



Financial innovation and profitability of private banks in Ecuador

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Received: December 21, 2022; reviews: 2; accepted: January 16, 2023

Abstract

Ecuadorian banking has been one of the sectors with the greatest growth in digitalization. In this sense, about 90% of banking services are available digitally, through web pages, cell phone applications, virtual assistants, contactless payment systems, ATMs among products. This research aims to analyze the impact of financial innovation on the profitability of private banks in Ecuador with a focus on ATMs between 2015 – 2019.

Keywords

financial innovation, profitability, return on assets, return on equity, ATMs

Introduction

In the banking system, the introduction and development of new methods of providing services to depositors, such as automated teller machines (ATMs), online banking and the call centre, may have greater economies of scale than traditional branch networks. In addition, advances in payment technology, such as point-of-sale terminals and feature-rich card issuances, may have generated network economies and economies of scale in back-office operations, as well as facilitated the transfer of funds between individuals and organizations in a country. (The & Ngo, 2020)

Financial innovation seen since the beginning of the twenty-first century as undeniably positive for the entire economy has been the subject of multiple criticisms since the financial crisis of 2007 and the subsequent recession. For many, financial innovation has served as an integral solution that allows markets to expand because they arise to cover the needs that appear as a result of changes in the economy, of financial systems it is the introduction of new financial services or modifications to processes and existing ones, as well as the renewal or change in instruments or institutions. (Arias González et al., 2021; Yuan et al., 2021)

Following the global financial crisis, most banks globally have witnessed a reduction in profitability. This phenomenon has raised the legitimate concern of financial institutions, as a persistent and widespread reduction in profitability has resulted in a key concern, as it weakens the bank's ability to raise the capital required for new capital regulations and finance an economy. (Bongini Hotels et al., 2019; C.-C. Lee et al., 2020)

As technologies evolve continuously, the banking sector has to accelerate its investments in innovation and digital improvements. The literature has demonstrated the importance of financial innovation to demonstrate the dynamics between countries either for national banking markets.

As background on financial innovation, we can mention the study called "Effect of Bank innovation of Financial performance of commercial banks in Kenya" in which it was determined that financial innovations have contributed to the financial performance of commercial banks thus demonstrating that innovations have generated significant influence and income returns on assets profitability and deposits (Ngumi, 2014)

Authors as mentioned that financial innovations focus on 3 simultaneous characteristics such as: the lack of discontinuity with the past a real improvement of the service provided to the client by the banks and the increase in profits, in this sense it is shown that financial innovation brings as a consequence a real economic growth, where it is evident that innovative banking entities invest less in traditional credit, as well as the low quality of the loan portfolio is positively related to innovation. Arnaboldi & Rossignoli (2015)

The relationship between financial innovation and bank profitability as mentioned has a positive and significant relationship, either due to the use of ATMs,

mobile banking and bank performance; In this sense, in their research they recommend developing financial products based on the use of technology and therefore increase bank profitability. Kamau & Oluoch, (2016)

Innovation can affect the financial performance of organizations in two perspectives: their market and financial positions. Market position refers to performance based on firms' revenues in the market (e.g., sales and market). The financial position refers to the performance of companies based on costs in the market (e.g., return on assets (ROA), return on equity, and return on sales), which considers the cost component of the company's activities.(Raajpoot & Sharma, 2021; Yuk & Garrett, 2023)

Ecuadorian banking has been one of the sectors with the greatest growth in digitalization. In this sense, about 90% of banking services are available digitally, through web pages, cell phone applications, virtual assistants, contactless payment systems, ATMs among products. This research aims to analyze the impact of financial innovation on the profitability of private banks in Ecuador with a focus on ATMs between 2015 – 2019.

Innovation

Financial innovation is a unique type of innovation. Unlike pharmaceutical manufacturing or innovation, it does not rely on patents or have a similar cost structure. (Bernier & Plouffe, 2019)

Schumpeter's theory relates innovation to new combinations or production functions, they are rather broad and vague, reflecting his struggle to understand the complexities of technological development. In this sense, innovation is visualized as a combination of resources, knowledge, materials.(Hawthorn, 1996; Skibinski & Sipa, 2015)

The word innovation remembers ideas products processes innovative activity in an organization, represents an interactive process characterized by the reciprocal technological relationships of the environment. Nowadays, innovation is considered an essential practice that generates competitive advantages as a source of resources that allow entities a significant improvement in their capacity and level of performance(Skibinski & Sipa, 2015; Yuk & Garrett, 2023)(Arias González et al., 2021; Garcia et al., 2016).

Innovation is defined through the use of key concepts such as the completion of incomplete markets overcoming problems of information asymmetries agencies reduction of transaction costs or research as responses to the changes of globalization risks and technological shocks. Innovation is an action or process of change that admits novelty today this concept is associated with technology so it leads to competitiveness and development of technological goods and services.(Kamau & Oluoch, 2016; Macharia & Tirimba, 2018)

Financial Innovation

Financial innovation is considered as the action of generating new financial instruments based on technologies, institutions and markets is also considered as a process of renewal with product innovations by modern means derivative contracts with new corporate securities or different ways of production of concentrated investment as well as the process of improving these channels to generate security in transactions and prices (León & Enrique, 2006; Yuan et al., 2021)

The term financial innovation means the inclusion of new financial instruments in financial institutions and markets through new technologies which include product process and organizational innovation. Process innovation is a new way of operating businesses and implementing information technology such as ATMs, mobile banking, online banking among others. (Awrey, 2013; European Central Bank, 2019; Laretta, 2018; M & Mamoghli, 2010)

Financial innovation has different conceptions according to the European Central Bank financial innovation represents a type of organizational innovation that admits the contracting of costs or risks of financial institutions and as an improvement of the financial service as a whole (European Central Bank, 2019)

Financial innovation is a growing trend that is defined as the investment vehicle and financing structure that maximizes the growth of organizations. It is considered as the establishment of new instruments or services of a financial nature. Its objective focuses on new opportunities to take risks improving existing markets generating cost reduction in non-tax transactions. (M & Mamoghli, 2010; Macharia & Tirimba, 2018)

Types of Financial Innovation

Financial innovation being considered as the creation of new financial instruments or services, whose purpose is to provide new opportunities to cover risks reduce transactional costs today 3 types of financial innovations are defined. (González, 2010; Puente Riofrío et al., 2022)

1. Innovation by processes: risk analysis, control of financial assets, business management. (Scott et al., 2017)
2. Market innovation: changes and organization in the structure of existing or new markets. (Beck et al., 2016; C. C. Lee et al., 2020; Ngumi, 2014)
3. Innovation by products: new investment instruments, financing, risk transfer. (Rodriguez, 2004)

Profitability

Profitability is an important element in any entity because it measures efficiency in the management of financial and economic resources. For financial institutions to maintain a good level of profitability allows to react to a financial

collapse, in this sense profitability is an objective that seeks to initially avoid a shock in a financial crisis (Pessarossi et al., 2020)

Performance measurement and reporting is now widespread in the public and private sectors. It has been argued that the most common tool used for this process are performance indicators (KPIs) which provide intelligence in the form of information on the performance of a public or private agency. The financial system represents the core of credit for any economy. In turn, credit is the engine that sets in motion the financial flows that determine the growth and economic development of a country.

The analysis of the profitability levels of an enterprise establishes that the financial information contained in the financial statements must meet characteristics of quantitative and qualitative variables that ensure compliance to provide reasonable information internally and externally. (Bongini Hotels et al., 2019; Puente et al., 2019)

Among the main indicators used to define bank profitability are returns on equity, return on assets and the financial leverage indicator.

Recent studies on the profitability of banks show empirical evidence that financial institutions suffer profitability shocks due to the macroeconomic context and only 30% of banking organizations can overcome these crises, which shows that the root of profitability problems is credit activity and the deterioration of the loan portfolio due to the risk assumed that is not counteracted by adequate capitalization provisions. (Bongini Hotels et al., 2019; Lazo & Woldesenbet, 2006)

Banks that manage to return to their previous level of profitability after an earnings shock adopt a more conservative lending policy, reduce their credit supply and effectively address the NPL (non-performing loans) problem.

Materials and methods

This research is within the economic financial field; Therefore, the present research is quantitative because the results to be obtained are mostly quantifiable with numerical parameters in addition to this qualitative type because in the research work different analyzes are carried out.

The study adopts a correlation research design with an explanatory scope that sought to establish the relationship between banks' financial innovation and profitability.

The target population for the study is represented by the 24 private banks of Ecuador, however when collecting the variables 12 private banking entities are taken into consideration.

The variables considered in the study are: ATMs, credit cards, debit cards, return on assets, return on equity. Statistical packages such as Excel and STATA were used to analyze the data.

Data collection was carried out from secondary data on the population under study, including return on assets, return on equity, number of ATMs, number of debit cards, credit card numbers, table number 1 shows the platforms from which the data were obtained.

Table 1: Data Platforms

PLATFORM DATA	Data Type	Website
Superintendence of Banks	Monthly Newsletters	http://estadisticas.superbancos.gob.ec/portalestadistico/portalestudios/?page_id=415
Superintendence of banks	General Statistics	http://estadisticas.superbancos.gob.ec/portalestadistico/portalestudios/?page_id=1826
Datalab Asobanca	Indicators, in percentages. Source: Superintendency of Banks	https://datalab.asobanca.org.ec/datalab/resources/site/index.html?QlikTicket=IX3OZqtW0UiE0V0h#
Datalab Asobanca	Credit Cards	https://datalab.asobanca.org.ec/datalab/resources/site/index.html?QlikTicket=IX3OZqtW0UiE0V0h#

Theoretical Model

For this research, regression equations were used to test the study hypotheses.

Analyze the influence of financial innovation through ATMs for the generation of returns on assets

$$ROA = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where X1, X2, X3, X4 represent the independent variables such as ATMs, credit cards, debit cards, number of banking agencies., β_0 is the cash or intercept, β_0 , β_1 , β_2 , β_3 , β_4 are the coefficients of the independent variables, ε represents the residual error of the values that are not captured within the econometric model.

Establish the relationship between ROE and ATMS as an element of financial innovation

$$ROE = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where X1, X2, X3, X4 represent the independent variables such as ATMs, credit cards, debit cards, number of banking agencies., β_0 is the cash or intercept, β_0 , β_1 , β_2 , β_3 , β_4 are the coefficients of the independent variables, ε represents the residual error of the values that are not captured within the econometric model.

Results

For descriptive analysis, the mean minimum and maximum standard deviation of each study variable was used.

Table 2. Descriptive statistics

Variable	Remarks	Media	Standard deviation	Minimal	Maximum
ATM	600	206.6417	239.524	4	880
Banking Agencies	600	97.24861	74.25295	6	303

Variable	Remarks	Media	Standard deviation	Minimal	Maximum
Credit Cards	600	192078.1	203442.2	1255	937130
Debit Cards	600	479168	649574.9	4900	3183597
ROA	600	0.0097631	0.004804	.000117	.0227645
ROE	600	0.0981394	0.048858	.0007531	.2083806
Note: data obtained from the Superintendency of Banks of Ecuador and processed in the statistical program Stata 16.1					

The average return on equity equals 9.8% with a standard deviation of 4.8%. The most attractive innovation that Ecuadorian banks have had in recent years corresponds to credit cards, a fact that can be attributed to the accessibility offered by private banking to its customers to have credit cards.

The use of ATMs is in positive progress far exceeds the average of banking agencies available in the Ecuadorian territory consequently it is observed that traditional banking has invested in financial innovations such as ATMs that replace traditional offices.

ROA Correlation and Financial Innovations

The study universe was made up of 11 Ecuadorian banks, which present elements of financial innovation such as ATMs, credit cards, debit cards.

$$ROA = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Table 3. ROE correlation – innovation variables

Variable	ROA	ATM	Banking Agencies	Credit Cards	Debit Cards
ROA	1				
ATM	0.2404	1			
Banking Agencies	-0.0920	0.4452	1		
Debit Cards	0.0844	0.5716	0.7445	1	
Credit Cards	0.2528	0.5491	0.7810	0.6789	1
Note: there is a high correlation level when the value is greater than 0.8, a low correlation when the value is less than 0.5					

Table 3 presents the correlation coefficients of Pearson ROA – banking financial innovations. Debit and credit cards have a correlation coefficient of 0.0844 and 0.2528, between ROA and ATMs a correlation of 0.2404 is evident, in relation to banking agencies, the ROA shows a negative correlation of 0.0920.

To identify the non-existence of multicollinearity between variables, variance inflation was used, showing that none of the variables has a value greater than 10 as shown in table four, in such virtue the linear regression equation considers all variables

Table 4. Variance inflation

Variable	BRIGHT	1/VIF
ATM	1.63	0.612280
Banking Agencies	3.35	0.298585
Debit Cards	2.70	0.369717
Credit Cards	2.98	0.335755
Mean VIF	2.67	

Return on assets and financial innovations model

For the Roa model and financial innovations, ordinary least squares regression was applied, considering robust deviations to overcome heteroscedasticity problems.

Table 5. ROA Model - Innovations

Variable	Coefficient	Error Robust Standard	T	P value
ATM	.0004558	.0001062	4.29	0.000
Banking Agencies	-.0240619	.0012579	-19.13	0.000
Credit Cards	.0004025	.0002798	12.87	0.000
Debit Cards	.0034432	.0002676	1.44	0.151
Constant	-0.008236	.0017928	-0.46	0.646
F(4,595)	128.74			
Probability (F)	0.0000			
R square	0.3017			
Note: * p value 0.05, if p value >0.05 is not significant				

The results shown in Table 5 show that 30.17% of the variations in return on assets (ROA) in Ecuadorian banking were influenced by ATMs, credit card banking agencies, excluding debit cards from the model, since they do not have a level of significance, that is; The value is greater than 0.05. In addition, the independent variables have had a significant joint influence F 128.74, p value < 0.05, the ATM[s, banking agencies and credit cards variables with a significance level of 0.05.

The relationship between ATMs and ROA is a directly proportional relationship, since the regression coefficient indicated that, if there were a change in one unit, the return on assets in Ecuadorian banking would increase by 0.45%, this change is minimal, the increase in a unit of credit cards loses generate a growth in the return on assets, in Ecuadorian banking equivalent to 0.40%.

The probability F is 0.000 less than the significance level 0.05, so the null hypothesis is rejected and the alternative hypothesis is accepted that the return on assets of Ecuadorian banks is influenced by financial innovations ATMs, banking agencies and credit cards.

Return on equity models and financial innovations

Credit and debit cards influence banking income, therefore, they are directly related to profitability on equity, states that credit and debit cards can generate positive and negative effects on ROE, in this context we proceeded to determine the correlation between ROE and the independent variables credit and debit cards of Ecuadorian banking. Mwanja (2009)

Table 6. ROE Correlation - Financial Innovations

Variable	ROE	ATM	Banking Agencies	Credit Cards	Debit Cards
ROE	1				
ATM	0.2165	1			
Banking Agencies	-0.2511	0.4452	1		
Debit Cards	0.2088	0.5716	0.7445	1	
Credit Cards	0.0297	0.5491	0.7810	0.6789	1

Table 6 shows the levels of correlation between ROE and the independent variables; between ATMs and ROE the correlation is 21.65%, banking agencies show a negative correlation of 25.11%, debit cards a correlation of 20.88% and credit cards show a low correlation with the dependent variable.

The seemingly ambiguous relationship between financial innovation and banking performance raises the question of its impact on the real sector in an extensive literature on finance and growth in terms of a positive correlation to the effect of financial innovations(Beck et al., 2016).

To determine the non-existence of multicollinearity between variables of the applied model, variance inflation was used where none of the variables has a value higher than 10, so in the regression equation all variables are considered.

Table 7 ROE Variance Inflation – Innovations

Variable	BRIGHT	1/VIF
ATM	1.63	0.612280
Banking Agencies	3.35	0.298585
Debit Cards	2.70	0.369717
Credit Cards	2.98	0.335755
Mean VIF	2.67	

Note: Vivid >10 exists multicolinealidad between variables

For the ROE – Financial Innovations model, the ordinary least squares model is considered.

$$ROE = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Table 8 ROE Model and Financial Innovations

Variable	Coefficient	Error Standard Robust	T	P value
ATM	.0033354	.001087	- 3.07	0.002
Banking Agencies	-.3395674	.0118101	-28.75	0.000
Credit Cards	.0160666	.0021782	7.38	0.000
Debit Cards	.0281209	.0019542	14.39	0.000
Constant	.0606051	.0183824	3.30	0.001
F(4,595)	223.70			
Probability (F)	0.0000			
R square	0.4726			
Note: **p value = 0.05				

After applying the model of the least squares it was evidenced that the use of 47.26% of financial innovations affects the return on equity, according to the beta coefficients ATMs if the percentage of incidence on the R oe is increased by one unit has no major influence because its value is almost zero represents only 0.33%, Banking agencies present a negative relationship, that is; if the percentage unit of the ROE is decreased, an average of 33% of the agencies is decreased, the credit cards when increasing one unit the Rroe would increase by 1.60 and if the debit cards are increased, a decrease in the ROE of 2.8% is generated, demonstrating a low correlation between variables.

The probability F is 0.000, less than the significance level 0.05, for this reason the null hypothesis is rejected and the alternative hypothesis is accepted "the profitability on the equity of Ecuadorian banks is influenced by financial innovations ATMs, banking agencies, debit cards, credit cards.

The results generated in the research show that financial innovations in Ecuadorian private banking have a low influence on bank profitability both in return on assets and return on equity, the analysis generated coefficients of determination that show percentages of variation in profitability that are explained through financial innovation. Significance tests show n the influence of financial innovations on ROA and ROE, as well as determining an existing relationship between customers with credit and debit cards based on ROE, for which the hypotheses of alternatives raised were accepted.

Discussion of Results

The results generated in this research show a low incidence of financial innovations in both ROA and ROE, when contrasted with studies such as the one that shows that in the United Kingdom, one of the most innovative countries, banking experiences significant decreases in relation to costs, but they have not demonstrated a significant relationship between financial innovation and profitability. Arnaboldi & Rossignoli (2015)

The study carried out by considers the possibility of ATM surcharges may affect bank profitability through the effect of the relationship with the client, in this scenario it is concluded that ATMs can decrease the return on assets in a minimum percentage. Taking into account other innovation channels such as credit and debit cards show a growth of ROA, this type of innovation shows that banking performance is not only driven by financial innovations, but that there are other drivers of financial performance such as regulations, human resources, quality of management among others. (Massoud et al., 2006)

(Gündoğdu & Taşkin, 2017)In its analysis on the relationship between financial innovation and bank profitability suggests that Internet banking the use of ATMs do not have an impact on bank performance, managers of financial institutions should employ policies to increase the use of these channels in order to minimize costs and maximize returns, In contrast to the results obtained in Ecuadorian banking, it is concluded that ATMs as a financial innovation have a low impact on profitability on assets and on equity, compared to previous research, so it can be inferred that financial innovations have a double side, which if not taken advantage of and regulated would not cause a greater impact on the profitability of banking.

When contrasted with previous research, it is shown that financial innovation variables such as ATMs, credit and debit cards are significant, but their beta coefficients are very low for this reason they do not greatly affect bank profitability.

Conclusions

Based on the results generated in the research, it is evident that the return on assets of Ecuadorian banks has a positive impact on financial innovations. In line with the research entitled "Does financial innovation improve performance? *An analysis of process innovation used in Pakistan*" carried out by consider that ATMs as a financial innovation Tahir et al. (2018) have a positive impact on bank profitability, taking into account other innovation channels such as credit and debit cards, a growth of ROA is shown, in conclusion this type of innovation shows that banking performance is not only driven by financial innovation, but there are other elements drivers of financial performance such as: regulations, quality of management, among others.

The return on equity (ROE), according to the results obtained is concluded to have a positive impact of financial innovations such as credit cards and debit cards, the adoption of this type of financial innovations explains that the return on equity is increased by non-traditional income obtained in transactions made in innovation channels such as debit and credit cards.

In this context, it is concluded that the return on equity has a positive impact on financial innovations, however; with the data obtained from Ecuadorian private banking it is evident that the adoption of ATMs does not generate greater impact on the return on equity, but credit cards increase this type of profitability.

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