

# Impacts of Financial Innovations on Financial Performance Evidence of Electronic Banking in Africa

Jingqin Zu<sup>1\*</sup>, Ying Gu<sup>2</sup>, Kaodui Li<sup>1</sup>, Osei-Assibey Mandella Bonsu<sup>1</sup>

<sup>1</sup>School of Finance and Economics, Jiangsu University, Zhenjiang 212013, China

<sup>2</sup>Business School of Wuchang University of Technology, Wuhan, 430063, China

Corresponding Author: Jingqin Zu, jingqin2019@126.com

**Abstract**— The study examined the impacts of financial innovation on banks profitability performance by means of electronic banking services in Africa from the period of 2015-2018. The study employed the dynamic panel data method and GMM estimations via a panel data regression model. The findings revealed that there is a strong persistence in a reliable manner for both ROA and ROE. The results further show that, positively, bank cards and ATM affect banks financial performances with the exception of POS terminal and internet banking. More importantly, the profitability of most African developing countries affected the percentage number of ATMs to the number of branches and is highly important. Certain policies were discussed.

**Keywords**— Innovations, Electronic banking, financial performance, Africa.

## I. INTRODUCTION

Financial institutions have witnessed colossal dynamism over time. A terrific deal of transformation has been hugged in the field that has prompted the growth of money-related items, exercises and ranked structures that have to intensify and expanded the productivity of the monetary framework. Globally, financial organizations and financial systems are in the throes of changes caused by escalating globalization and deregulation. In the financial sectors, financial innovations such as mobile banking, internet banking, and Automated Teller Machine (ATM), Point of Sale Purchase (POS), and App store, mobile money, internet banking, agency banking are taking place at a massive fast place. (Tunay, Tunay et al. 2015). According to Nofie (2011), innovations in the banking sector is the emergence of a new or best product. In fact, innovation lowers the cost of manufacturing current financial service. Akamavi (2005) also states that innovation in the financial services industry has resulted in latest basic modifications, including: deregulation, Increased competition, 2 greater costs of creating new products and the fast pace of technological innovation, more challenging clients and corporate consolidation.

The approach of innovation and changing financial conditions have warranted this transformation. The liberalized domestic regulation escalated global competition, increase innovations in the new financial methods, and the volatile expansion in internet banking, and information technology decimated for this change. In fact, this transformation has impeded escalating pressure on managers and employees to improve productivity and organizational financial performance.

Financial innovations have greatly impacted the financial market in relating to the establishing up new and big opportunities for the shareholders, thus developing new products and services to improve new markets.

However, the new existing financial institutions products made to customers is significant. In Africa, the technology-based applications such as mobile banking, internet banking, and Automated Teller Machine (ATM), Point of Sale Purchase (POS), and App store as cited in ((Tam and Oliveira 2016)) provides clients of financial institutions imperative edge in the conveyance of subsisting products. These innovations are accessible to every African financial institution's products and services with low-cost banking works for 24 hours to 7 days.

The induction of technology-based applications has greatly impacted the Africa financial sectors positively. It has caused financial institutions effective and transparent share of grievances. Since the emergence of the stated technology-based applications in Africa, it has caused the dependence of branches to dwindle. According to (Al-Smadi and Al-Wabel 1970), these qualities escalates the day to day activities in financial institutions, thus encourages institutions to take electronic-based services for clients.

The technology-based products provide opportunities for financial institutions to have important cost advantages, ease nether risk and increasing profitability than the traditional way of banking. Moreover, various studies conducted depicts that, electronic-based applications products of financial institutions affect financial performance; Okiro & Ndungu, 2013, (Shaikh, Glavee-Geo et al. 2017), thus yielding returns for institutions when invested in the short run. In fact, the expected findings are not noticed in most developing countries in Africa especially in the banking community due to the fact that, customers prefer traditional based banking to electronic-based banking. Therefore, the current study investigates the effects of electronically based applications on banks financial performance in West Africa countries from the period of 2009-2018.

The rest of the papers are as follows. The next paper review prior studies. Following the prior studies section is the

methodology of the study. The fourth section analyzes the results and the last section concludes the study.

## II. LITERATURE REVIEW

BatizLazo and Woldesenbet, 2006 as mentioned in (Stoica, Mehdian et al. 2015), financial innovations are used by banks as powerful strategic instruments to surpass the competition and have become an important channel for financial institutions to enhance their performance and maintain their market efficiency. It intrigues the imperativeness in studying the relationship between financial institutions performance and banking performances.

A financial institution competitive advantage distinctiveness can be known due to successful innovations especially in a highly unstable working environment thus placed banking institutions a unique competitive position and lead to higher level financial performance. (Roberts and Amit, 2003). Porter, (2004) admonished that, this can only be ascertained by continual innovation and enlargement of the products.

Innovation is vividly a significant approach in any industry of the modernized economy. Over the years, financial innovation has made a substantial impact on the banking sectors to have new and innovative products and services.

According to Hayashi & Klee, (2003), innovations in developed countries over the years includes negotiable CDs, Eurodollar accounts, Eurobonds, sushi bonds, floating-rate bonds, puttable bonds, zero-coupon bonds, stripped bonds, options, financial futures, options on futures, options on indexes, money-market funds, cash-management accounts, income warrants, collateralized mortgages, home equity loans, currency swaps, floor-ceiling swaps, and exchangeable bonds. The significance of technology-based banking is escalating day and day. It is irrefutable that technology-based banking gives banks relatively low risk and cost advantage thus ensures high returns.

Empirically, prior studies have done addressing the effects of the financial performance on the profitability of financial institutions which proffer electronic banking products. For instance, Sullivan (2000), DeYoung (2001), Hasan (2002), Pigni et al. (2002), Arnaboldi and Claeys (2008), Ciciretti et al. (2009), Weigelt ve Sarkar (2012) as cited in (Liébanacabanillas, Nogueras et al. 2013), in their studies on the effects of electronic and internet banking applications depicted that, electronic banking applications needs advanced technology increasing the overall profitability of the banks in the United States and other European countries. Thus, the technology way of banking has an important positive effect on the development of competition in financial institutions and performances.

In Arnaboldi and Claeys, 2008, Ciciretti et al. 2009, internet banking applications make bank to build the orientation of technological innovations up. In most developing economies, the absence of technology-based banking amenities seized effects of the expected cost-effectiveness and profitability. It is not available solid impacts on the profitability of electronic and technology banking activities as results of the inadequate data technology

amenities of branches and the limitedness of Automated Teller Machines. (Fadoju, Evbuomwan et al. 2018)

However, in emerging economies, internet banking has been operated by big financial institutions (Malhotra and Singh, 2006, 2009, as cited by(Akhisar, Tunay et al. 2015). This makes the big individual owned banking institutions received a higher deposit, thus low branches and less fixed assets lead to internet banking. (Akhisar, Tunay et al. 2015)

According to Malhotra and Singh 2007, financial institutions resulting in internet banking boost the low market share and as results, rivals speed up the induction of competitive works in this area. With respect to the positive effects on the performance of the role of cost-effectiveness is internet banking is terrific. For example, Kagan et al 2005, Abaenewe et al. 2013, transactions executed by a branch of an organization can be reduced when the same works are done on websites, or Automated Teller Machine (ATM). It can be seen that the services cost associated with internet, technology and electronic banking reduces average operational cost, overhead physical costs endured by financial organizations.

Innovations are classified as intensive electronic banking services for financial institutions, their distributions ways are more but having a cost below the sector average. (Pigna, 2002). Moreover, electronic amenities utilized by financial institutions is significant and a terrific deal as in cost per transactions reducing along the emerged infrastructure. According to (Oyewole, Abba et al. 2013), education plays a crucial role in contributing to the success of the internet and electronic banking. The level of education of customers including the working of the Institution's websites, ATM machines are strong factors due to internet banking. For example,(Brush, Dangol et al. 2012); Sullivan, 2000, too much use of internet banking will emerge when customers level of education is very high. Therefore, in developing economies, the utilization of electronic and technology-based banking is not at its peak as long as the services cost will impact banks profitability.

Research has been resulted to clients who are inclined toward electronic banking show that clients are creating the ability to use such administrations. Then again, the use of customers digital banking administrations also affects the economic institutions expense and revenue structure.

Not all financial institutions in the segment have increased productivity segment productivity when banks used comparative electronic administrations and did not frequently consider the company boundary. Interestingly, when banks provide comprehensive services banks then decrease operating costs and expand income (Dubois et al. 2011, Brush et al. 2012).

Research has been led to customers who incline toward electronic banking demonstrate that customers create abilities in the utilization of such administrations. Then again, utilization of electronic banking administrations of customers likewise influences the expense and income structure of the financial institutions. All financial institutions have not expanded productivity in the segment when the banks utilized comparative electronic-based administrations and not considering the business limit commonly. Interestingly, when

banks give integral services banks then operational costs decreasing and incomes expanding (Dubois et al. 2011, Brush et al., 2012).

### III. RESEARCH DESIGN

The study used descriptive research design. The descriptive research approach includes the gathering of data that describe and establish, tabulates, depicts and defines the data.

#### 3.1 Model Specification

The study used panel regression model to determine the impacts of electronic banking products on financial institutions performance in West Africa countries.

$$ROA_{it} = \alpha_{it} + per_{it} + \beta_0 + \beta_1 Cards_{it} + \beta_2 POS_{it} + \beta_3 ATM_{it} + \beta_4 Internet\ Banking_{it} + \varepsilon_{it} \quad (1)$$

$$ROE_{it} = \alpha_{it} + per_{it} + \beta_0 + \beta_1 Cards_{it} + \beta_2 POS_{it} + \beta_3 ATM_{it} + \beta_4 Internet\ Banking_{it} + \varepsilon_{it} \quad (2)$$

Where  $ROA_{it}$  and  $ROE_{it}$  is a particular economy financial institutions system as in financial performance,  $Cards_{it}$  is period  $t$  the with a country released a total banks cards (bean it debit credits, credit credits, master cards etc.),  $Pos_{it}$  existing POS terminal number, ATM is the automated teller machine and it is the ratio of ATMs to the number of branches and Internet banking represents the sum of customers who benefit from internet banking happenings.

At this point,  $\alpha_{it}$  is the equal constant,  $\pi$  is persistency coefficient,  $\beta_0$  are the coefficients of the descriptive variables and  $\varepsilon_{it}$  is the error term embodies white noise features.

#### 3.2 Data Collection and Study Sample.

The study used all the developing economies or countries in West Africa for the period of 2015- 2018. The electronic banking data of individual countries were attained from BIS (Payment systems Statistics), and the World Bank (World Development Indicators). However, performance data of the banking organizations were obtained from the International Monetary Fund (IMF), specifically at the Financial Soundness Indicators). The sampled countries for the analysis is displayed as an appendix.

#### 3.3 Data processing Procedures

In processing data of the study, we used the system dynamic panel method as analysis method. Arellano and Bover (1995) and Blundell & Bond (1998) is broadly used to examine bank financial performance. In reducing the likely biases, the system GMM estimator is chosen since the samples are infinite. Goddard et al, 2011; (Akhisar, Tunay et al. 2015). The system in which wrapped levels and lagged distinct of instruments variables centered on the GMM estimator. It is mandatory to demonstrate that, the instruments validity and second-order auto relationship in error terms are not used to ensure for continual estimations. With this, two tests are performed respectively. A Hansen (1982) test for instrument validity as used by (Akhisar, Tunay et al. 2015), which is robust to heteroscedasticity in the troubled term; and Arellano-

Bond Test of the null hypothesis of no second-order auto relationship in the disturbance term. (Roodman, 2006, 2008; Goddard et al, 2011; (Huang and Hou 2019)

### IV. ANALYSIS, DISCUSSIONS AND RESULTS

#### 4.1 Descriptive Statistics.

The table below depicts the descriptive statistics of the variables. It gives the summary of the mean, standard deviation, maximum and minimum results of the variables acquired from BIS (Payment systems Statistics), and the World Bank (World Development Indicators), and International Monetary Fund (IMF), specifically at the Financial Soundness Indicators.

TABLE 1: Descriptive analysis

Variable	Mean	Std. Dev.	Min	Max
ROA	1.156	0.943	-1.350	5.000
ROE	12.552	9.551	-45.7	44.5
POS	921.011	1387.956	0.0001	10632.1
Cards	386.854	1067.425	0.0001	8427.8
Internet Banking	14.851	24.776	0.0001	83.000
ATM	0.446	0.574	0.0001	3.805

From the table, it is vivid that, the average of (1.156) and (12.552) are attained by banks in Africa on their financial performance represented by ROA and ROE respectively. It emanates with a range of (2.45) stanch from a minimum of (47.05) for the banks on their total assets and minimum of (49.5). Meanwhile, an average of 921.01 of the banks was by affected by POS with a minimum of (0.000) and a maximum of (10632.1)

It is seen from table 1 that, descriptive statistics of some variables revealed significant differences for the reason that, the sample for the study was made up of different structure economies.

TABLE 2: Correlation Matrix

	ROA	ROE	POS	Cards	ATM	Intrn. Bank.
ROA	1					
ROE	0.895	1				
POS	0.0811	0.033	1			
Cards	0.0000	0.0102	0.6705	1		
Internet Banking	-0.5401	-0.3683	-0.1962	-0.1415	1	
ATM	-0.0767	-0.0583	-0.1522	-0.0881	-0.0141	1

From the table (2) above, the correlations of the variables of the study were tested by means of the correlation coefficient. It is not astonishing that Return on Equity and Return on Assets are in elevation correlation positively as a result of the performance metrics calculations. It is shown that the number of customers using internet banking has a strong relationship with virtually all variables excluding Automated Teller Machine (ATM), but depicting outstanding negative relationships with all other variables

#### 4.2 Discussions

In table 3, the generalized method of moments (GMM) systems estimations which are based on the model equations and is however presented. In this table, financial performance of banks signified by return on equity (ROE) and return on

assets (ROA) both estimated distinctly for the dynamic panel model. We used Wald test and the findings shows that, all the coefficients of the model is significant statistically.

TABLE 3: Estimation of system panel dynamic data.

	ROE		ROA	
	Coefficient.	z Test	Coefficient.	z Test
Per-it	0.47879	34.95 ***	0.36609	17.02 ***
Cards	0.00008	2.43 ***	0.00366	8.35 ***
ATM	0.16801	4.66 ***	3.30665	4.12 ***
POS	-0.0002	-12.5 ***	-0.00259	-11.52 ***
Internet Banking	-0.00464	-1.84 *	-0.0754	-3.43 ***
Constant	0.56749	11.78 ***	7.79359	12.42 ***
Observation	154		154	
Wald Test	1355.2	[0.0000]	655.94	[0.0000]
Sargan Test	17.45826	[0.9784]	20.2305	[0.9460]

  

Arellano-Bond Test	ROE	
	Coffin.	z Test
AR (1)	-2.4546	[0.0097]
AR (2)	-1.3489	[0.1739]

  

Arellano-Bond Test	ROA	
	Coffin.	z Test
AR (1)	-1.6616	[0.0764]
AR (2)	-1.1547	[0.1683]

\*\*\*denotes significance at 1%, while \*\* denotes significance at 5% and \*denotes significance at 10% z tests respectively.

From the table above, the findings specify that the correct set of contributory variables were designated for the models as well as the Wald tests show that the general implication of the model is high. Moreover, there is no problem with the residues in the Arellano-Bond test in second-order autocorrelation and GMM estimator is real technically. This studies confirms with a study conducted by Goddard et al, 2011; and (Akhisar, Tunay et al. 2015).

The findings also depict that, there is a powerful persistence for both ROA and ROE in a reliable way. The findings indicate that, with the exception of POS and internet banking, bank cards and ATM influence economic performance of companies. This is in accordance with a studies conducted by Ilyas et al., 2015 on the electronic banking effects on performance of banks using a panel dynamic data. The negative effects of POS and internet banking on financial institutions (banks) based on the analysis can be attributed due to the distinct structural features of the investigated economies.

Furthermore, the findings indicates that ATM affects banks profitability at all-out. Banking institutions are increasing the number of ATMs and this leads to the increase of banks profitability and eventually decreasing operational costs of banks. This is based on the number of branches opened, so the findings are not astounding.

Notably, Automated Teller Machine (ATM), are highly used by customers of banks than other technological or electronic based banking tools because of the longtime uses. With this, both behaviors of customers and the lack of amenities in countries are utilized not more than other banking products. For the purpose of this study, all the variables with the exception of ATM or branches are delicate relative with banks realization since development and cultural levels are entirely distinct in respective countries. Adding to that, banks

card is comparatively weak but positive effects banks profitability, going along with an indirect contact which is tremendously significant for financial institutions in Africa.

## V. CONCLUSIONS AND IMPLICATIONS

The study investigated the impacts of financial innovation on banks financial performance using electronic-based banking on Africa from the period of 2015-2018. The study used panel data and it was analyzed using dynamic panel data methods of the sample developing countries in Africa. The study also used GMM estimator in the analysis to gives more reliable and effective findings.

The findings show that it is not astonishing that Return on Equity and Return on Assets are in elevation correlation positively as a result of the performance metrics calculations. It is also shown that the number of customers using internet banking has a strong relationship with virtually all variables excluding Automated Teller Machine (ATM), but depicting outstanding negative relationships with all other variables. The results further revealed that Return on Equity (ROE) and Return on Assets (ROA) both estimated distinctly for the dynamic panel model. With the utilization of the Wald test, it shows that, all the coefficients of the model is significant statistically.

The findings reveal that the number of POS and internet banking services by the customers negatively affected profitability. This issue can be understood as the sample had distinct in electronic banking infrastructure and socio-cultural traits of customer's behavior in the countries.

Moreover, the findings indicate that ATM affects banks profitability at all-out. Banking institutions are increasing the number of ATMs and this leads to the increase of banks profitability and eventually decreasing operational costs of banks. This is based on the number of branches opened, so the findings are not astounding. Adding to that, banks card is comparatively weak but positive effects banks profitability, going along with an indirect contact which is tremendously significant for financial institutions in Africa.

Therefore, most African countries should develop most of the electronic banking services like ATM/branch since it affects bank performance importantly on the basis of profitability. Even when the results evaluated, it impacts banks financial performance. The impacts of electronic banking services on performance on the description of the innovation arrangement clarify innovations on the bank's performance important

## ACKNOWLEDGMENT

The authors would like to acknowledge Isaac Adu Amankwaa, Belinda Obeng Faamaaa from the School of Management Jiangsu University, China for their immense contribution to this study and two anonymous reviewers.

## REFERENCES

- [1] Akhisar, İ., et al. (2015). "The Effects of Innovations on Bank Performance: The Case of Electronic Banking Services." *Procedia - Social and Behavioral Sciences* 195: 369-375.



[2] Arnaboldi, F., & Claeys, P. (2008). Internet banking in Europe: a comparative analysis. Research Institute of Applied Economics Working Papers, No. 2008/11.

[3] Al-Smadi, M. O. and S. A. Al-Wabel (1970). "The impact of e-banking on the performance of Jordanian banks." *The Journal of Internet Banking and Commerce* 16(2): 1-10.

[4] Brush, T. H., et al. (2012). "Customer capabilities, switching costs, and bank performance." *Strategic Management Journal* 33(13): 1499-1515.

[5] Batiz-Lazo, B. and K. Woldesenbet, (2006). "The dynamics of product and process innovation in UK banking". *International Journal of Financial Services Management*, 1 (4), pp. 400-421.

[6] Ciciretti, R., Hasan, I., & Zazzara, C. (2009). Do Internet activities add value? Evidence from the traditional banks. *Journal of Financial Services Research*, 35(1), 81-98.

[7] DeYoung, R. (2001). The financial performance of pure-play Internet banks. Federal Reserve Bank of Chicago, *Economic Perspectives*, Issue Q1, 60-75.

[8] Fadoju, O. S., et al. (2018). "Dataset for electronic payment performance in the Nigerian banking system: A trend analysis from 2012 to 2017." *Data in Brief* 20: 85-89.

[9] Hassan, S. U., Maman, A., & Farouk, Musa A. (2013). Electronic banking products and performance of Nigerian listed deposit money banks. *American Journal of Computer Technology & Application*, 1(10), 138-148.

[10] Huang, C.-H. and T. C.-T. Hou (2019). "Innovation, research and development, and firm profitability in Taiwan: Causality and determinants." *International Review of Economics & Finance* 59: 385-394.

[11] Kagan, A., Acharya, R. N., Rao, L.S., & Kodepaka, V. (2005). Does Internet banking affect the performance of community banks? American Agricultural Economics Association Annual Meeting, July 24-27, 2005, Providence, Rhode Island.

[12] Liébana-Cabanillas, F., et al. (2013). "Analysing user trust in electronic banking using data mining methods." *Expert Systems with Applications* 40(14): 5439-5447.

[13] Malhotra, P., & Singh, B. (2009). The impact of Internet banking on bank performance and risk: The Indian experience. *Eurasian Journal of Business & Economics*, 2(4), 43-62

[14] Oyewole, O. S., et al. (2013). "E-banking and bank performance: Evidence from Nigeria." *International Journal of Scientific Engineering and Technology* 2(8): 766-771.

[15] Pigni, F., Ravarini, A., Tagliavini, M., & Vitari, C. (2002). Bank strategies and the Internet: An interpretation of the banking industry in the Italian retail market. *Journal of Information Technology Case & Application Research*, 4(3), 8-37.

[16] Porter, M.E. (2004). "Competitive strategy". New York edition

[17] Roberts, P.W. and R. Amit, (2003). "The dynamics of innovative activity and competitive advantage: the case of Australian retail banking, 1981 to 1995". *Organization Science*, 14 (2), pp. 107-122

[18] Shaikh, A. A., et al. (2017). "Exploring the nexus between financial sector reforms and the emergence of digital banking culture – Evidence from a developing country." *Research in International Business and Finance* 42: 1030-1039.

[19] Sullivan, R. J. (2000). How has the adoption of Internet banking affected performance and risk in banks? Federal Reserve Bank of Kansas City, *Financial Industry Perspectives*, 1-16.

[20] Stoica, O., et al. (2015). "The Impact of Internet Banking on the Performance of Romanian Banks: DEA and PCA Approach." *Procedia Economics and Finance* 20: 610-622.

[21] Tam, C. and T. Oliveira (2016). "Understanding the impact of m-banking on individual performance: DeLone & McLean and TTF perspective." *Computers in Human Behavior* 61: 233-244.

[22] Tunay, K. B., et al. (2015). "Interaction between Internet Banking and Bank Performance: The Case of Europe." *Procedia - Social and Behavioral Sciences* 195: 363-368.

[23] Weigelt, C., & Sarkar, M.B. (2012). Performance implications of outsourcing for technological innovations: Managing the efficiency and adaptability trade-off. *Strategic Management Journal*, 33, 189-216

APPENDIX

*Selected African Countries for the Analysis*

Ghana	Swaziland
Nigeria	Ivory Coast
Kenya	Egypt
Tanzanian	Senegal
Sudan	Ethiopia
Central Africa Republic	Cameroon
Togo	Zimbabwe
South Africa	Zambia
South Sudan	Burkina Faso
Morocco	Liberia

*\*Fund project : The 18th batch of scientific research projects sponsored by Jiangsu University (Project number:18C063) ; The Project of practical Innovation training Program for College students in Jiangsu University in 2019 ( Project number:201910299288H)*