

The effect of financial inclusion on the financial performance of the commercial banks: Empirical study on the developing countries

تأثير الشمول المالي علي الأداء المالي للبنوك التجارية: دراسة اختبارية علي الدول النامية

Rehab EmadEldeen

Lecturer of Accounting

**Faculty of Commerce and International Trade at Egyptian Chinese University
School of Business at American University in Cairo**

الملخص:

يهدف هذا البحث إلى قياس أثر الشمول المالي على الأداء المالي للبنوك التجارية في الدول النامية. من أجل تحقيق هذا الهدف، تم إجراء دراسة اختبارية علي البنوك التجارية في 39 دولة نامية في الفترة من 2004 إلى 2021 وتم استخدام نموذج التأثير الثابت والعشوائي باستخدام البيانات السنوية المقطعية والمستخرجة من قاعدة البيانات الاقتصادية للاحتياطي الفيدرالي وقاعدة بيانات البنوك العالمية. وأظهرت النتائج أن هناك علاقة إيجابية ذات دلالة إحصائية بين استخدام الشمول المالي من خلال الودائع المصرفية والأداء المالي للبنوك التجارية، مما يشير إلى أن ارتفاع معدل الودائع المصرفية يحسن من الأداء المالي للبنوك. علاوة على ذلك، هناك علاقة إيجابية ذات دلالة إحصائية بين استخدام الشمول المالي من خلال القروض والأداء المالي للبنوك التجارية، مما يشير إلى أن ارتفاع معدل القروض يتيح تمويل عدد أكبر من المشاريع ومن ثم يحسن من الأداء المالي للبنوك. بالإضافة إلى ذلك، هناك علاقة إيجابية ذات دلالة إحصائية بين توافر الشمول المالي من خلال ماكينات الصراف الآلي وعدد فروع البنوك التجارية والأداء المالي للبنوك التجارية في الدول النامية، مما يشير إلى أن استخدام المزيد من ماكينات الصراف الآلي وفروع البنوك

التجارية يزيد من فرصة إتاحة الشمول المالي لكل الفئات مما يساعد في تحسين الأداء المالي للبنوك. لذلك يُوصي البحث برفع معدل القروض و الودائع المصرفية، وتوفير عدد أكبر من ماكينات الصراف الآلي و فروع البنك وذلك لزيادة الشمول المالي ومن ثم رفع الأداء المالي للبنوك التجارية في الدول النامية. تتوافق نتائج البحث مع النظريات والأبعا الذين يعملون على كل بُعد على حدة.

الكلمات المفتاحية: الشمول المالي ، الأداء المالي ، البنوك التجارية ، التحول الرقمي ، الصراف الآلي ، الفروع ، الودائع ، القروض ، التكنولوجيا المالية.

Abstract:

This research aims to measure the impact of financial inclusion on the financial performance of commercial banks in developing countries. To achieve this objective, an empirical study was conducted on commercial banks in 39 developing countries in the period from 2004 to 2021. Pooled regression, random and fixed effect models were used by conducting annual cross-sectional data from the Federal Reserve Economic Database and the World Banks Database. The results showed that there is a statistically significant positive relationship between access to financial inclusion through bank deposits and bank performance, which indicates that the high rate of deposits enhances bank performance. Moreover, there is a statistically significant positive relationship between the usage of financial inclusion through outstanding loans and bank performance, which indicates that the high rate of loans allow the banks to fund more operation, consequently, enhancing the bank performance. In addition, there is a statistically significant positive relationship

between the availability of financial inclusion through ATMs and branches and bank performance, which indicates that using more ATMs and bank branches increases the chance of financial inclusion to reach the unbanked, which helps enhance bank performance. Therefore, the research recommends raising the rate of loans and deposits and launching more ATMs and bank branches to increase financial inclusion and improve the bank's performance. These insights are consistent with theorists and scholars worked on each dimension separately.

Keywords: Financial inclusion, financial performance, commercial banks, digital transformation, number of ATMs, number of branches, deposit, loans, fintech.

1- Introduction

In recent years, financial inclusion (FI) has been seen as an important factor for sustainable development on a global scale. Financial inclusion individuals and businesses have access to formal financial institutions' products and services, such as payments, savings, transactions, insurance, and credit, at a rational cost and in a sustainable method. Financial inclusion is widely seen as a vital instrument for decreasing poverty through the availability of more suitable financial services and digitalizing these services in a simple way and promoting inclusive economic growth. Therefore, high access to financial services allows marginalized groups to escape poverty and

reduces societal inequality. It helps not only individuals but the whole economy and drives economic growth (Attia, 2021).

Moreover, achieving the financial inclusion supports the efforts undertaken by countries to develop the infrastructure, encourage investment, achieve financial sustainability, and meet the challenges of unemployment. Consequently, promoting the financial inclusion will deepen the financial and banking sector, enhancing its stability and safety, and strengthening its role in serving growth endeavors (Yen et al., 2022).

Efforts to promote financial inclusion involve expanding the reach of financial services, developing appropriate and affordable products, leveraging technology and green innovation (Li, et al., 2023), enhancing financial literacy and education, and creating an enabling regulatory environment. These initiatives aim to bridge the gap between the financially excluded and the formal financial system, empowering individuals and businesses to build assets, manage risks, invest in their future, and participate in economic opportunities (Hakimi, et al., 2023)

While progress has been made in advancing financial inclusion globally, challenges remain. Barriers such as limited physical infrastructure, high costs, low financial literacy, cultural norms, and regulatory constraints can hinder the achievement of full financial inclusion. However, through collaborative efforts, innovative approaches, and inclusive policies, financial inclusion

has the potential to create more inclusive and resilient economies, promote social equity, and improve the overall well-being of individuals and communities (Liu, F., & Walheer, B. 2022).

Therefore, the question of our research is that “Can the commercial banks’ financial services made through the financial inclusion enhance the bank performance?”

According to the information given by the World Bank report, there is about 70% of the world's population does not have access to financial services (Demirgüç-Kunt, et al., 2018). Also, according to the United Nations’ Sustainable Development Report 2021, around 63% of this percentage is from developing countries (Report, 2021). Specifically, in Egypt, there is 67% of the population remains unbanked and they rely primarily on cash, they do not have access to financial services Banks. Banks are trying to increase digital channels by launching more ATMs and point-of-sale machines; while partnering with Fintech companies to enhance mobile wallets and payment options for customers. Another challenge is that the banking sector remains under-leveraged with a low loans-to-deposits ratio (Egypt, 2022).

The rest of the paper is organized as follows. Section 2 discusses the literature review through the theoretical background and hypotheses development. Section 3 determines the research methods and methodology used. Section 4 deals with the data analysis and discussions. Finally, section 5 addresses the conclusions of this paper.

2- Literature review:

2-1 Theoretical background:

2.1.1. Financial inclusion beneficiary:

*According to the **Public good theory***, providing formal financial services should be considered as a public good, and everyone can be brought into the formal financial sector as a beneficiary. So one person's access to formal financial services does not limit its availability to others. For persons or small businesses, banks can offer them a free debit card and use ATMs without a transaction fee; for suppliers, they will bear the cost as a sunk cost of doing business; and governments can provide financial institutions with subsidies to help them deal with any cost issues that occur because of providing citizens with free formal financial services (Kamal, et al., 2021).

*According to the **Vulnerable group theory***, poor individuals, young people, women, and the elderly should be prioritized for financial inclusion programs because they are the ones who are most affected by financial crises and economic recessions (Bhandari, 2018). One approach to accomplish this is by government to-person (g2p) social cash transfers into needy people's formal accounts. This may motivate more vulnerable people to enter the formal financial sector and open a formal account in order to benefit from this service (Swamy, 2014).

2.1.2. Financial inclusion delivery:

*According to the **Special agent theory***, because of the nature of rural communities, their population, or their location, providing formal financial services to unbanked adults might be hard. As a result, using specialist agents (a local bank, non-bank institution, or a special institution) to supply formal financial services to members of these excluded communities is necessary (Ozili, 2018).

*According to **Collaborative intervention theory***, to bring the excluded people into the formal financial sector, a combined intervention and collective effort from different stakeholders is required (Arun & Kamath, 2015).

2.1.3. Financial inclusion funding:

According to **Private money theory**, Private money should fund financial inclusion projects because private funders will guarantee that it is used efficiently and given to the excluded parts of the population (Mohiuddin, 2015).

According to **Public money theory**, government funds should fund financial inclusion projects. Public investment in financial inclusion appears to be expanding faster than private funding (Dashi et al., 2013).

According to these theories, financial inclusion could be treated as a public good and the government should apply and fund

it. On the other hand, the private sector could be the one that funds and delivers it to the excluded people and rural communities. Both of them, private and public, can work together to achieve the goal of financial inclusion and reach the excluded.

2-2 Hypotheses development:

In the matter of realizing comprehensive, maintainable, and impactful financial development. When financial services become accessible to previously underserved or excluded populations, it expands the customer base for banks. This leads to an entry of new customers, allowing banks to attract more deposits and create additional revenue from fees and interest charges.

Financial inclusion initiatives often focus on encouraging individuals to open bank accounts and save money. This leads to an increase in deposits for banks, providing them with a stable source of funds for lending and investment activities. Larger deposit bases enable banks to expand their loan portfolios and generate interest income. Nowadays, Banks need to invest and deal with customers easier, faster, and even safer by using digital transactions to access financial services. Banks also try to improve the quality of the services provided to ensure sustainable development (Cámara & Tuesta, 2014). David, et al., (2018) show that deposits of rural commercial bank branches and credit of private sector have a positive effect.

AI (Artificial Intelligence) and fintech (financial technology) have the potential to significantly affect financial inclusion by expanding access to financial services and improving the overall efficiency and effectiveness of financial systems. AI powered fintech keys can afford financial services to underserved populations who have limited access to traditional banking infrastructure (Albert B. Chu, 2018). Furthermore, AI algorithms can analyze enormous amounts of financial data in real-time to recognize potential risks and detect fraudulent actions. This benefits in reducing credit risks, avoiding financial crimes, and safeguarding the interests of consumers and financial institutions. By enhancing risk management practices, AI can make financial services more accessible and affordable for a broader range of people (Mhlanga, 2020).

While AI and fintech have immense potential for financial inclusion, it is crucial to report certain challenges and risks connected with their deployment. These contain ensuring data privacy and security, handling algorithmic biases, fostering digital literacy, and structuring robust regulatory frameworks to protect consumers' interests and rights. By addressing these challenges, AI and fintech can continue to drive financial inclusion and create more reasonable access to financial services (Hua. Et al., 2019). Some studies show that the access to the financial inclusion positively affect the bank performance (Harish et al., 2023; Asit et al., 2023; Agyekum et al., 2022;

Nguyen, 2020). According to the previous studies, the following hypotheses can be developed and tested;

Hypothesis 1: The access to financial inclusion has no significant effect on the financial performance of commercial banks.

One of the main indicators of financial inclusion usage is the ownership of bank accounts or other formal financial accounts. Enlarged usage implies a higher percentage of individuals and businesses holding accounts to access financial services, create transactions, and manage their finances. The usage of financial inclusion often includes the adoption of digital transactions (Mhlanga, 2020). This comprises activities such as mobile banking, digital wallets, online payments, and electronic fund transfers. Digital transactions allow individuals to conduct financial activities securely, conveniently, and in a cost-effective manner (Dawei, Anzi, & Gen, 2018).

Furthermore, financial inclusion usage is reflected in the deployment of savings and deposit services. This indicates that individuals and businesses are consuming formal financial channels to save money and hold deposits, rather than depending solely on informal or cash-based methods. Enlarged savings and deposits contribute to financial stability and afford a foundation for future investments and credit access (Harish et al., 2023).

Moreover, the usage of financial inclusion usage benefits in reducing the dependence on informal financial practices, such as money lenders or loan sharks. By employing formal financial services, individuals and businesses can access transparent and regulated financial channels, decreasing their exposure to exploitative practices and increasing their financial security (Gomber, Koch, & Siering, 2017; Agyekum et al., 2022).

Additionally, with enriched access and usage to financial services, individuals and businesses gain opportunities to access credit. This diversifies the loan portfolio of banks by including borrowers from previously underserved segments. A diversified loan portfolio supports banks manage risks and shrinks dependence on specific industries or customer segments. Furthermore, financial inclusion can add to improved loan repayment rates for banks. When individuals have access to financial services, they can better manage their finances, join in formal credit systems, and shape credit histories. This develops creditworthiness and diminishes default rates, leading to enhanced loan performance for banks (Hakimi, 2023).

Ultimately, the usage of financial inclusion is a dynamic and evolving process. It involves efforts from governments, financial institutions, and other stakeholders to encourage awareness, improve appropriate products and services, address barriers to usage, and foster a culture of financial inclusion and empowerment

(Albert B. Chu, 2018; Rathi & Vandana, 2016). It's claimed by Ozili (2018) that digital financial inclusion is highly beneficial to governments, financial users, and the general economy.

David, et al., (2018) show that the loans of the rural commercial banks' branches and the loans of the agricultural sector have a negative effect. Some studies shows that the usage of financial inclusion and bank performance have a positive relationship (Hakimi, et al., 2023; Agyekum et al., 2022; Nguyen, 2020). According to the previous studies, the following hypotheses can be developed and tested;

Hypothesis 2: The usage of the financial inclusion has no significant effect on the financial performance of commercial banks.

The availability of financial inclusion depends on the range of products and services offered by financial institutions. It comprises basic banking services like savings accounts, payment services, and remittances, as well as access to credit, insurance, and investment products. The availability of diverse and tailored financial products is vital to meet the specific needs of different sectors of the population at affordable cost. Furthermore, the regulatory environment plays a significant role in modeling the availability of financial inclusion. Governments and regulatory bodies can present policies and regulations that support financial inclusion, such as relaxing branch licensing requirements,

supporting digital financial services, and applying consumer protection measures. A supportive regulatory framework encourages financial institutions to enlarge their services and reach underserved populations (Maity, S., & Sahu, T. N. 2022).

The number of branches has a positive and significant impact on the profitability of banks (Kumar, et al., 2021). It is believed that an increase in the number of branches and ATMs will lead to an increase in the number of customers, resulting in an increase in the deposit and lending portfolio and diversification of risk. Some studies not only reveal a positive relationship between financial inclusion and the profitability of commercial banks but also that digital services have a positive impact on the profitability of commercial banks (Al-Adwey, 2019; Maity, S., & Sahu, T. N. 2022). According to the previous studies, the following hypotheses can be developed and tested;

Hypothesis 3: The availability of the financial inclusion has no significant effect on the financial performance of commercial banks.

3- Research methodology:

3-1 Target Sample and data collection:

Panel data were used for 39 developing countries using time series from 2004 – 2021. The final observation is 702 observations. Our research sample does not cover all the developing

countries since countries data are incomplete for these variables over these years. Moreover, some of variables were excluded like mobile money account, mobile money agent and mobile money transaction due to the insufficient data for these variables.

The data were collected from Financial Access Survey (FAS), International Monetary Fund (IMF), International Financial Statistics (IFS), Bankscope, World Bank national accounts data, and OECD National Accounts data files for the period from 2004 to 2021.

3-2 Variable measurement:

For the explanation and measurement of variables, panel (A) consists of the dependent variable of bank performance. Panel (B) comprises of the independent variables (access, usage and availability of financial inclusion). And Panel (C) comprises of the control variables.

In order to measure access to financial inclusion, we use the data of deposit per 1000 adults following the measures of Sarma (2012, 2016).

On the other hand, Sarma (2008, 2016) mentioned the view of Kempson et al. (2004) that in some countries, the percentage of people with bank accounts is great, however they are using few bank services. Consequently, purely having an insufficient bank account for a whole financial system.

Therefore, grounded on the suggestion of Gupte et al. (2014); Lenka and Bairwa (2016); Beck et al. (2007) and Sarma (2016) outstanding loans (% of GDP) have been used in order to measure the usage of the financial inclusion.

Ultimately, similarly according to Sarma (2016), in a whole financial system, bank transaction themes were branches, offices, ATMs, etc. must be certainly available to users. Hence, in order to measure the availability of the financial inclusion, we used data on the number of branches and ATMs per 100,000 adults. As shown in Table (1).

Table (1): variables measurement:

	Variable	Measurements	Source	Reference
Panel (A): Dependent variable:				
Financial performance	Bank return on equity (% , after tax) (ROE)	Commercial banks' after-tax net income to yearly averaged total equity. Raw data are from Bank scope and Orbis.	Bankscope (2000-14) and Orbis (2015-21), Bureau van Dijk (BvD)	
Panel (B): Independent variables:				
Access to financial inclusion	Deposit accounts per 1,000 adults (Deposits)	(number of deposit accounts*1,000)/adult population in the reporting country.	International Financial Statistics (IFS), International Monetary Fund (IMF)	Sarma (2008, 2016); Park and Mercado (2015); Gupte et al. (2012); Amidzic et al. (2014); Mialou et al. (2017).
Usage of financial inclusion	Outstanding loans per 1,000 adults (Loan)	(number of loan accounts*1,000)/adult population in the reporting country.	Bankscope (2000-14) and Orbis (2015-21), Bureau van Dijk (BvD)	Gupte et al. (2012); Sarma (2016, 2008, 2012); Camara and Tuesta (2014).

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Availability of financial inclusion	ATMs per 100,000 adults (ATMs)	100,000*Number of ATMs/adult population in the reporting country.	Financial Access Survey (FAS), International Monetary Fund (IMF)	Sarma (2016, 2008, 2012); Park and Mercado (2015); Gupte et al. (2012); Amidzic et al. (2014) Mialou et al. (2017); Camara and Tuesta (2014); Thi Truc (2020).
	Bank branches per 100,000 adults (Branches)	(number of institutions + number of branches)*100,000/adult population in the reporting country.	Financial Access Survey (FAS), International Monetary Fund (IMF)	Sarmer (2008, 2012); Park and Mercado (2015); Gupte et al., (2012);Amidzic et al. (2014); Mialou et al. (2017); Camara and Tuesta (2014)
Panel (C): Control variables:				
Inflation, GDP deflator (annual %) (INF)		Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole.	World Bank national accounts data, and OECD National Accounts data files.	
Growth domestic product growth (annual %) (GDP)		Annual percentage growth rate of GDP at market prices based on constant local currency.	World Bank national accounts data, and OECD National Accounts data files.	

The statistical analysis will investigate the following hypotheses:

1. The access to financial inclusion has no significant effect on the financial performance of commercial banks.
2. The usage of financial inclusion has no significant effect on the financial performance of commercial banks.

3. The availability of financial inclusion has no significant effect on the financial performance of commercial banks.

3-3 Data analysis:

Panel Data (longitudinal data) has been used, which combines Cross Sectional Data (39 countries), and Time Series Data (18 years from 2004 to 2021), Eviews 10 is the statistical program used to analyze the data, through applying the 3 following Panel Data models:

- 1- Pooled Regression Model.
- 2- Fixed Effect Model
- 3- Random Effect Model.

According to the combined regression model, all observations are considered as one entity without considering both differences between countries of the study and differences over time. This model is estimated by Ordinary Least Square (OLS). So that the equation constant is (β_0) and the regression coefficients are (β 's), which are constant for all countries over time, as shown in Equation (1). As for the fixed effects model, the regression model will be estimated by considering the differences between the countries of the study, which allows for each country to have its own equation constant is (β_{0i}). This is because of the different characteristics of each country, but this difference is constant over time, which means the regression

coefficients (β 's) are constant for all countries over time. Besides The fixed effects model is estimated by using Least Square Dummy Variables (LSDV) as illustrated in equation (2). And as for Random Effect Model, the regression model will be estimated by taking into accounts that all countries are different in their random error (ϵ_i). Especially Random Effect Model deals with the differences between countries and differences over time as random variables, so these differences are added to the random error term as random components. So, the random effects model will be estimated by using Generalized Least Square (GLS) as shown in equation (3).

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + e_{it} \quad (1)$$

$$Y_{it} = \beta_0 i + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + e_{it} \quad (2)$$

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \epsilon_i + e_{it} \quad (3)$$

Where:

X_{1it} : is the first independent variable of country i during the time t .

X_{2it} : is the second independent variable of country i during the time t .

X_{kit} : is the last independent variable of country i during the time t .

Y_{it} : is the dependent variable of country i during the time t .

e_{it} : is the random error that is resulted from regression model.

ϵ_i : Random error for each country.

To determine the best model to represent data from the previous three models, the following tests will be used Wald test (Restricted F-test) will be applied to compare between the Pooled model and the fixed effects model. Moreover, Breusch-Pagan LM (Lagrange Multiplier) will be applied to compare between the Pooled Model and the random effects model. Furthermore, Hausman test will be applied to compare between the fixed effects model and the random effects model. That is in case the fixed effects model and the random effects model are better than the Pooled Model.

3-3-1 Descriptive statistics

Descriptive statistics for variables were calculated using minimum, maximum, mean, and standard deviation as shown in table (2).

Table (2): Descriptive Statistics

Variables	Sample Size	Descriptive Statistics			
		Minimum	Maximum	Mean	Std. Dev.
ROE	612	-45.644	64.608	12.799	9.263
ATMs	612	0.040	126.707	37.282	27.094
Branches	612	0.385	92.338	18.063	15.862
Deposits	612	6.188	251.261	55.512	45.269
Loans	612	6.951	134.227	45.997	25.022
GDP	612	-21.400	34.500	4.136	4.795
INF	612	-18.845	150.001	6.554	9.171

The table shows that the average number of ATMs in developing countries is 37 ATM. Furthermore, the average number of branches is 37 branches. Moreover, average deposits are 55, and the average outstanding loans are 46.

In order to show the access, usage, and availability of financial inclusion in each of the 39 countries, the following figures were used.

Figure (1): access to financial inclusion:

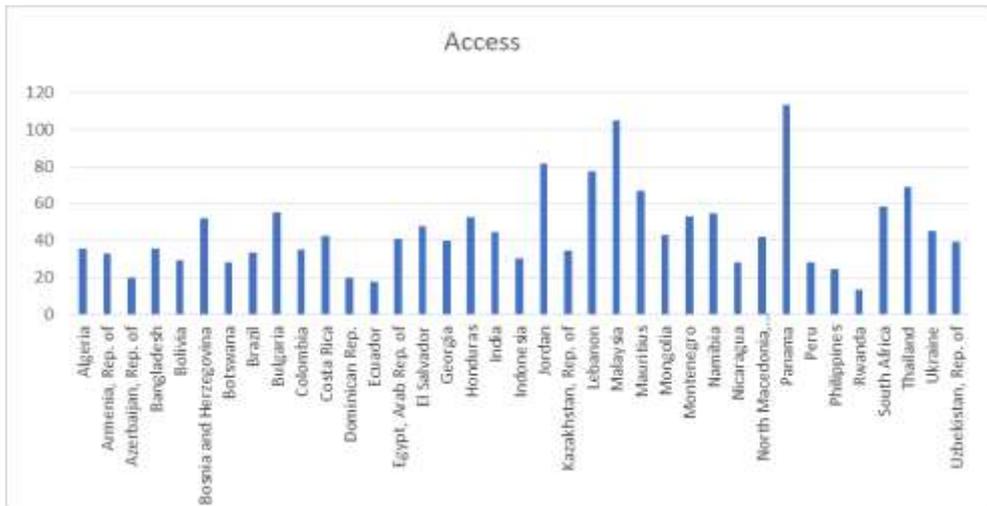


Figure (1) shows that Panama, Malaysia, Jordan, and Lebanon have the first rank in the highest access to financial inclusion. Furthermore, Thailand, Mauritius, South Africa, and Bulgaria were second rank for the highest countries that have high access to financial inclusion. Ultimately, India, Egypt, and

Ukraine were the third rank for the highest countries that have high access to financial inclusion. Rwanda shows the lowest access to financial inclusion compared to the other countries, which indicate that the rate of deposits is too low in Rwanda compared with the other countries.

Figure (2): usage of financial inclusion:

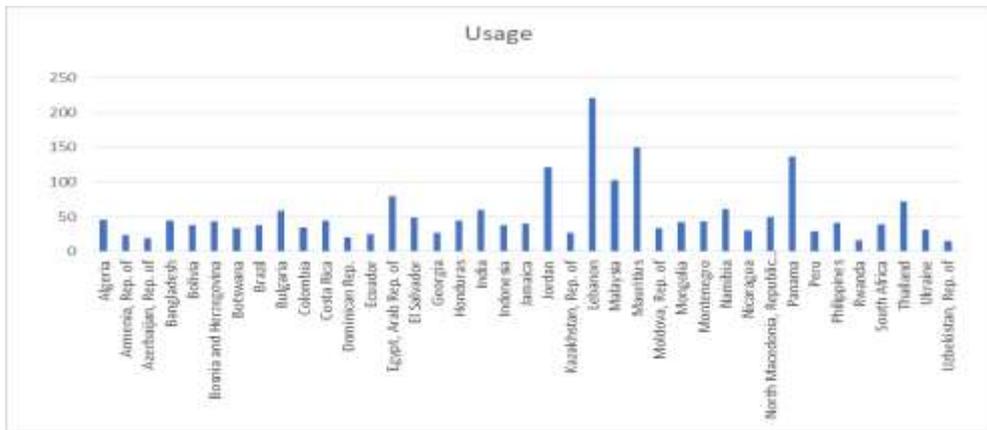


Figure (2) shows that Lebanon has the first rank in the highest usage of financial inclusion. Furthermore, Mauritius, Malaysia, Jordan, and Panama were second rank for the highest countries that have a high usage of financial inclusion. Ultimately, Egypt and Thailand were the third ranks for the highest countries that have a high usage of financial inclusion, which indicate that Egypt has a moderate outstanding loans compared with the other developing countries.

Figure (3): availability of financial inclusion:

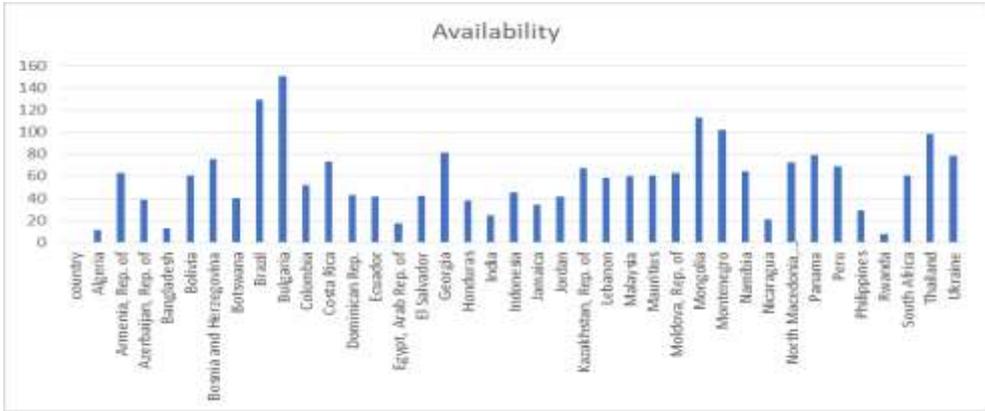


Figure (3) shows that Bulgaria, Brazil, and Mongolia have the first rank in the highest availability for financial inclusion. Furthermore, Thailand, Mauritius, Lebanon, Malaysia, and Georgia were the second rank for the highest countries that have high availability to financial inclusion. Ultimately, Egypt, Algeria, Bangladesh, and Rwanda were the lowest countries that have availability to financial inclusion, which indicate the Egypt should launch more ATMs and branch for their customer to increase the availability of the financial inclusion.

3-3-2 Correlation Matrix

Correlation coefficients were calculated among the variables, to know the degree of the relationship of the variables.

Table (3): Correlation matrix between variables

Variables	Corr.	ROE	ATMs	Branches	Deposits	Loans	GDP	INF
ROE	Corr.	1						
	p-value							
ATMs	Corr.	0.243	1					
	p-value	0.000						
Branches	Corr.	0.171	0.308	1				
	p-value	0.000	0.000					
Deposits	Corr.	0.136	0.134	0.079	1			
	p-value	0.001	0.001	0.051				
Loans	Corr.	0.267	0.393	0.204	0.732	1		
	p-value	0.000	0.000	0.000	0.000			
GDP	Corr.	0.277	-0.276	0.003	-0.135	-0.167	1	
	p-value	0.000	0.000	0.937	0.001	0.000		
INF	Corr.	-0.004	-0.138	0.010	-0.099	-0.178	-0.002	1
	p-value	0.926	0.001	0.805	0.014	0.000	0.954	

Table (3) shows the correlation between the independent variables. It shows that the number of the ATM positively correlated with the number of branches, deposit and loans. Moreover, the number of the deposit positively correlated with the outstanding loans.

3-3-3 Test of the 1st and 2nd hypotheses:

Through this section, a statistical model was built to test the hypotheses, as shown in equation (4):

$$\text{ROE}_{it} = \beta_0 + \beta_1 \text{Deposits}_{it} + \beta_2 \text{Loans}_{it} + \beta_3 \text{GDP}_{it} + \beta_4 \text{INF}_{it} + e_{it} \quad (4)$$

Where:

ROE_{it} : is Return on Equity of country i during time t .

Deposits_{it} : is deposits with banks of country i during time t .

Loans_{it} : is Outstanding loans from commercial banks of country i during time t .

GDP_{it} : is GDP growth of country i during time t .

INF_{it} : is Inflation of country i during time t .

e_{it} : is the random error that is resulted from regression model.

Table (4) shows the results of Panel Data Models (Pooled Model, Fixed Effects Model, Random Effects Model) including Regression Coefficients, Standard Error (S.E.), and the results of t-test, in addition the result of Coefficient of Determination (R^2), Adjusted R^2 , F-test, Wald test (Restricted F-test), BreuschPagan LM (Lagrange Multiplier) and Hausman test.

Table (4): Regression models

Variables	Pooled Model				Fixed Effect Model				Random Effect Model			
	Coefficients		t-test		Coefficients		t-test		Coefficients		t-test	
	Value	S.E.	t	P value	Value	S.E.	t	P value	Value	S.E.	t	P value
Constant	15.383	0.926	16.612	0.000	15.399	1.807	8.520	0.000	16.272	1.692	9.619	0.000
Deposits	0.028	0.011	2.469	0.014	0.126	0.028	4.456	0.000	0.085	0.021	4.088	0.000
Loans	0.124	0.021	5.967	0.000	0.250	0.034	7.405	0.000	0.217	0.030	7.165	0.000
GDP	0.462	0.074	6.246	0.000	0.436	0.062	6.985	0.000	0.439	0.062	7.126	0.000
INF	-0.050	0.039	-1.286	0.199	0.018	0.038	0.465	0.642	-0.004	0.035	-0.104	0.917
R²	0.137				0.507				0.174			
Adjusted R ²	0.132				0.476				0.168			
S.E.	8.632				6.707				6.729			
<i>F</i> -test(<i>p</i> -value)	24.173 (0.000)				15.985 (0.000)				31.898 (0.000)			
<i>LM</i> -test(<i>p</i> -value) = 729.923 (0.000), <i>Wald</i> -test(<i>p</i> -value) = 13.070 (0.000), <i>Hausman</i> -test(<i>p</i> -value) = 7.929 (0.094)												

Table (4) shows that the probability value of Wald-test is lower than the significance level at 5% ($p\text{-value} = 0.000 < \alpha = 0.05$), which indicates that the Fixed Effect Model is better than the Pooled Model. Furthermore, the probability value of LM-test is lower than the significance level at 5% ($p\text{-value} = 0.000 < \alpha = 0.05$), which indicates that the Random Effects Model is better than the Pooled Model. Moreover, the probability value of Hausman-test is greater than the significance level at 5% ($p\text{-value} = 0.094 > \alpha = 0.05$) which indicates that Random Effects Model is better than the Fixed Effect Model.

According to the above findings, Random Effects Model will be used. Getting back to table (4), it is found that there is a positive, statistically significant impact of Deposits on ROE at

significance level 5%, whereas regression coefficient for this variable is 0.085 and p -value = 0.000 < α = 0.05. Furthermore, there is a positive, statistically significant impact of Loans on ROE at significance level 5%, whereas regression coefficient for this variable is -0.217 and p -value = 0.000 < α = 0.05.

Moreover, the regression model is statistically significant at significance level 5%, whereas the probability value of F-test is lower than the significance level (p -value = 0.000 < α = 0.05). Additionally, the variables forming the model can explain (17.4%) of the changes in ROE, and the remaining (82.6%) is because of the random error or other factors that may affect ROE and that influences are not studied in this research.

3-3-4 Test of the 3rd hypothesis

Through this section, a statistical model was built to test the hypothesis, as shown in equation (5):

$$ROE_{it} = \beta_0 + \beta_1 ATMs_{it} + \beta_2 Branches_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + e_{it} \quad (5)$$

Where:

ROE_{it} : is Return on Equity of country i during time t .

$ATMs_{it}$: is Number of ATMs per 100,000 adults of country i during time t . $Branches_{it}$: is Number of commercial bank branches per 100,000 adults of country i during time t .

GDP_{it} : is GDP growth of country i during time t .

INF_{it} : is Inflation of country i during time t .

e_{it} : is the random error that is resulted from regression model.

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Table (5) shows the results of Panel Data Models (Pooled Model, Fixed Effects Model, Random Effects Model) including Regression Coefficients, Standard Error (S.E.), and the results of t-test, in addition the result of Coefficient of Determination (R^2), Adjusted R^2 , F-test, Wald test (Restricted F-test), BreuschPagan LM (Lagrange Multiplier) and Hausman test.

Table (5): Regression models

Variables	Pooled Model				Fixed Effect Model				Random Effect Model			
	Coefficients		t-test		Coefficients		t-test		Coefficients		t-test	
	Value	S.E.	t	P value	Value	S.E.	t	P value	Value	S.E.	t	P value
Constant	14.191	0.850	16.690	0.000	12.825	1.230	10.42	0.000	13.542	1.430	9.467	0.000
ATMs	0.048	0.014	3.341	0.001	0.071	0.018	3.909	0.000	0.066	0.017	3.832	0.000
Branches	0.075	0.023	3.190	0.002	0.038	0.056	0.688	0.492	0.010	0.044	0.236	0.000
GDP	0.460	0.077	5.989	0.000	0.445	0.065	6.811	0.000	0.446	0.065	6.872	0.813
INF	-0.022	0.039	-0.557	0.578	0.015	0.035	0.433	0.665	0.009	0.034	0.249	0.803
R^2	0.122				0.474				0.128			
Adjusted R^2	0.117				0.440				0.122			
S.E.	8.706				6.933				6.925			
F-test (p value)	21.166 (0.000)				13.969 (0.000)				22.208 (0.000)			
LM-test(p-value) = 669.881 (0.000), Wald-test(p-value) = 11.616 (0.000), Hausman-test(p-value) = 2.615 (0.624)												

Table (5) shows that the probability value of Wald-test is lower than the significance level at 5% ($p\text{-value} = 0.000 < \alpha = 0.05$),

which indicates that the Fixed Effect Model is better than the Pooled Model. Furthermore, the probability value of LM-test is lower than the significance level at 5% ($p\text{-value} = 0.000 < \alpha = 0.05$), which indicates that the Random Effects Model is better than the Pooled Model. Ultimately, the probability value of Hausman-test is greater than the significance level at 5% ($p\text{-value} = 0.624 > \alpha = 0.05$) which indicates that Random Effects Model is better than the Fixed Effect Model.

According to the above findings, Random Effects Model will be used. Getting back to table (5), it is found that there is a positive, statistically significant impact of ATMs on ROE at significance level 5%, whereas regression coefficient for this variable is -0.066 and $p\text{-value} = 0.000 < \alpha = 0.05$. Furthermore, there is positive, statistically significant impact of Branches on ROE at significance level 5%, whereas $p\text{-value} = 0.000 > \alpha = 0.05$.

Moreover, the regression model is statistically significant at significance level 5%, whereas the probability value of F-test is lower than the significance level ($p\text{-value} = 0.000 < \alpha = 0.05$). Additionally, the variables forming the model can explain (12.8%) of the changes in ROE, and the remaining (87.2%) is because of the random error or other factors that may affect ROE and that influences are not studied in this research.

4. SUMMARY & CONCLUSION

This research aims to measure the impact of financial inclusion on financial performance in commercial banks in 39 developing countries.

On the micro-level, financial inclusion helps to promote local economies by allowing individuals, particularly in underserved areas, to access formal financial services. Banks hope to reach out to more consumers to make more deposits that can spend on technology and equipment as well as recruit additional people when they create new branches. Banks can make more money by extending credit, especially if it comes with new services and suitable loan terms, such as acceptable asset requirements and credit costs.

On a macro level, financial inclusion is critical for establishing a strong basis for a country's financial infrastructure, which will promote economic growth and development. It also promotes social, economic, and environmental development by achieving sustainable development and improving global welfare based on equality and human rights.

In order to achieve our objective, an empirical study was conducted on commercial banks in 39 developing countries in the period from 2004 to 2021. Pooled regression, random and fixed effect models were used using annual cross-sectional data from the Federal Reserve Economic Database and the World Banks Database.

The **results** showed that there is a statistically significant positive relationship between access to financial inclusion through bank deposits and the financial performance of commercial banks, which indicates that the high rate of deposits enhances the bank performance. Moreover, there is a statistically significant positive relationship between the usage of financial inclusion through outstanding loans and bank performance, which indicates that the high rate of loans allow the banks to fund more operation, consequently, enhancing the bank performance.

In addition, there is a statistically significant positive relationship between the availability of financial inclusion through ATMs and commercial bank branches and the financial performance of commercial banks in developing countries, which indicates that the use of more ATMs and the high number of commercial bank branches increases the chance of financial inclusion for all categories, which helps in enhancing the bank performance.

Therefore, the research recommends raising the rate of loans, deposits and providing more ATMs and bank branches to increase financial inclusion and enhance the bank's performance.

The result of our research is consistent with theorists and scholars who are working on each dimension separately.

Ultimately, the descriptive statistics revealed that Egypt has a moderate access and usage of financial inclusion compared to the other developing countries. Unfortunately, Egypt is low availability of financial inclusion.

Therefore, this research **recommends** that Egypt should increase the availability of financial inclusion by launching more ATMs and branches in order to reach more unbanked people and face the challenges of poverty and unemployment, and to move forward to achieve sustainable development.

This research was **limited** to the 39 developing countries for the period from 2004- 2021, so further research can analyze how the financial inclusion affect the developed countries. Moreover, this research exclude some variables due to the insufficient data such as mobile money account, mobile money agent, and mobile money transaction. Therefore further studies can show the effect of the digital financial inclusion on the bank performance using these variables.

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