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THE EFFECT OF BANK INNOVATION ON FINANCIAL PERFORMANCE OF BANKS: EVIDENCE FROM ETHIOPIAN COMMERCIAL BANKS

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Abstract

The paper focus on the effect of bank innovation on financial performance of commercial banks in Ethiopia. The study adopted an explanatory and descriptive research design with quantitative research approach. the study referenced to Ethiopian commercial banks on basis of data covers five years (2018-2022) period and the data was gotten from the reports of the regulatory body of the banks in Ethiopia i.e. the National Bank of Ethiopia (NBE), Central Statistical Authority, Ministry of Finance and Economic Cooperation and from others that are as secondary data sources from the seventeen commercial banks of Ethiopia. The Target population was all commercial banks that engage in commercial activities and registered by National Bank of Ethiopia to act. Consequently, seventeen commercial banks, out of the thirty one commercial banks, have purposively were selected for the study. The methods of analysis applied a panel least square regression using STATA vs 12 to test whether random effect or random effect regression. And the model were a random effect model selected. The finding were agent banking, Mobile banking users and Gross Domestic product were found positive effect on financial performance of commercial banks and statistically significant. Bank Liquidity negative effect on financial performance of commercial banks but statistically significant. ATM machine terminals, RTGS users, agent banking and Bank size were found positive effect on financial performance of commercial banks but statistically insignificant. Internet banking and Inflation negatively effect on financial performance of commercial banks and statistically insignificant.

***Key words**: Commercial Banks, innovation, ROA and Random effect*

1. INTRODUCTION

The phrase "bank innovation" refers to a new generation of banking systems that use interactive, electronic channels to deliver both classic and modern banking services to clients automatically. According to Driga and Isaac (2014), it is a service that gives users the chance to access their accounts, complete transactions, and get information about financial products and services via a public or private network, including the internet. Information technology is becoming more and more important to the banking industry. Because of this, banks are implementing technology that enables them to provide financial services through the most economical means possible, and e-banking is one such method (Booz & Hamilton, 1997).

By substituting automated procedures for labor-intensive and paper-based methods, banking technology in Ethiopia has become a strategic asset for increasing customer accessibility, efficiency, control over operations, and cost reduction, ultimately resulting in increased productivity and profitability (Ayana, 2012). Commercial banks in Ethiopia have been investing a significant amount of money and working to extend these electronic alternative self-service channels by installing a big number of ATMs, point-of-sale machines, and other banking technology services around the nation (Kassahun G., 2016).

Notwithstanding the importance of banking technology in affecting bank performance, the impact of bank innovation on financial performance is still poorly understood for two main reasons: first, the drivers of banking technology are not well understood, and second, the impact of e-banking technologies on banks' financial performance is still poorly tested (Mabrouk & Mamoghli, 2010).

In general, it appears that bank innovation improves the banks' financial performance. However, since banking technology advances periodically, it's intriguing to see how it affects Ethiopian commercial banks' current financial performance. Furthermore, to the best of the researcher's knowledge, there have been relatively few and flawed prior studies on the impact of bank innovation on financial performance in Ethiopia. First off, innovations and expanded banking technology products in the Ethiopian banking industry, like internet and mobile banking, are not included in that study (ICT's effects on commercial banks' performance in Ethiopia) (Girma, 2016). Second, according to Yosef (2017), the study's scope was restricted to a single Ethiopian

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commercial bank (case study) in the CBE Addis Ababa district as well as a few other carefully chosen Ethiopian commercial banks. The other fundamental flaw in the aforementioned studies is that they solely looked at ROA when examining how e-banking affected financial success. However, since lowering operating costs is the primary motivator for banking businesses to embrace banking innovation, research on how bank innovation affects financial performance is crucial.
Due to a lack of research on the subject, there is a paucity of literature on the financial innovation issue in Ethiopia. For example, Gardachew (2010), Ayana (2012), Assefa (2013), Abenet (2010), Gemechu (2014), and Worku (2016) assessed the uptake of e-banking in relation to banks' perceptions. Prior research on Ethiopian e-banking concentrated on the assessment study and the relationship between customer satisfaction and e-banking. Furthermore, the study on how Ethiopian commercial banks' financial performance is affected by electronic banking (Tilahun, 2016) only looked at three factors: mobile banking, debit cards, and ATMs. Also, they considered about 10 oldest banks such as Awash International Bank (AIB), Dashen Bank (DB), Bank of Abyssinia (BoA), Wegagen Bank (WB), United Bank S.C (UB), Nib international bank (NIB), Cooperative bank of Oromia (CBO), Lion International Bank S.C (LIB), and Oromia International Bank S.C (OIB) and ignored six recently established commercial banks.

This indicates that earlier empirical research only addressed the problem of the study population gap, which is restricted institutions. By including a subset of officially registered commercial banks with five years of continuous audited financial data from 2018 to 2023, our study closed the study population gap. Remarkably, to the best of the researchers' knowledge, no studies have yet used variables like agency banking and RTGS in the Ethiopian context. With an emphasis on the impact of banks' innovation performance (ROA), this study aims to close the current research gaps.

Therefore, this study will fill the above mentioned gap by assessing the effects of bank innovation services particularly use of ATM, internet and mobile banking, agency banking, electronic fund transfer (RTGS and---),bank size , liquidity , gross domestic product and inflation along with its effect on financial performance commercial banks in Ethiopia.
The general objective of the study was to assess the effects of bank innovation on financial performance of commercial banks in Ethiopia. And its specific objective

I. To identify the effects of ATM banking on financial performance of commercial banks in Ethiopia.
II. To find out the effect of agency banking on financial performance of commercial banks in Ethiopia
III. To understand the effect of mobile banking on financial performance of commercial banks in Ethiopia
IV. To assess the effect of internet banking on financial performance of commercial banks in Ethiopia
V. To investigate the effect of electronic fund transfer (RTGS) on financial performance of commercial banks in Ethiopia.

2. RESEARCH METHODOLOGY

The study mostly used a quantitative research approach in order to accomplish the aforementioned research goals. a time-series component represented by the study's 2018–2022 timeframe, which was recorded using panel data or longitudinal data, and a cross-sectional component represented by the several Ethiopian banks. PBT and ROA on the financial performance of commercial banks were dependent variables, and ATMs, agencies, the Internet, RTGS, and mobile banking were independent variables.
Because the study was primarily concerned with the financial data of commercial banks, secondary data sources and types were used. The primary source of secondary data for this study was the national bank of Ethiopia's yearly audited reports of commercial banks, which included the balance sheet, revenue account, and income statement. Typically, NBE provided these commercial banks' financial statements, which were only completely accessible beginning in 2018. Additionally, relevant books, journal articles, and other manuals were consulted in order to gather the data.

The target population of the study was 31 commercial banks of Ethiopia registered by NBE and under operation in Ethiopia. As of June, 2023, there are 30 private commercial banks and 1 governmental commercial banks working in Ethiopia. For this study the researcher were used a 17 commercial banks those who fulfill 5 year audited financial statement.

As stated earlier under scope of the study, even though this study is intended to generalize about analysis of financial performance commercial banks of Ethiopia, using purposive sampling technique the sample size were 17 commercial banks of Ethiopia, which had a 5 years audited financial data.

The sample banks are as follows: Commercial Bank of Ethiopia, Awash International bank S.C, Dashen Bank S.C, Bank of Abyssinia S.C, Wegagen Bank S.C, United Bank S.C, Nib International Bank S.C, Cooperative Bank of Oromia S.C, Lion International Bank S.C, Oromia International Bank S.C, Abay Bank, Addis International Bank, Berhan International Bank, Bunna International Bank, Debub Global Bank, Zemen Bank, and Enat Bank.

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Table list of Commercial banks in Ethiopia and there Year of Establishments

Sr. no	Bank name / Population /	Years established	Sampled
1	Commercial Bank of Ethiopia	1963	Accept
2	Awash International bank S.C	1994	Accept
3	Dashen Bank S.C	1995	Accept
4	Bank of Abyssinia S.C	1996	Accept
5	Wegagen Bank S.C	1997	Accept
6	United Bank S.C	1998	Accept
7	Nib International Bank S.C	1999	Accept
8	Cooperative Bank of Oromia S.C	2005	Accept
9	Lion International Bank S.C	2006	Accept
10	Oromia International Bank S.C	2008	Accept
11	Abay Bank	2010	Accept
12	Addis International Bank	2011	Accept
13	Berhan International Bank	2010	Accept
14	Bunna International Bank	2009	Accept
15	Debub Global Bank	2012	Accept
16	Enat Bank	2013	Accept
17	Zemen Bank	2009	Accept
18	Tsehay Bank	2022	**Reject**
19	Gadaa Bank SC	2023	**Reject**
20	Tsedey Bank	2022	**Reject**
21	Goh Betoch Bank SC	2021	**Reject**
22	Ahadu Bank	2022	**Reject**
23	Amhara Bank	2021	**Reject**
24	Shabelle Bank	2022	**Reject**
25	Siinqee Bank	2021	**Reject**
26	Hijra Bank	2021	**Reject**
27	ZamZam Bank	2021	**Reject**
28	Rammis bank	2022	**Reject**
29	Sidama bank	2022	**Reject**
30	Omo bank	2022	**Reject**
31	Siket bank	2023	**Reject**

From those CBE is state owned and the rests are private owned commercial banks

To achieve the broad research objective, the study were adapted panel data, which was collected through structured document review. Thus, the collected panel data were analyzed using descriptive statistics, and correlations analysis.

Null and alternative hypotheses:

Ho1*: ATM banking has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$1*: ATM banking has positive and significant impact on impact on financial performance of Ethiopian commercial banks.*

Ho2*: Agency banking has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$2*: Agency banking has positive and significant impact on impact on financial performance of Ethiopian commercial banks.*

Ho3*: Mobile banking has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$3*: Mobile banking has positive and significant impact on impact on financial performance of Ethiopian commercial banks*

Ho4*: Internet banking has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$4*: Internet banking has positive and significant impact on impact on financial performance of Ethiopian commercial banks*

Ho5*: Electronic fund transfer has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$5*: Electronic fund transfer has positive and significant impact on impact on financial performance of Ethiopian commercial banks*

Ho6*: Liquidity has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$6*: Liquidity has positive and significant impact on impact on financial performance of Ethiopian commercial banks*

Ho7*: Bank size has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$7*: Bank size has positive and significant impact on impact on financial performance of Ethiopian commercial banks*

Ho8*: GDP has negative and insignificant impact on financial performance of Ethiopian commercial banks.*

$H_1$8*: GDP has positive and significant impact on impact on financial performance of Ethiopian commercial banks*

Ho9: *Inflation of the country has positive and significant impact on on financial performance of Ethiopian commercial banks.*

***$H_1$9:** Inflation of the country has negative and significant impact on on financial performance of Ethiopian commercial banks.*

To estimate the effect of variables on the lending, the following panel data regression model were developed. The dependent variable in this research is financial performance whiles the independent variables consisting of ATM, Agency banking, mobile banking, internet banking, electronic fund transfer (RTGS).

Yit= α+ ΣβKXit+ εit-------------- (1)

The following model was used to examine the relationship between the bank innovation variables and the effect on the Ethiopian commercial banks;

ROAit=β0+β1∗NATMit+β2∗NMBUit+β3∗NABt+β4∗NRTGSit+β5∗NIBit+β6∗BLit+ β7∗BSit+β8∗INit+β9∗GDP+εit………………………………………………………………2

Where:

ROA-Return on Asset that measures financial performance
NATM= Number of ATM machine terminals
NMBU = Number of Mobile banking users
NAB = Number of agent banking
NRTGS= Number of RTGS users
BL= Bank Liquidity
BS= Bank size
IN= Inflation
GDP = Gross Domestic product
B0-constant term
B1, B2, **B3, B4 ………..9** are **B** coefficients to be estimated
iCommercial banks i=1….16 **t**- index of time periods t=1-6(2018-2023)

Table variables and their relationship

Variables		Notation	Measure	Expected result
Dependent variable	Return on Asset	ROA	Net income before tax/Average Total Asset	
Independent variables	Internet Banking	NIB	Natural logarithm of Number of Internet Banking users	+ significant
	Mobile Banking	NMB	Natural logarithm of Number of Mobile Banking users	+ significant
	Automated Teller Machine	NATM	Natural logarithm of Number of ATMs	+ significant
	Number of agent banking	NAB	Natural logarithm of Number of agent	+ significant
	Number of RTGS users	NRTGS	Natural logarithm of Number of RTGS	+ significant
	Inflation rate	AAIR	Average Annual Inflation Rate	+ significant
	Real Gross domestic product	RGDP	Real GDP growth product	+ significant
	Liquid Asset to deposit ratio	LADR	Liquid to total deposit	+ significant
	Bank size	BS	Natural logarithm of total asset	+ significant

Source: Researcher organized from different literature 2024Discussion and Analysis

Variance Inflation Factor

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. vif
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Variable	VIF	1/VIF
nmbu	2.60	0.385105
bsize	2.55	0.392461
inf	1.23	0.811255
nibu	1.15	0.867971
lr	1.14	0.880546
nab	1.13	0.888388
natm	1.09	0.920932
nrtgs	1.06	0.946214
gdp	1.03	0.972706
Mean VIF	1.44	

Source: from stata12 output (2024)

Multi-collinearity can be a problem if and only if VIF value exceeds 10 as it can be seen below. The result of VIF is 1.44 which is less than ten.

Random effect versus fixed effect models

In order to identify which model is appropriate the study used Hausman test.

Fixed effect model is most appropriate when null hypothesis is rejected whereas random effect is appropriate when alternative hypothesis is not rejected.

H_0= Random effect model is appropriate

H_1= Fixed effect model is appropriate

Hausman Test

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
nab	.0593852	.0359703	.0234149	.0663194
natm	.000603	.0005417	.0000613	.0002567
nmbu	5.756868	7.3879	-1.631033	3.658938
nrtgs	-.3472172	.0314564	-.3786736	.2993044
nibu	-.1832086	-.1698236	-.013385	.1273457
gdp	.0004484	.0014492	-.0010008	.0014654
lr	-.008598	-.0087194	.0001214	.0019602
bsize	.0481314	.0536052	-.0054738	.0381287
inf	-.0879561	-.0987104	.0107544	.0561357

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                b = consistent under Ho and Ha; obtained from xtreg
    B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

           chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =        3.64
         Prob>chi2 =      0.8877
```

Source: from stata12 output 2024

According to above Hausman specification test the model has the value of p=0.8877 for the regression model of dependent and independent variables. This shows random effect model is more appropriate, because the null hypothesis was accepted (not rejected). Depending on the hausman test P-value, Prob > chi2 greater than 0.1, therefore for this study random effect model is appropriate.

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2.2. Random Effect Regression Analysis

Table: Test of Random effect model

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Random-effects GLS regression                   Number of obs      =        85
Group variable: id                              Number of groups   =        17

R-sq:  within  = 0.1464                         Obs per group: min =         5
       between = 0.5594                                        avg =       5.0
       overall = 0.2187                                        max =         5

                                                Wald chi2(9)       =     20.99
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0127
```

roa	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
nab	.0359703	.0881319	0.41	0.683	-.136765	.2087056
natm	.0005417	.000363	1.49	0.136	-.0001697	.0012531
nmbu	7.3879	4.462721	1.66	0.098	-1.358873	16.13467
nrtgs	.0314564	.2214592	0.14	0.887	-.4025957	.4655085
nibu	-.1698236	.148266	-1.15	0.252	-.4604197	.1207725
gdp	.0014492	.0008254	1.76	0.079	-.0001686	.0030669
lr	-.0087194	.0038177	-2.28	0.022	-.016202	-.0012368
bsize	.0536052	.0990558	0.54	0.588	-.1405407	.247751
inf	-.0987104	.0831296	-1.19	0.235	-.2616415	.0642206
_cons	-.5484049	.5168739	-1.06	0.289	-1.561459	.4646494
sigma_u	0					
sigma_e	.19248673					
rho	0	(fraction of variance due to u_i)				

Source: from stata12 output 2024

Table Presented an empirical findings from the econometric output on determinant of lending on Ethiopian commercial banks. That is a reports of regression results between the dependent variable of lending rate and explanatory variables.

Empirical model: As presented in the third chapter the empirical model used in the study in order to find out the effects of bank innovation on financial performance of commercial banks in Ethiopia provided as follows:

1. Agent banking

The coefficient of Agent banking is 0.0359 with its p-value of 0.683 and positively related to profitability. This implies that, keeping other variables constant when Agent banking increase by one ROA of commercial banks would increase by 3.59 percent but statistically insignificant at.

2. ATM machine terminals

The above table in relation to that of ATM machine terminals the result indicates that coefficient 0.0054 and p-value of 0.136 and had positive relation with profitability of commercial banks measured by return on asset. This means that, keeping other variables relentless one increase in ATM machine terminals results increase in profitability of sampled firms by 0.05 percent but statistically insignificance.

Table 4.7 also presented that, the coefficient value of usage of ATM machine terminals measured by ROA is 3.7% and it's insignificant at P-value of 0.539. This is an indication that ATM banking and profitability of commercial banks in Ethiopia were insignificantly associated. This is due to the fact that ATM innovations offer banking institutions the opportunity to transform the ATM from a cash dispenser to a customer relationship management tool, helping to enhance loyalty among all customers. This is the main reason behind commercial banks in Ethiopia to intensify their adoption and usage of ATMs as a major e-banking tool to generate substantial contributions to their operations and financial improvement. Moreover, the positive relationship between usage of ATM and return on asset could be attributed, by retaining large number of satisfied customers. Further, the more ATM transaction executed the more commission will generated by commercial banks in Ethiopia.

3. Mobile banking

The study found that there was a positive relationship between Mobile banking and return on asset. The coefficient of Mobile banking is 7.38 and p-value 0.098 and significant at 10%, then reject the null hypothesis which states Mobile banking has negative and statically significant effect on financial performance. Based on Return on assets as a measure of financial performance, the coefficient of Mobile banking is positive at 7.38 which is positive and statistically significant at 10%.

These finding supports the study done by Osewe and Muturi (2017) its finding reveals that mobile banking innovation has

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significant positive effect on banks ROA. This finding is also in line with that of Bonface and Ambrose (2015) concludes that the prices of mobile-banking services had a high positive influence on the financial performance of commercial banks in Kenya. Mobile-banking helped to promote efficiency and confidence in the financial system thus winning public trust. The results of this study are also in agreement with Gakure and Ngumi, (2013) their finding revealed that mobile banking innovations had a moderate influence on profitability of commercial banks in Kenya.

4. Electronic fund transfer /RTGS/

The results of the regression analysis for RTGS shows that, the coefficient is 0.0314 with its p-value of 0.887 and positively related to profitability. This implies that, keeping other variables constant when RTGS increase by one ROA would increase by 3.14 percent but statistically insignificant.

5. Internet Banking

As we seen in the regression result above table, the coefficient of internet banking indicate that 0.1698 and p-value 0.25. thi indicated that there is negative relation between with return on asset and insignificant. This indicate that, keeping other independent variables constant when internet banking increase by 1 and return on asset (ROA) would be decrease by 16.98 percent but it is not significant .

Similarly, Pooja (2009) revealed that profitability and offering of internet banking does not have any significant association.

6. Gross Domestic product

GDP measured by annual GDP rate. As it can be seen from random effect analysis method above, the regression result revealed that, the coefficient result 0.0144 and p-value 0.079. This implied that there is positive relation between GDP and their profitability which indicate that, there is an increase in ROA by 1.44 percent when GDP increase by one unit.

This result is consistent with the findings of Ruth (2014), who state that lending rates have a positive relationship with GDP.

7. Bank Liquidity

Liquidity ratio used in this study as a control variable. It used to measure the short term solvency of the firm. As we seen in the regression result above table, the coefficient of liquidity indicate that, there is positive relation between current ratio and return on asset but it is insignificant.

The results of the regression analysis for liquidity shows that, the coefficient is 0.087 with its p-value of 0.022 and negatively related to profitability. This indicate that, keeping other independent variables constant when current ratio increase by 1 unit return on asset (ROA) would be decrease by 0.87 percent but it is significant at 5%.

This finding is consistent with the findings of Ojo (1978),Ituwe (1985),Ajayi (2007), and Malede (2014), who finds a positive relationship between ROA.

8. Bank Size

This study uses bank size (measured as log of total asset) as control variable to isolate the effects of electronic banking products on financial performance of commercial banks in Ethiopian, in line with previous studies (Yosef, 2017; Njogu, 2014). The natural logarithm of total asset of the bank was used as proxy for size in the regression model according to the study of (Boyd & Runkle, 1993).

The explanatory variables remains constant bank size has positive impact on ROA and insignificant at p-value of 0.588 with the coefficient of 0.536. The coefficient values of bank size in both table indicates that a percentage increase in the asset of banks would lead to an increase in ROA y 53.6% but insignificant.

This finding is consistent with findings of (Karimzadeha *et al.* 2014; Wanja, 2012; Yosef, 2017; Njogu, 2014) revealed that the larger the bank size, the more profitable the bank. This is also, agreeing with prediction as in the work of Chin et al., (2009); they suggest that larger banks usually have cost advantages over small ones.

9. Inflation

The regression output of the study shows that the coefficient of Inflation is 0.987 and its P-value is 0.235. This means holding other explanatory variables constant at their average value, when inflation increased by one percent, ROA Ethiopian commercial banks in Ethiopia would be decreased by 98.7 percent and statistically insignificant.

However, this result is consistent with the study result of Amano (2014) and Nkusu (2011), who founds a positive association between inflation rate and loan and advances.

Banks should continue investing in innovation delivery channels because they are able to control their costs much better as compared to investment in brick and mortar or physical branches. The volume of transactions that can be processed on channels like the internet and mobile are high as compared to delivering such transactions using manual processes. This helps to minimize the cost per unit of service and hence better returns to the banks. Commercial banks should explore more ways of maximizing their utilization and returns from mobile banking and internet banking.

Even if usage of ATM had positive effects on financial performance, currently installed ATM in Ethiopia banking industry is outdated one that doesn't enable bank customers to make deposit, so it is better for commercial banks to adopt the latest or updated ATM to deliver comprehensive service in vantage area so as to attain efficiency and improve their financial performance.

Mobile phones and internet have been found to have a major influence in delivering technology driven banking services. It is recommended that commercial banks continue to create sustainable business linkages and collaborations with mobile phone

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service providers as well as the internet service providers. Findings revealed that mobile phones had a higher moderating effect than internet service and this can be attributed to the level of penetration and ease of access of mobile phones to the public. Banks should leverage on mobile phones in order to grow their business and customer base. The Government should continue to offer more incentives for technologies that use mobile phones as their delivery platforms.

The management of commercial banks and all other stakeholders should join efforts to increase the internet connectivity infrastructure in Ethiopia. The study further recommends that the commercial banks managers should emphasize on training their clients on use of internet banking through advertisements. In order to promote utilization of electronic banking channels in Ethiopian commercial banking industry, the regulatory authorities (NBE) should come up with relevant policies to foster financial inclusion within the banking industry in order for the industry to achieve maximum returns from electronic banking.

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