of online banking and mobile banking is also predominant. The investigation also showed a high penetration of digital banking usage among the UAE population, with 82 percent of UAE customers using at least one digital banking channel. According to the investigation, 61 percent have conducted online banking via a mobile device, while 57 percent have used a mobile app.

The development of information technology has changed the way organizations conduct business (Al-Jabri, 2012). Mobile and online banking in the banking industry has transformed how commercial banks work with businesses and consumers. Internet and mobile banking has permitted financial organizations to provide banking services online and via mobile devices and has provided customers with easy access to financial services and other benefits. The global banking industry is becoming increasingly competitive, thereby forcing commercial banks to innovate for survival (Sohail & Shanmugham, 2003). Studies on mobile banking have been steered worldwide to identify how e-banking could improve service quality or provide high-value financial services at lower costs to cross-sell products like loans or credit cards in the absence of physical boundaries (Yang, Li, Ma and Chan 2018). However, very limited empirical research is available to define mobile banking's impact on multichannel banks' performance, particularly in the UAE.

Hence, to broaden the body of literature on mobile banking performance under the UAE context, this study aimed to examine mobile banking's effect on the financial performance of UAE banks. The study employed the random effect model using the pooled ordinary least square (OLS) regression technique. The study analyzed data collected from audited and published financial statements of the 15 listed banks in the UAE. The study results provide useful information for scholars and policymakers regarding mobile money transactions and services. The study also enables banks in the UAE to gain a competitive advantage if mobile banking is employed by innovating new products and services. Outside of the UAE, developing countries can leverage this study's findings to understand better how

deploying mobile banking may affect bank performance. The rest of the paper is as follows; Section 2 focuses on the literature review. In this section, attention is focused on mobile banking analysis and empirical review. Section 3 delineates the methods through which data were analyzed with specific discussion of data consideration, variables, and model specification. Section 4 provides the estimation results and interpretation. The final section provides readers with conclusions, policy implications and recommendations, and limitations of the study.

II. LITERATURE REVIEW

This study unit offers an overview and analysis of relevant literature, provides context for this study, and situates the study's findings in the current body of literature.

A. Mobile Banking Overview and Analysis

According to Castillo (2018), Mobile banking is the act of making financial transactions on a mobile device (e.g., cell phone, tablet, etc.). This activity can be as simple as a bank sending usage information or fraudulent activity to a client's mobile phone or as complex as a client paying bills or sending money abroad (Castillo, 2018). The force behind the revolution of financial institutions is innovation in mobile information technology. Mobile banking applications are continuously being developed and have become banks' preferred channels for offering banking services (Cherrayil, 2014). According to Coelho (2003), one of the key tactics for growth and a major focus for mobile network providers and the banking industry is mobile banking. The development of new digital tools, such as customers' mobile phones or tablets, give banking consumers the suitability of banking where and when they want. Because of that, mobile banking will ultimately surpass all other banking channels put together (Castillo, 2018). Mobile banking has become an essential part of every bank's plan to overcome obsolete methods and mismanaged client relationships. As such, mobile banking trends are putting a lot of pressure on large banks and financial institutions to provide the essential technology to meet or exceed their customer's expectations in the name of customer attainment and retention.

Adopting mobile banking is gaining grip in the UAE, and it is anticipated to cultivate further with Dubai's mobile initiative. At the moment, the UAE government has shaped a clear order for citizen-centric services. Banks in the UAE have reached a high level of complexity in a short period compared to their European counterparts. UAE banks are trying to use mobile technology as a banking channel into which all the transactions formerly carried out at branches will be consolidated. Similar to the banks' expedient adoption of technology, it is anticipated that a new generation of people will become more tech-savvy and more likely to conduct banking transactions online (Castillo, 2018).

B. Previous Literature

Empirical studies have tested mobile banking's impact on bank performance using variables related to bank-specific characteristics and macroeconomic variables. Some of these studies have focused on a specific country, while others have concentrated on a panel of countries. For example, Tchouassi (2012) to explored whether mobile phones work to extend banking services to underserved populations using empirical data from selected Sub-Saharan Africa (SSA) countries. Poor, susceptible, and low-income households in SSA countries often lacked access to bank accounts and faced high costs for steering basic financial transactions. The study argued that the mobile phone presented a great opportunity to provide financial services to the unbanked. However, the study did not establish the snowballing effect of the various branchless banking strategies on performance.

Rosen (2013) explored whether the custom of mobile banking and agent banking can benefit low-income earners in Kenya. The results from this study show that mobile and agent banking accelerated the delivery of financial services to populations that were hitherto excluded from financial services. The result is the improvement of the economic conditions of these individuals and improvement in their overall welfare. Like the studies above, the impacts of mobile banking technology and usage on the banks' performance were largely ignored.

Al-Jabri (2012) studied mobile banking adoption in Saudi Arabia. He looked at applying innovation theory diffusion and examined how a set of technical traits inclined mobile banking adoption in Saudi Arabia. His results recommended banks in Saudi Arabia create mobile banking services that are compatible with various current users' requirements, past experiences, lifestyles, and beliefs to fulfill customer expectations.

A limited amount of research exists on the impacts of mobile banking on banks' financial performance. For example, Egland, Furst, Nolle, and Robertson (1998) examined the performance and structure of 8,983 banks in the United States. The study, however, failed to show the relationship between internet banking and bank performance. Likewise, Furst, Lang, and Nolle (2001) scrutinized 2,517 national banks' performance in the United States from 2000 to 2002. Their studies show that banks with internet banking gained more profit than non-internet banking banks. However, internet banking was a small factor in swaying bank performance. Hasan, Maccario, and Zazzara (2002) analyzed 105 banks by using the data collected from 1993 to 2000 in Italy and observed that the banks with internet banking outperformed those with non-internet banking. However, the study did not indicate the actual impact of internet banking on bank performance.

Yangi, Li, and Chen (2018) used panel data from 2003 to 2013 to examine the relationship between e-banking and bank profitability in the Chinese banking system. Their drive was to explore whether e-banking improved financial performance using ROA, ROE, NIM, and operating margin (OM) as performance indicators. The study revealed that e-banking could improve Chinese bank performance in ROA, ROE, and OM. Harelimana (2017) similarly used panel data from 2012

to 2016 for seven micro-finance companies to investigate mobile banking's impact on bank performance in Rwanda. The study found a positive relationship between mobile banking and performance using ROA as a performance indicator. The study showed low transaction fees for mobile banking usage added to the banks' profitability, which directly impacted mobile banking on financial performance. Sullivan (2000) studied banks in Kansas City in the United States and found that multichannel banks tend to add non-interest expenses compared to non-internet banks. He found that return on average assets cannot be a significant factor in examining banks' profitability during the study. He explains that internet banks sometimes are higher in this dimension than non-internet banks. However, he found the return on equity to be higher on average and a better performance indicator. Consequently, due to time limitation, the result of Sullivan was not significant evidence to display the relationship between e-banking and bank profitability.

By and large, the UAE economy depends on oil, and therefore any adverse effect on this sector will have a profound impact on the economy as a whole. Khandelwal et al. (2016) studied the nexus between global oil prices and macroeconomic and financial developments in the Gulf Corporation Council (GCC). The authors found that the performance of key indicators of business and financial cycles generally strengthened during the oil price upturns. Moreover, the timing of downwards in those variables tends to coincide with oil price downturns. The studies found oil price and economic activities to be significantly related.

III. METHOD

The purpose of this section of the paper is to delineate the model used to examine the impact of mobile banking adoption on bank performance in the UAE. The section specifically describes the data source, explanation of variables, and model specification.

A. Data Source

The study examines the effects of mobile banking adoption on the listed bank performance in the UAE. Our analysis covers financial performance data reported between 2008 and 2016. We selected the year 2008 to start compiling the data as it marks the period where the global economic crises impacted the region associated with a prolonged period of low oil prices, economic volatility, and inflation. We closed our data collection period with the last year of available data at the time the study commenced, 2016. The data for 15 selected banks, on a yearly basis, were obtained from the annual balance sheet and income statements of the banks listed on the Dubai Stock Exchange. The country-specific and macroeconomic variables were obtained from the Ministry of Finance website. The mobile banking adoption data is based on the year of adoption, and to this effect, we proxy the mobile baking adoption data as a continuous dummy variable. The study utilized panel data. Hsiao (1986) noted several diverse roles of panel data. For instance, panel data offers more degrees of freedom, increases variations in the data, and thus reduces the chances of multicollinearity and makes it possible to control for fixed effects. Before the econometric analysis, the data were revised and checked for extreme values and possible reporting errors.

B. Variables and Measurement

The chosen dependent variable was the return on assets (ROA), whereas the independent variables are mobile banking adoption (MOB), market share (MS), branch intensity (BRI), expense-income ratio (EXIN), oil price (OP), and inflation (INFL).

We ROA as the dependent variable and considered it as a measure of bank performance and a test to see whether other explanatory variables had an impact on performance indicators. The direction of this variable can be somewhat equivocal. It is possible that more profitable banks will choose to incur the costs of offering mobile banking because they are financially capable and can, however, maintain their competitive position. It also possible that less profitable banks can choose to invest in mobile banking just to improve performance (Bughin, 2001). Nonetheless, we choose ROA as a better measure of financial performance as it explicitly takes into account all the assets used to support business activities. Using ROA as a key performance metric quickly focuses management attention on the assets required to run the business. Similar studies have used ROA to measure financial performance. For example, Owusu-Antwi, Banerjee, and Ofei (2018) employed ROA as a performance measurement to determine the impact of ownership structure on bank performance in the UAE.

C. Independent Variable

To determine the banks' decisions to adopt mobile banking, we follow the work of Pooja Malthottra (2010), who used the logistic form to determine bank decision to adopt internet banking in India by imitating the S-curve, which is typical of adoption behavior of new technologies. To this end, we estimate the mobile banking adoption to take the value of 1 if a bank adopted mobile banking between 2008 and 2016 and zero otherwise. Bank market share (MS) measures the size of the bank relative to its own market. It is expected that as market share increases, the probability that a bank adopts mobile banking would increase (Courchane et al., 2002). It may also be possible that banks with lower market share may adopt mobile banking to increase their customer base.

Thus, the expected sign for bank market share can be unclear to some extent. Branch intensity (BRI) is another distinctive variable that might impact the likelihood to adopt mobile banking. Further, banks with many branches may achieve cost savings by snowballing the efficacy of their existing operations. Thus, banks with higher branch networks may have more motivation to adopt mobile banking with the goal of reducing inefficiencies. Furst et al.

(2001) and Andriy (2001) argued that banks without a large branch network would adopt mobile banking as an economical means to grow their customer base. Given this vagueness, it is not conceivable to make any prior assumption on the effect of branching intensity on the adoption. Expenses (EXIN) are an indicator of cost-effectiveness and are the operational cost of banks, which consume a portion of the bank's net income and has an inverse relationship with bank profit.

It is an indicator of bank administration proficiency in its dealings during operations. As expense has an inverse relationship with profit, high expenses lead to reduced profitability. This association between expense and profit is investigated by the study of Bourke (1989). Similarly, direct and significant associations between profit and expenses have been explored in Tunisia by Naceur (2003). Naceur found that banks with relatively high expenses for premises and fixed assets (expenses) may view the adoption of mobile banking as a way to reduce expenditures. The adoption of mobile banking should appear more attractive to banks experiencing higher fixed expenses. Thus, the expected sign for expenses is positive.

Given the dependence of the UAE on oil exports, the link between oil prices and bank performance is of high policy interest not only during the current crisis but also during previous boom-bust oil cycles. The question is, do oil prices influence bank performance, and if so, what could be the applicable channels by which bank behavior is affected? Oil price shocks could affect bank profitability directly via increased oil-related lending, business activity, or excess liquidity in the banking system. Higher oil prices could lead to higher domestic demand, which will feedback in higher bank confidence, more lending, and fewer non-performing loans. The recent rapid increase in oil prices has spurred series of studies discussing appropriate measures of oil price shocks (Kilian, 2008; Hamilton, 2008). Given the effect that oil prices have on the general economic conditions of the UAE, it is imperative that this study include oil prices as a latent impact on the financial performance indicators reported by UAE banks.

The effects of inflation can be considerable and weaken the stability of the financial system and the ability of regulators to control the solvency of financial intermediaries. Revell (1979) argued that deviations in bank profitability could be strongly explained by the level of inflation. An important indirect influence on commercial banks lies in the impact of inflation on their customers and the consequent changes in the demand for different kinds of financial services. Unforeseen rises of inflation cause cash flow snags for borrowers, which can lead to premature cessation of loan arrangements and precipitate loan losses.

D. Model Specification

In this study, pooled OLS, fixed effects, as well as random effects models, are considered for the robustness of the estimation results. The fixed-effects model formulation infers that differences across groups can be identified in the constant term. It also allows the unobserved individual effects to be correlated with the included variables. However, if the individual effects are strictly uncorrelated with the regressors, it might be appropriate to model the individual specific constant terms as randomly distributed across cross-sectional units (Greene, 2012). The empirical specification estimated the relationship between return on assets (ROA) and a set of banks' characteristics variables. To control for the effect of the exogenous factors, oil price and inflation variables are included.

E. Research Model

The empirical model used in the study for the impact of mobile banking on bank performance is presented as follows:

$$ROA_t = \alpha + \delta_1 MOB + \delta_2 MS + \delta_3 BRI + \delta_4 EXIN + \delta_5 OP + \delta_6 INFL + \mathcal{E}_i \quad (1)$$

Where ROA represents the return on assets for the bank (i) at the time (t), MOB represents mobile banking adoption (dummy), and MS is for market share while BRI represents branch intensity. EXIN denotes the expenses to income ratio, and OP represents oil prices. INFL signifies inflation. The coefficients α and δ symbolize the model intercept and the coefficients related to the banks and macroeconomic variables.

In order to choose a fixed or random-effect model, the Hausman test was used. Accordingly, if the p-value is higher than 0.05 (i.e., it is insignificant), a random effect model is preferable, whereas if the p-value is lower than 0.05 (i.e., it is significant), a fixed-effect model is preferable (Gujarati, 2004). According to the Hausman test, the random effect model is used since the p-value for the model is 0.9837, which is more than 0.05 (significant). The results of the Hausman test is presented in Table 1.

Table 1. Hausman Test

MOB	- 0.0028	- 0.0028	- 0.0000	0.0003
MS	0.0013	0.0012	0.0001	0.0002
BRI	- 0.0001	- 0.0001	- 0.0000	0.0000
EXIN	0.0078	0.0077	0.0001	0.0001
OP	0.0000	0.0000	0.0000	0.0000
INFL	- 0.0002	- 0.0002	- 0.0000	0.0000

Note: p = 0.9837
b = consistent under Ho and Ha
B = inconsistent under Ha efficient under Ho
Chi² (8) = (b-B)'[(v_b –v_B)^ (-1)](b-B). Prob > chi² = 0.9939

The p-value of 0.9837 provides evidence to accept the random effect as an appropriate model for the study.

F. Diagnostic Test

To test our model to see if the residuals are serially correlated across entities, we performed a diagnostic test using Pesaran's test of cross-section independence. The results of the Pesaran's test are presented in Table 2.

Table 2. Model Diagnostic Check

Pesaran's test of cross-sectional independence	0.7570
Pr	0.4488
The average absolute value of the off-diagonal elements	0.4410

Given the p-value of 0.4488, the model is correctly specified. Pesaran's test of cross-sectional independence shows that there is no serial correlation, which suggests we should utilize the specified model.

IV. RESULTS AND INTERPRETATION

This section of the paper presents the descriptive statistics of the study.

A. Descriptive Statistics

Table 3 showed the descriptive statistics for the seven variables used to test the model in this study from 2008 to 2016. There are 135 observations for 15 selected banks in the UAE. The number of data, minimum, maximum, mean, and standard deviation values are presented. The average value and the standard deviation for the dependent variable ROA remained fairly stable throughout the sample period. It should be pointed out that the mean values for the BRI and OP are relatively high, which reveals that their samples are not biased toward large banks on the average terms.

According to Table 3 above, the mean return on assets ratio (ROA) is 0.01663, and the minimum and maximum figures are -0.02459 and 0.051478, respectively. Regarding the mobile banking ratio (MOB), the mean is .63358, and the minimum and maximum are 0 and 1 separately, with a standard deviation of .48367. The maximum figure of market share (MS) is 14.2, with a minimum of -.38 and a mean of 1.000689 with a standard deviation of 2.425585. For the Branch Intensity (BRI), the average is 46.14074, where minimum and maximum is 0 and 132, respectively. On average, the expense to income ratio (EXIN) is 1.377892, and the maximum and minimum are -1.402723 and 4.996647, respectively. The standard deviation for EXIN is .99164. The gap between minimum and maximum suggests that banks generate significant changes during the process of adopting mobile banking. The mean value for the oil price is recorded at 82.09778 with a minimum and maximum of 40.68 and 109.45, respectively.

In respect to inflation, the average value is 2.836667 with a standard deviation of 3.503744, and the minimum and maximum recorded were .67 and 12.3, respectively. Furthermore, compared with other variables, branch intensity has the highest standard deviation of 34.90438. This means that BRI has more significant variance than other variables. Similarly, the large standard deviation in oil prices (SD = 24.80473) is representative of the large fluctuations in oil prices between 2008 and 2016.

B. Correlation Analysis

Table 4 reports the degree of correlation between the variables used in the study. Pearson's correlation coefficients are used to show the degree of relationship. It is evident from the matrix that the correlation between the independent variables does not signal multicollinearity. According to Kennedy (2008), multicollinearity creates problems when the correlation exceeds 0.80. The correlation matrix does not gesture multicollinearity between the independent variables.

Table 3. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ID	135.00	8.00	4.34	1.00	15.00
ROA	135.00	0.02	0.01	- 0.02	0.05
MOB	131.00	0.63	0.48	0.00	1.00
MS	135.00	1.00	2.43	- 0.38	14.20
BRI	135.00	46.14	34.90	0.00	132.00
EXIN	135.00	1.38	0.99	- 1.40	5.00
OP	135.00	82. 09	24.80	40.68	109.45
INFL	135.00	2.84	3.50	0.67	12.30

Table 4. Pairwise Correlation

	ROA	MOB	MS	BRI	EXIN	OP	INFL
ROA	1.000						
MOB	- 0.103	1.000					
	0.240						
MS	0.101	- 0.161	1.000				
	0.242	0.067					
BRI	- 0.112	0.198*	0.090	1.000			
	0.196	0.023	0.299				
EXIN	0.408*	0.178*	- 0.074	0.067	1.000		
	-	0.042	0.397	0.443			
OP	0.116	- 0.079	- 0.021	- 0.027	0.030	1.000	
	0.179	0.368	0.813	0.754	0.732		
INFL	0.052	-0.335*	0.045	- 0.072	0.059	- 0.039	1.000
	0.546	0.000	0.606	0.407	0.495	0.652	

* $p < .05$

As expected, the dependent variable shows a weak correlation between the explanatory variables. The matrix shows a significant relationship between ROA and EXIN, while ROA and MOB are not significantly correlated.

C. Estimating Results

As described above, several tests were performed to determine the appropriate model, and the random effect model was selected based on the Hausman test. The results of the random effect model are presented in Table 5.

Table 5. Random Effect Model

ROA	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
MOB	- 0.003	0.001	- 2.540	0.011***	- 0.005	- 0.001
MS	0.001	0.000	2.650	0.008***	0.000	0.002
BRI	- 0.000	0.000	- 1.110	0.267	- 0.000	0.000
EXIN	0.008	0.001	13.040	0.000***	0.007	0.009
OP	0.000	0.000	2.410	0.016***	0.000	0.000
INFL	- 0.000	0.000	- 1.150	0.252	- 0.000	0.000
_cons	0.006	0.004	1.540	0.124	- 0.002	0.014

Note. $p < .05$; Wald $chi^2(8) = 210.34$; $R^2 = 0.6536$

Table 5 presents the results of the random effect model. The R^2 for the model is 65.36%. The test confirms the chosen independent variables are highly explanatory. The value of Wald Chi^2 is 210.34 with a p-value equal to 0.0000, indicating that the model for UAE banks is significant. The regression results offered in Table 5 above indicate that the amounts invested in mobile banking negatively impact ROA. The results also indicate that for every AED devoted to mobile banking, ROA is reduced by -0.0028103 units, respectively holding other factors constant. This could be elucidated as the actual investment in financial terms is an expense, and as such, it reduces the operating profit, which eventually leads to the decline in the ROA through a reduction in net profits. Another clarification to the negative effect is that since most banks are still in the investment phase of mobile banking, there is a possibility that the sales revenue being generated from this channel at the bank-level is still below the breakeven point (Horne and Wachowicz, 2001). At the bank level, there is a possibility that most banks are not generating a sufficient volume of mobile banking transactions, and the subsequent revenues generated are still less than the investment made on mobile banking. The amounts invested in mobile banking infrastructure could also be expensed at the financial years when these costs are incurred hence the negative effect on financial performance. The results obtained are consistent with the study by Horne and Wachowicz (2001).

The coefficient for market share (MS) is given as 0.001209 associated with a p-value of 0.0008 and is positive and significant, showing that the banks with higher market share are more likely to adopt mobile banking, which is in line with Internet banking literature (DeYoung et al., 2007).

The coefficient for EXIN is recorded as .0076925 with a p-value of 0.016. The positive coefficient of EXIN is consistent with the hypothesis that banks with relatively high fixed expenses may see mobile banking as a way to reduce expenses for premises and fixed assets. Thus, banks are more likely to adopt mobile banking as a way to reduce expenses for premises and fixed assets. From the results, it is detected that oil price has a positive and significant effect on ROA.
A low coefficient of .0000422 is evident that the increase in ROA during the period of study is only partially explained by oil prices. This implies that banks have successfully adapted to the market conditions created by lower oil prices and are continuing to manage their costs sensibly. The results are consistent with Poghosyan and Hesse (2009) in their study on MENA countries from 1994 - 2008, where a positive relationship between oil price shocks and bank ROA was confirmed.

The coefficient associated with inflation (INFL) is reported as -.0001528 with the associated p-value of 0.252. This variable is insignificant and negative, revealing that inflation had no significant effect on bank performance during the period of analysis. This finding seems to be counterintuitive. Moreover, even under high inflationary conditions, banks tend to invent measures to protect revenues from erosion by adjusting interest rates and fees charged to their customers. Under these conditions, the negative coefficient of $INFL_{it}$ may be vindicated.

V. CONCLUSION

This study has reinforced and expanded prior research by applying a random effect model using pooled ordinary least squares to estimate the coefficients of explanatory variables with ROA. By applying the random effect model for the period of 2008 to 2016, we found the adopting mobile banking had a small but significant negative effect on bank performance in the UAE banking industry. The study also found market share, expenses to income ratio, and oil price to be the drivers of bank performance as measured by ROA. Interestingly, branch intensity and inflation were found to be insignificant, implying that neither has a significant impact on bank performance.

A. Policy Implication and Recommendation

Many implications for banking executives and financial policymakers can be derived from this research. We found it surprising and important that the adoption of mobile banking did not significantly or materially increase ROA of the UAE banks studied. In fact, the adoption of mobile banking showed a negative impact on ROA. A further detailed study is needed to better understand the cause driving this inverse relationship, but initial thoughts and conversations merit discussion. For example, although mobile banking was not significantly correlated with a market share in this study, was the adoption of mobile banking a long-term strategy to increase market share, which could not be measured given the time limitations of this study? This would be plausible and warranted. It could be argued that the growth in market share as a result of mobile banking adoption was not represented by the years included in the study. If banking executives believe mobile banking will increase or maintain market share, mobile banking may be a sound investment as market share was indeed correlated with an increase in ROA. The findings of this study, however, should alert executives and policymakers to the slow return on mobile banking investments in terms of ROA, if they materialize at all.

The findings of this study also shed new light on the conversation in which branch intensity is juxtaposed with mobile banking. Many executives and policymakers may have seen mobile banking as a lower-fixed-cost solution to bringing banking transactions to consumers. This study's findings show that although mobile banking had a small negative impact on ROA, branch intensity had little to no impact on ROA. Given the risks involved with financing, staffing, and operating branch locations, policymakers may consider the marginal long-term savings from investing in mobile banking as opposed to branch locations a way to improve operating efficiencies with little Impact on ROA. Further research on the physical versus mobile models would better inform this important discussion. Additionally, executives, policymakers, and UAE citizens alike may benefit from the social impact of mobile banking. Given the disparity in income, living conditions, and resources across the UAE, mobile banking may be a conduit through which new, unbanked populations are reached, served, and provided financial acumen and resources. Not only would this outreach via mobile banking serve a social purpose, but it may also allow banks, especially those with low branch intensity, to reach new markets and improve ROA through increased market share while acting for the betterment of the entire UAE population.

The continuing growth and adoption of mobile banking require that banks overcome development and implementation challenges, most of which can be mitigated by taking a strategic and focused approach. As is the case with many emerging markets, the rapidity of change is challenging, and banks must be prepared to adapt accordingly. Despite the admiration of mobile banking among newer market segments, many customers are oblivious of the powerful value proposition that mobile channel affords. Banks need to edify their customers to the benefits of mobile banking and make sure they distinguish themselves from competitors' solutions, such as account aggregation services, by providing advanced features. To

achieve operational efficiencies and realize the full growth potential, banks will need to assimilate their existing bank platforms to include core banking, customer relationship management, and payment hubs with mobile banking solutions. To this end, we can affirm that technology is moving at whirlwind speed, and there are plenty of rewards for customers and businesses of all sizes to leverage mobile banking and profit on t the latest mobile banking trends. Mobile banking is already renovating the way people save, invest, and manage their money, and there are no signs of it slowing down. As for banks, continuing to develop their mobile banking technology will be a key urgency going forward, as it will help them improve their competitive advantages over existing banks and new entrants into the banking industry.

B. Limitations of the Study

Although this study adds to the current body of literature on mobile banking and bank performance, some limitations exist. The study observed data from 2008 to 2016 due to data availability. As such, the results of this scholarship might not be appropriate after 2016 due to the significant development of mobile banking in the UAE. To this effect, the change in bank performance may not be noteworthy in some areas. In addition, the sample banks were chosen at random. Even though the chosen banks were large, they cannot represent all the UAE banks. Hence, the results may not be suitable for every bank. Furthermore, the ratios used in the research only offer a restricted view of the financial performance of UAE banks. According to empirical research, using many ratios could add value to the analysis of the bank's performance. However, in the study, limited ratios are selected to test the model and gain meaningful, but early, insights into the impact of mobile banking on UAE bank performance. As such, for further study of this topic, it is necessary to analyze other ratios such as liquidity, total deposit to liquidity, loan to assets, and non-performing loans in different stages and further explore qualitative variables such as customer satisfaction and quality of services.

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