The Importance of Financial Depth, in Achieving Financial Inclusion in Algeria: An Analysis of Data from 2004-2021

Laila OULAD BRAHIM
Laboratory of applied studies in financial and accounting
University of economic, Ghardaia, Algeria
.
ouladbrahim.laila@univ-ghardaia.dz

Received: 08/10/2023 *Accepted*: 10/01/2024 *Published*: 23/01/2024

Abstract:
The main objective of this study is to examine the data, on inclusion and financial depth in Algeria from 2004 to 2021. The aim is to understand and measure the relationship and correlation between these two variables. To achieve this, we utilized both Excel and Eviews12 programs to test our hypotheses and discuss our findings Our study discovered that there is no impact between the credit provided to the sector and ATMs. However interestingly we did find a positive effect between the expansion of money supply and the number of ATM transactions. Specifically for every 1% increase in money supply there was an increase of 0.83% in ATM transactions. Furthermore, our research revealed that both credit provision to the sector and an expanded money supply has an influence on the number of bank branches.
***Key Words*:** Financial Depth, Financial Inclusion, Financial Stability, Indicators.

JEL Classification: G2, C22

* Corresponding author: Laila OULAD BRAHIM , (*ouladbrahim.laila@univ-ghardaia.dz)*

Introduction:

The banking industry is widely recognized as a pillar, for stabilizing economies and plays a key role in achieving financial and economic growth. In the context the financial and banking sector has experienced changes requiring the establishment of effective mechanisms to implement economic and financial policies and laws. It is also important to emphasize the importance of improving knowledge among citizens as this greatly contributes to enhancing their understanding of matters and active involvement in the financial system.

To assess the progress of development in any country specific indicators can be utilized that reflect its characteristics. One such indicator is depth, which measures the extent of activity within a country and its capacity to meet borrowing and investment requirements. Additionally, there is also access, which assesses the availability of services across all segments of society thereby promoting inclusivity, in finance and overall economic advancement.

Main problem: The primary focus of this study is to address the question:

How does financial depth contribute, to enhancing financial inclusion in Algeria during the study period?

Sub questions: To tackle the problem, we have identified the sub questions:

- What does financial inclusion mean. What are its measurement indicators?
- What is the nature of the relationship between inclusion and financial depth?
- What are the levels of financial depth indicators in Algeria?

Study Hypothesis: This study posits that promoting inclusion relies on support from indicators of financial depth (such as broad money supply to GDP credit granted to the private sector to GDP, etc.).

Study Importance: This research provides an understanding by combining practical developments. It highlights how financial inclusion contributes to banking stability and plays a role, in promoting investment opportunities diversifying the uses of markets and financing economic activities.

Study Objectives: This research aims to accomplish goals, which include:

- Gaining familiarity, with the concept of inclusion and its indicators in Algeria.
- Understanding how financial depth contributes to promoting financial inclusion in Algeria.
- Assessing Algeria capacity to achieve both financial depth and inclusion.

Methodology Used: To address these objectives a descriptive approach was employed to cover the concepts of the subject and enhance its aspects. Additionally, the study utilized a method that involved analysis to explore the relationship between indicators of financial inclusion and financial depth in Algeria.

Scope of the Study

Geographical Scope: The study focuses on analysing the financial sector environment within Algeria.

Temporal Scope: The study covers a timeframe from **2004, to 2021** relying on reports published by the Central Bank of Algeria.

Previous studies

1. This Study (Al-Obaidi, 2020) was examined the trends of financial depth indicators, in three countries; Iraq, Saudi Arabia and Jordan. The purpose was to analyze the values and development of these indicators from 1992 to 2018 in order to identify opportunities for improvement and leverage their aspects. Additionally, the researchers aimed to compare the levels of depth among these countries based on indicators. The study findings revealed that Jordan ranked highest in terms of depth among the selected sample countries, followed by Saudi Arabia with Iraq ranking

2. The Study (Ahmed Aziz Ahmed & Ahmed Al-Naemi, 2022): focused on analyzing depth and financial inclusion indicators in two banking sectors; Saudi Arabia. Using ***EviewsV.10*** software the researchers examined the impact of depth on the level of inclusion in these countries through a multiple regression model for the period spanning **from 2004, to 2019.**

The research findings indicated a correlation, between depth and financial inclusion in the countries included in the study. It was observed that financial depth plays a role in achieving the objectives of promoting inclusion particularly within Arab countries. Based on these conclusions it was suggested to diversify high quality services to attract a wider customer base. Additionally emphasizing the importance

of literacy was recommended to support the growth and integrity of financial systems.

3. The Study (Hamoush, 2020): aimed to emphasize the significance of promoting inclusion as a means to enhance the depth of banking sectors in countries. Through analyzing indicators of inclusion and central bank efforts it was evident that there is still room for improvement in providing access to banking services for various segments of society within Arab nations. Consequently, it is crucial for Arab central banks to prioritize promoting inclusion as part of their policies towards enhancing their banking sectors depth.

4. The Study (Azzam Mahmoud Azzam A., 2017): study focused on examining indicators of depth within Palestines market and their impact on economic growth rates, from 1997 2015.

The objective of the research was to determine these indicators; the level of progress, in the market its connection with the actual economy and the main obstacles facing the development of the Palestinian financial market and its impact on economic growth. The research employed an approach, which involved explaining the phenomenon and analyzing its causes and origins. To establish the relationship between depth indicators and real GDP a quantitative method was utilized along with software called **SSPS.** As a recommendation decision maker, in Palestine should prioritize both social aspects of their policies while also closely monitoring their financial and banking sectors.

I. Theoretical Framework of the Study:

1. Financial Inclusion:

1.1. Concept of Financial Inclusion:

a. Definition of Financial Inclusion: The concept of financial inclusion has been approached from multiple perspectives, leading to diverse definitions for this term. Some of these definitions include:

The International Monetary Fund defines it as: "Planned and organized efforts aimed at making financial services available to everyone, especially the deprived and the poor. (Bouziane, Wafi, & Said, 2023, p. 684). While the World Bank defines it in its 2014 report as: "The proportion of individuals or companies using financial services. (Ghadiri & Bousalem, 2023, p. 518).

b. Goals and Importance of Financial Inclusion: These can be summarized in the following points:

b.1. Enhances competition among financial institutions: By diversifying their products, improving their quality to attract more clients and customers, and facilitating some informal processes through regulation (Ben Gaid & Bouafia, 2018, p. 94).

b.2. Boosting economic development efforts: Many applied studies conducted by the World Bank Group showed a tangible effect of financial inclusion on economic

growth levels. Furthermore, it's observed that the depth and use of financial services lead to improved social justice levels in societies (Khmaili, 2022, p. 15).

b.3. Enhancing individuals' ability to integrate and contribute to the development of their communities: Studies have shown that enhancing an individual's ability to interact with the financial system increases their potential to start their businesses and incentivizes them to invest in education. Additionally, this will help enhance their ability to manage financial risks and handle challenges associated with financial fluctuations. Qasi & Boulasnam, 2021, p. 681).

b.4. Strengthening the stability of the financial system: Increasing the use of the official financial system diversifies the deposit portfolio of financial institutions, reducing concentration levels and alleviating the risks of these institutions. Moreover, this diversification boosts the stability of the financial system. A study by the World Bank showed that countries with higher levels of financial inclusion are less prone to political fluctuations (Khmaili, 2022, p. 15).

1.2. Conditions for Financial Inclusion:

For the implementation and generalization of financial inclusion, certain conditions must be met, as follows: (Karkar, 2020, p. 366) .

- Define the goals that countries should achieve to enhance and maximize financial inclusion.
- Conduct a new study in the banking sector to evaluate the feasibility of current products and their suitability to the needs of society members.
- Include monitoring customer satisfaction with available services, providing them with necessary information about their accounts, and meeting their needs.
- Analyze market requirements and needs for banking services and implement them practically.
- Introduce new services that meet the needs of different segments of society in their financial and banking areas.
- Provide consultancy services to customers and assist them in choosing the services suitable for them, which help them manage their money effectively.
- Strengthen the role of different regulatory bodies to give customers confidence in the services provided and implement fair policies.

1.3. Challenges of Financial Inclusion:

Globally, the number of adults without bank accounts is about 1.7 billion. Most people with bank accounts live in high-income countries. In fact, half of these individuals live in just seven developing countries: Bangladesh, China, India, Indonesia, Mexico, Nigeria, and Pakistan. As for the challenges faced by Arab countries in promoting financial inclusion, they are related to social and economic factors, including financial illiteracy, low income, geographical factors, and the high cost of providing financial services. Additionally, there's a lack of infrastructure necessary to expand financial inclusion. Despite a relative improvement in infrastructure levels for financial sectors in the Arab world recently, many of these infrastructures still lack the basic elements that can increase financing opportunities (Ali Hussein & Hussein Al-Haidari, p. 110).

2. Financial Depth... Theoretical Background:

2.1. Concept of Financial Depth:

The World Bank defines financial depth as: "The increase in the stock of financial assets, indicating the capacity of financial institutions in general to effectively mobilize financial resources to achieve economic development goals. (Bousba & Sahli, 2020, p. 343)

Financial deepening is also defined as: A multi-dimensional process aiming to expand the size and activity of intermediary financial institutions through diversifying the range of services and financial instruments (Tarshi, Tarqo, & Bouflih, 2018, p. 114) The importance of financial depth can be represented in the following: (Al-Khafaji & Al-Sabawi, 2023, p. 5)

- ✓ Rational and logical thinking in making savings and investment decisions plays a crucial role. Financial depth itself partially depends on the willingness of wealth owners to invest their savings in various financial assets such as stocks and bonds.
- ✓ Full risk coverage is ensured by comprehensively diversifying the asset portfolio. This includes offering a diverse range of financial assets with the aim of reducing liquidity risks. The financial sector establishes a wide range of assets that diversify or distribute risks.
- ✓ Increasing the capital volume required by private financial institutions rather than relying on direct government funding.
- ✓ Strengthening the financial sector by improving supervisory and regulatory procedures, enhancing stability, efficiency, and competitive capability.
- ✓ An increase in the size of institutions participating in the financial sector enhances the effective exchange of goods and services.
- ✓ Reducing information asymmetry relies on the use of technology in processing and disseminating information, applying effective rules and regulations to regulate the financial sector, efficiently organizing companies and markets, and establishing new institutions.

Financial deepening can achieve the following objectives: (Tarshi, Tarqo, & Bouflih, 2018, p. 114)

- ❖ Increase the number of active institutions in the financial services sector.
- ❖ Diversify available financial services and the volume of financial trading in various channels of the financial sector.
- ❖ Strengthen the financial sector through improved supervisory and regulatory procedures, enhance stability, increase efficiency, and bolster competitive capability.
- ❖ Increase the volume of financing provided by private financial institutions to the private sector rather than direct borrowing from the government.
- ❖ Increase the proportion of the population that has access to credit and financial services.
- ❖ Ensure good risk coverage by diversifying a wide range of assets.
- ❖ Make logical and prudent decisions regarding savings and investments.

2.2. Pillars of Financial Depth:

a. **Policies that Contribute to Increasing Financial Depth:** Among the policies adopted to achieve this are the following: (Azzam Mahmoud Azzam, 2017, p. 20).
   - Enacting laws aimed at enhancing trust between investors and financial institutions by establishing administrative bodies to monitor marketing records.
   - Developing the capital market, especially the bond market, for long-term financing.
   - Bridging the gap between formal and informal financial sectors by establishing institutions to support them in enhancing their activity and developing financial products tailored for small and medium-sized enterprises, aiming to empower a larger population.
   - Restructuring the banking sector by opening it to competition and introducing appropriate financial instruments to boost local financing.
   - Regulating financial markets effectively to provide a diverse range of financial tools and services, with the aim of deepening the market and ensuring the efficient collection of financial resources.

b. **Indicators for Measuring Financial Depth:** Indicators used to measure financial depth vary, either quantitatively or qualitatively, according to previous and applied studies. A team of economists believes that using qualitative indicators is more effective in this context, as they provide deeper structural and institutional details about financial depth. The application of qualitative financial depth indicators includes a set of sub-indicators dealing with credit supervision, interest rates, entry barriers, regulations and laws related to trading, privatization in the financial sector, and restrictions on international financial transactions. (Binyan Al-Jubouri, 2019, p. 42)

The most important indicators for measuring financial depth can be summarized in the following table:

Table 01: Indicators for Measuring Financial Depth

Bank-Based Depth Indicators	Financial Market-Based Depth Indicators
Percentage of credit provided to the private sector to GDP.	Private debt bonds to GDP.
Financial assets to GDP.	Public debt bonds to GDP.
Monetary aggregates to GDP.	International debt bonds to GDP.
Total deposits to GDP.	Stock market capitalization to GDP.
Value added of the financial sector to GDP.	Traded stocks to GDP.
-	Number of listed companies.
Bank-Based Depth Indicators	Financial Market-Based Depth Indicators

Percentage of credit provided to the private sector to GDP.	Private debt bonds to GDP.
Financial assets to GDP.	Public debt bonds to GDP.
Monetary aggregates to GDP.	International debt bonds to GDP.
Total deposits to GDP.	Stock market capitalization to GDP.
Value added of the financial sector to GDP.	Traded stocks to GDP.
	Number of listed companies.
	Capitalization of the securities market plus local unpaid private debt bonds to GDP

Source:,(Dardour, 2022,P 195)

c. Theories of Financial Depth:

c.1.Keynesian Theory: John Maynard Keynes believes in the necessity of increasing the effective aggregate demand through government intervention in economic activity. This is achieved by increasing government spending in both consumption and investment groups. This means adopting an expansionary and revitalizing fiscal policy, which increases savings. Savings are considered a fundamental factor in the economic development process and are an indicator of financial depth in markets. Indicators of financial depth vary from one country to another, depending on the efficiency of their financial systems and financial regulation (Khudar Abtan Al-Sabaawi, 2022, P. 112).

c.2.Financial Repression Theory: This theory proposes that removing financial resources in the repressed economy contributes to increasing savings, enhancing credit supply, and promoting investment, thereby boosting economic growth and typical investments in developing economies. It appears that self-financing investments and investments can only occur if accumulated savings accumulate in the form of bank deposits (Binyan Al-Jubouri, 2019, P. 41).

2.3. Challenges Facing Financial Depth:

Through the concept of financial depth, which includes the ability of financial institutions to provide financial services with higher efficiency and lower costs, improve the level of financial intermediation, and diversify financial tools, significant benefits can be identified. However, many challenges and obstacles stand in the way of achieving these goals, including:

- Incomplete regulatory frameworks, low financial intermediation, and ineffective recording systems undermine the diversification of financial tools and reduce market liquidity. Also, they decrease the volume of financial intermediation, which impedes the enhancement of market depth and commercial activity and reduces GDP.
- A lack of innovative financial tools, especially those aimed at small and medium-sized enterprises, which constitute the majority of businesses, reduces the increase in GDP growth rates.

- A narrow capital market and the difficulty of converting financial assets into cash liquidity hinder long-term financing and perplex domestic debt financing.
- The existence of a banking sector where the impact of financial intermediation in expanding and increasing the market size decreases, due to very high interest rates.

3. Analysis of the Banking System in Algeria According to International Measurement Indicators:

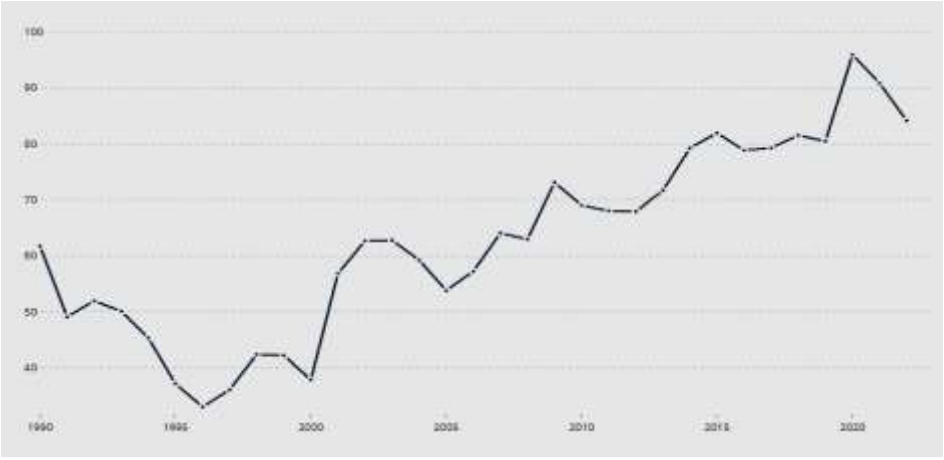
3.1. Access Usage Indicators:

a. Analysing financial depth through liquidity indicators:

The liquidity index is one of the traditional measures of financial depth and was first used in a study by King and Levine in 1993. This index is used to measure the degree of cash trading or otherwise to measure the total volume of the financial intermediation sector in the economy. It is calculated by comparing the liquid liabilities of banks and other financial intermediation institutions to GDP. (Ben Yahia, 2021, P. 227)

Looking at ***Monetization***, this rate represents the size of the formal financial sector compared to the economy's size and is considered an indicator of monetary and financial development within specific levels. For example, when this rate is significantly high, it indicates a significant increase in monetary activity and the cash financing of investments, meaning financial intermediation plays a significant role in achieving financial depth. (Ben Al-Rahman, 2021, P. 178) The attached figure illustrates the development of Algeria's economic liquidity during the financial liberalization phase.

Figure 01: Development of Liquidity Index (M_2/GDP) in Algeria



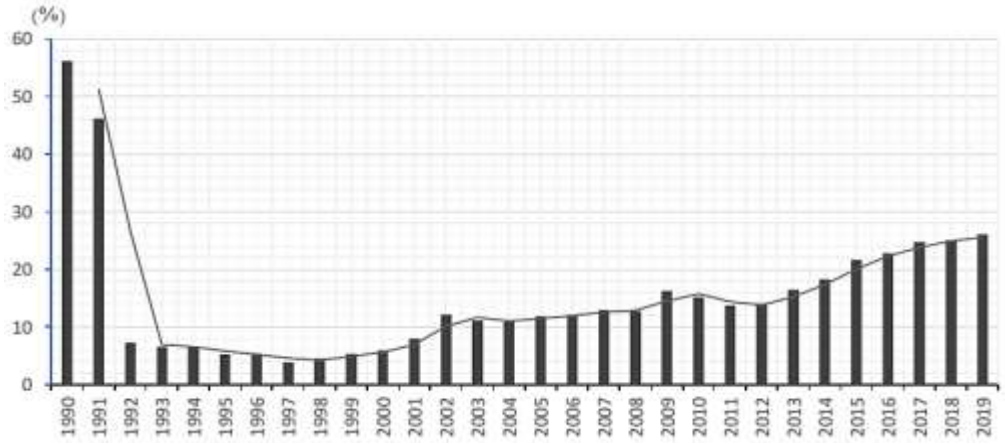
Source: Prepared by the researcher based on the World Bank database

b. Banking Depth Index (Bank Loans):

An index of the credit available to the private sector by banks and other financial institutions relative to GDP was used. This index reflects the primary function of the banking system, which is to collect savings and provide them through financing

means for production projects owned by the private sector. (Mujahid, 2016, P. 40). **Levine** points out that a banking system that provides loans to the private sector can be more efficient than a banking system where loans are primarily granted to public sector institutions. This requires collecting more information, better monitoring of management and guidance, as well as estimating and diversifying risks. Expanding in these functions necessarily reflects the significant role that banks and market brokers play in the economy. (Ben Al-Rahman, 2021, P. 180) vThe following chart illustrates the development of this indicator in Algeria as follows:

Figure 02: Development of the ratio of credit granted to the private sector to GDP in Algeria



Source: (Ben Yahia, 2021, P. 234)

The **figure 02** shows that public banks continued to provide direct financing to the public economic sector entirely in 2021, and their share in financing the private sector declined slightly to **74.81%** compared to 75.99% in 2020. Given the slowdown of bond markets in 2021, direct loans still play a significant role in financing the economy, accounting for approximately 98.30%, and fully covering private sector financing. In addition, direct loans included 100% financing for the public sector and approximately 96.08% for the public economic sector.

3.2. Financial Services Access Level Index:

a. Banking density ratio: Through this index, we can measure the extent of the bank network's expansion in a given country, meaning the availability of financial services to a large percentage of the population without bearing the cost of traveling to bank agencies. This index also reveals the banks' ability to absorb household savings. (Tarshi and Bouflih, 2016, P 46)

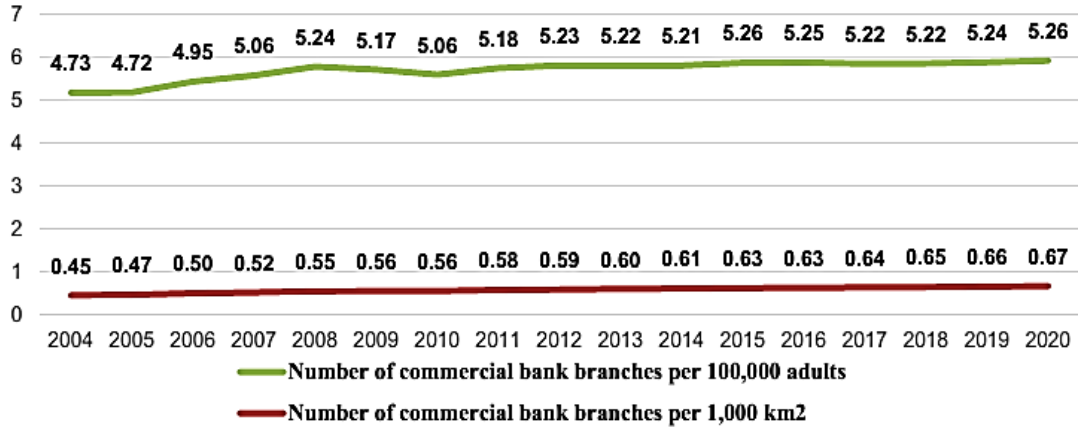
Table 02: Banking density in Algeria

Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of Windows	1324	1367	1441	1478	1499	1525	1556	1577	1595	1617	1642	1671
Population per Window	26,700	26,300	25,500	25,400	25,500	25,600	25,660	25,900	26,560	26,560	27,500	26,000
Number of Commercial Bank Branches per 1000km²	0.56	0.56	0.58	0.59	0.60	0.61	0.63	0.63	0.64	0.65	0.66	0.67

Source: Prepared by the researcher based on: (Annual Reports of the Bank of Algeria) and (Tarshi and Bouflih, 2016, P. 46)".

Table **02** shows that the total number of agencies in the banking system and financial institutions in Algeria for **2021** was **1700** agencies compared to **1671** agencies in **2020**. This means the presence of an additional agency for every **26,438** individuals in **2021** compared to **26,944** individuals in **2020**. The ratio of bank branch employees to the population witnessed a slight decline in 2021, with one bank window for every **7293** working-age individuals compared to **7247** individuals in **2020**. Banking density is measured using two indicators: the first is the number of commercial bank branches per **100,000** adults (demographic spread), and the second is the number of commercial bank branches per **1,000** km2 (geographic spread). The following figure illustrates the development of these two indicators in Algeria.

Figure 03: Number of branches of commercial banks per 100,000 adults and the number of branches of commercial banks per 1,000 km²

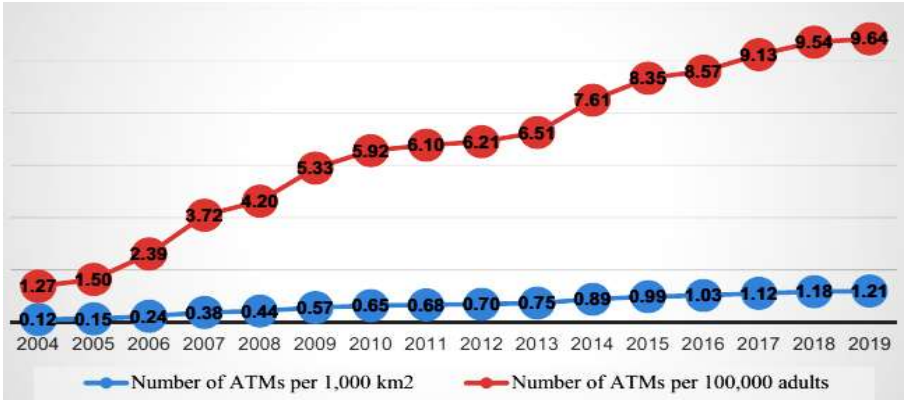


Source: (Bakhoush, 2022, P. 222)

b. ATM banking proliferation:

ATMs are internet-connected devices for banks that allow CIB cardholders to withdraw their money and check their account balances securely at any time. Additionally, these machines offer extra features like money transfers and mobile phone balance top-ups. ATM prevalence is also measured using two indicators: one expressing geographical distribution and another expressing demographic distribution, as illustrated in the following figure:

Figure 04: Number of ATM machines (ATMs) per 100,000 adults and the number of ATM machines (ATMs) per 10,000 km^2



Source: (Bakhoush, 2022,P. 225),

II.Practical Framework of the Study:

We will attempt to construct a measurement model expressing the relationship between financial depth and financial inclusion in Algeria based on the above information.

1. Model Construction:

To construct a measurement model for our study, we will use credit provided to the private sector to Gross Domestic Product (GDP) and the broad money supply to GDP as independent variables. The number of ATMs and bank branches will represent our dependent variables. To reduce heteroscedasticity, we will rely on the logarithmic form as follows:

$$DIST=b_0+b_1*CP+ b_2*M2+ \mu\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$AGEN=b_0+b_1*CP+ b_2*M2+ \mu\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where:

DIST: Number of ATMs (dependent variable);
AGEN: Bank branches (dependent variable);
CP: Credit provided to the private sector;
M_2: Broad money supply;
$b_{0\text{-}2}$: Represents the parameters of independent variables;
μ: A random variable representing the effects of factors outside the model.

2. Unit Quality Test:

The integration level of variables should be either I(0) or I(1). Table 03 shows the stability level and the integration degree of the time series studied based on the Phillips-Perron test. We found that all variables are integrated of the first degree.

Table 03: Stability test of time series (Phillips-Perron test)

UNIT ROOT TEST RESULTS TABLE (PP)
Null Hypothesis: the variable has a unit root

		DIST	AGEN	CP	M2
At Level					
With Constant	t-Statistic	-6.7943	-13.2770	-0.6114	0.0872
	Prob.	***0.0000*** ***	***0.0000*** ***	***0.8435*** n0	***0.9546*** n0
With Constant & Trend	t-Statistic	-4.1122	-4.6539	-2.2864	-3.9673
	Prob.	***0.0247*** **	***0.0093*** ***	***0.4183*** n0	***0.0319*** **
Without Constant & Trend	t-Statistic	4.5570	2.3389	1.8256	3.4639
	Prob.	***0.9999*** n0	***0.9924*** n0	***0.9786*** n0	***0.9993*** n0
At First Difference		d(DIST)	d(AGEN)	d(CP)	d(M2)
With Constant	t-Statistic	-3.0724	-1.6006	-4.0832	-6.6845
	Prob.	***0.0494*** **	***0.4594*** n0	***0.0073*** ***	***0.0001*** ***
With Constant & Trend	t-Statistic	-3.9226	-3.2141	-3.8281	-6.1605
	Prob.	***0.0363*** **	***0.1166*** n0	***0.0426*** **	***0.0008*** ***
Without Constant & Trend	t-Statistic	-1.6690	-1.2438	-3.2787	-4.5775
	Prob.	***0.0889*** *	***0.1870*** n0	***0.0028*** ***	***0.0002*** ***

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

This Result is The Out-Put of Program Has Developed By:

Dr. Imadeddin AlMosabbeh

College of Business and Economics

Qassim University-KSA

Source: Prepared by the researcher based on the outputs of the statistical program **Eviews 12**

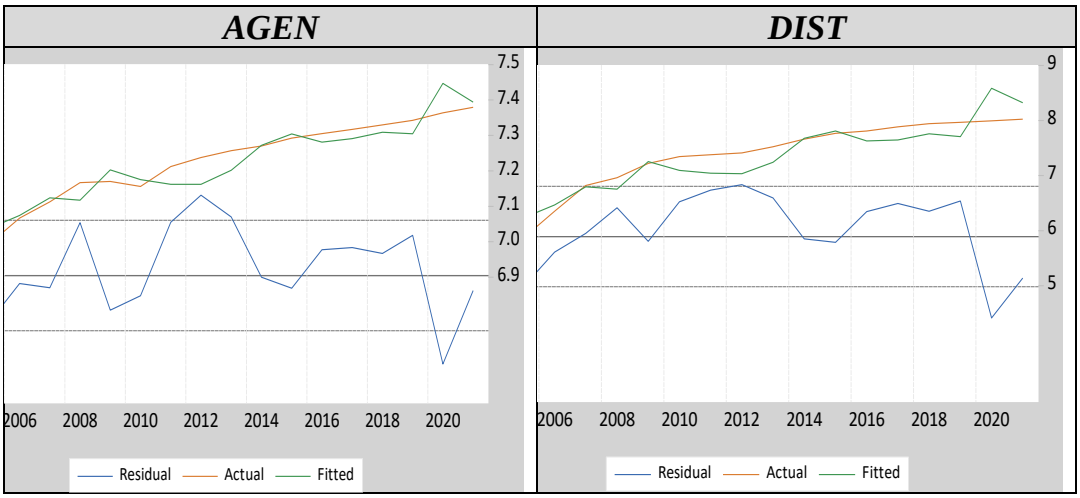
3. Model Quality Test:

Before adopting the model, its performance quality must be verified using the following tests:

3.1. Model Quality:

To study the quality of the two models, it is necessary to compare actual values with estimated ones through the following figure:

Figure 05: Actual and Estimated Values and Residuals (Model Quality)



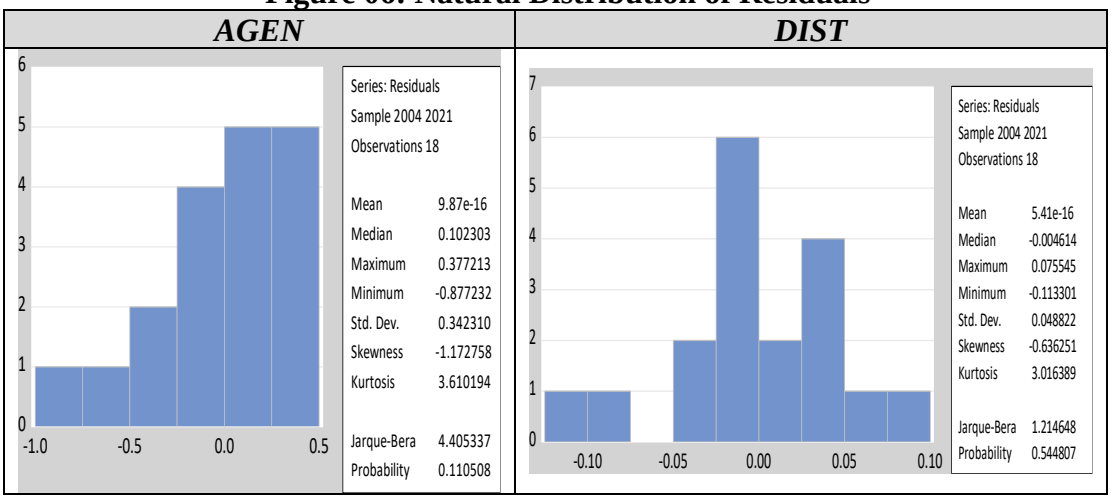
Source: Prepared by the researcher based on the outputs of the statistical program Eviews 12.

From Figure 05, we notice that the estimated values are close to the actual values, indicating the quality of both models (1 and 2). Therefore, they can be relied upon for interpretation and analysis of results.

3.2. Natural Distribution of Residuals:

To verify the condition of natural distribution, we use the JarqueBera test. The test result was found to be insignificant **α>0.05** supporting that residuals follow a normal distribution. Given the J-B value is less than χ^2**=5.99 in** both models **(1.21, 4.40)**, it confirms that the model residuals are normally distributed, as illustrated in the following figure:

Figure 06: Natural Distribution of Residuals



Source: Prepared by the researcher based on the outputs of the statistical program **Eviews 12.**

3.3. Autocorrelation Test for Errors :

To ensure the absence of autocorrelation, we refer to the autocorrelation test (Breusch-godfrey correlation LM test), as detailed in the following table:

Table 03: Results of the Autocorrelation Test for Errors

AGEN	*DIST*
Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags F-statistic 1.765057 Prob. F(2,13) 0.2098 Obs*R-squared 3.844018 Prob. Chi-Square(2) 0.1463 Test Equation: Dependent Variable: RESID Method: Least Squares Date: 09/07/23 Time: 13:23 Sample: 2004 2021 Included observations: 18 Presample missing value lagged residuals set to zero.	Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags F-statistic 0.596420 Prob. F(2,13) 0.5652 Obs*R-squared 1.512814 Prob. Chi-Square(2) 0.4693 Test Equation: Dependent Variable: RESID Method: Least Squares Date: 09/07/23 Time: 13:22 Sample: 2004 2021 Included observations: 18 Presample missing value lagged residuals set to zero.

Source: Prepared by the researcher based on the outputs of the statistical program **Eviews 12.**

According to the LM test, the Prob chi-square is greater than 0.05 in both models (1 and 2). Therefore, we accept the null hypothesis of no autocorrelation.

3.4. Variance Stability Test :

To detect variance stability, we use the test illustrated in the following table:

Table 04: "Variance Stability Test Results"

AGEN	*DIST*
Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity F-statistic 0.131464 Prob. F(2,15) Obs*R-squared 0.310079 Prob. Chi-Square(2) Scaled explained SS 0.281030 Prob. Chi-Square(2) Test Equation: Dependent Variable: RESID^2 Method: Least Squares Date: 09/07/23 Time: 13:28 Sample: 2004 2021 Included observations: 18	Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity F-statistic 0.338773 Prob. F(2,15) 0.7180 Obs*R-squared 0.777917 Prob. Chi-Square(2) 0.6778 Scaled explained SS 0.544647 Prob. Chi-Square(2) 0.7616 Test Equation: Dependent Variable: RESID^2 Method: Least Squares Date: 09/07/23 Time: 13:29 Sample: 2004 2021 Included observations: 18

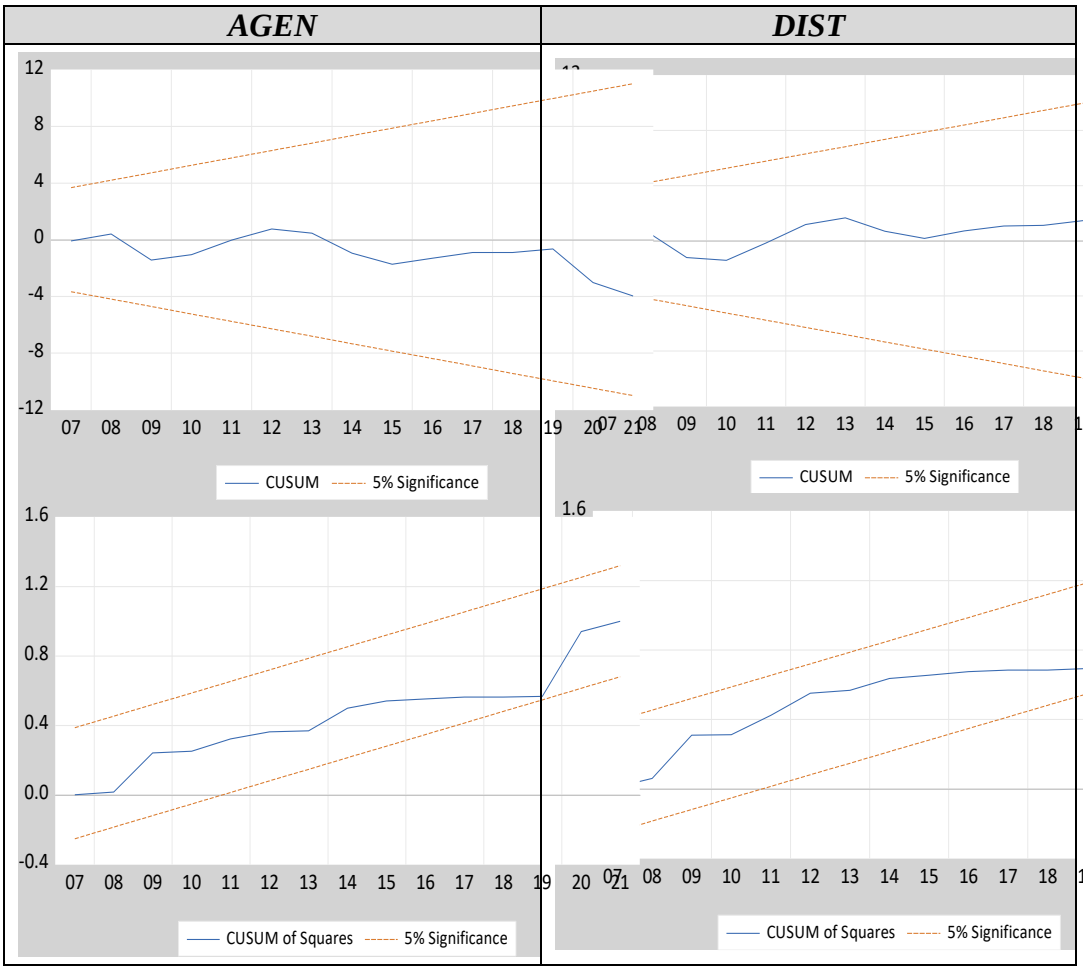
Source: Prepared by the researcher based on the outputs of the statistical program **Eviews 12.**

According to this test, the Prob F is greater than 0.05, which means that F is not significant in both models (1 and 2). Therefore, we accept the null hypothesis of variance stability over time.

3.5. Stability Test:

To ensure that the data used is free from any structural changes, we must use one of the tests illustrated in the following figure:

Figure 07: Model Stability Test Results



Source: Prepared by the researcher based on the outputs of the statistical program **Eviews 12.**

Since the graphical representation in both the CUSUM Test and the CUSUM of Squares Test is within the critical limits at the 0.05 level, we accept the stability of both models (1 and 2).

4. Statistical and Economic Estimation of the Model:

To estimate the parameters of the models (1 and 2), the least squares method was used. Relying on the Eviews 12 program, the model estimation results emerged as shown in the following table:

Table 05: Model Estimation Results

AGEN

Dependent Variable: AGEN
Method: Least Squares
Date: 09/07/23 Time: 12:41
Sample: 2004 2021
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CP	-0.418947	4.377178	-0.095712	0.9250
M2	5.745976	2.219763	2.588553	0.0206
C	3.188623	0.923648	3.452204	0.0036

R-squared	0.774707	Mean dependent var	7.311070
Adjusted R-squared	0.744668	S.D. dependent var	0.721183
S.E. of regression	0.364417	Akaike info criterion	0.969974
Sum squared resid	1.991992	Schwarz criterion	1.118369
Log likelihood	-5.729766	Hannan-Quinn criter.	0.990436
F-statistic	25.78995	Durbin-Watson stat	0.750780
Prob(F-statistic)	0.000014		

DIST

Dependent Variable: DIST
Method: Least Squares
Date: 09/07/23 Time: 12:37
Sample: 2004 2021
Included observations: 18

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CP	0.327522	0.624291	0.524631	0.6075
M2	0.833706	0.316592	2.633381	0.0188
C	6.550335	0.131734	49.72379	0.0000

R-squared	0.843656	Mean dependent var	7.218957
Adjusted R-squared	0.822810	S.D. dependent var	0.123473
S.E. of regression	0.051975	Akaike info criterion	-2.925113
Sum squared resid	0.040520	Schwarz criterion	-2.776718
Log likelihood	29.32602	Hannan-Quinn criter.	-2.904651
F-statistic	40.47108	Durbin-Watson stat	1.163407
Prob(F-statistic)	0.000001		

Source: Prepared by the researcher based on the outputs of the statistical program **Eviews 12.**

4.1. For the first model, DIST:

From the estimated model, we notice:

A positive and statistically insignificant impact of credit provided to the private sector on the number of ATMs. This means that even if the credit provided increases, it does not encourage an increase in the number of ATMs in Algeria. This could be due to several reasons, notably that commercial banks have not given significant importance to the deployment of these machines, especially in remote areas.

A positive and statistically significant effect of the broad money supply on the number of ATMs. For every 1% increase in the money supply, the number of ATMs increased by 0.83%. This is a weak ratio in terms of the impact on commercial banks' strategy to enhance and develop their digital services for customers. An increase in the money supply might push Algerian banks to increase the number of ATMs as part of their efforts to expand digital service.

4.2. For the second model, AGEA:

From the estimated model, we notice:

A positive and statistically insignificant impact of credit provided to the private sector on the number of bank branches. This means that even if the credit provided increases, it does not encourage an increase in the number of bank branches in Algeria. This could be due to several reasons, including the slow process of opening bank branches across the country. Additionally, setting up bank branches requires significant investments in real estate and equipment, as well as administrative costs. With technological advancements, banks and financial institutions are leaning towards digital banking and fintech

. A positive and statistically significant effect of the broad money supply on the number of bank branches. For every 1% increase in the money supply, the number of bank branches increased by 5.74%. This significant ratio confirms the strategic direction of commercial banks towards gathering resources hoarded outside the banking channels, restoring trust in the banking system, and promoting greater financial inclusion.

Conclusion:

Through this research paper, we tried to demonstrate the effect of financial depth, measured by the ratio of the broad money supply to Gross Domestic Product (GDP) and the credit provided to the private sector, on financial inclusion for the time period between [years are not mentioned in the provided text]. This applied study has arrived at several findings, the most important of which can be summarized in the following points:

A decline in innovation and technological advancement leads to the exclusion of some segments of society from accessing and benefiting from financial services.

There is a significant positive effect of financial depth on financial inclusion in Algeria.

Financial depth indicators in Algeria are primarily focused on the banking sector, a result of the weak financial market in Algeria.

The applied study results showed that the ratio of credit provided to the private sector to GDP is statistically insignificant, meaning it does not affect financial inclusion. However, the ratio of the money supply to GDP has affected financial inclusion indicators. A 1% increase in the money supply to GDP leads to a 5.74% increase in the number of bank branches and a 0.83% increase in the number of ATMs.

From the suggestions and recommendations that can be concluded at the end of this study, the following can be mentioned:

- There is a need to promote the use of ATMs and points of sale and to expand their scope, given their vital role in facilitating electronic banking transactions and making them available to as many members of the Algerian community as possible.
- Financial literacy should be promoted among all segments of society, especially those with limited and marginalized incomes.
- Efforts should be made to innovate and develop technological financial tools with the aim of enabling all segments of society to access and benefit from financial services to improve their living conditions.
- Greater emphasis should be placed on the credit provided, especially to the private sector, by increasing the number of commercial bank branches and increasing their capital.

Bibliographic References

- Ahmad, A. A., & Alnaimi, Z. A. (2022). The impact of financial depth in enhancing financial inclusion in some Arab countries, Tikrit Journal of Administrative and Economic Sciences, 18 (57), PP 380-400 .
- Al Obaidi, S. L. (2020). Ittijahat mu'ashirat al'umq almalii li'ina min alduwal al'arabia: Dirasat muqaranah , Postgraduate diploma thesis, University of Mosul, Iraq.
- Ali Hussein, S., & Al-Haydari, W. H. (2021). Dawr altamwil alraqmi fi tahsin wata'ziz alshumul almalii: Bahth tatbiqi fi aljihaz almasrafi al'iraqi. Journal of Accounting and Financial Studies, 16(57),PP 102-118.
- Ben Abdelrahman, A. S. (2021). Financial liberalization and economic growth in Algeria: An econometric study , Doctoral dissertation, University of Djilali Liabes.
- Ben Gida, M., & Bouafaya, R. (2018). Waqi' waafaq alshumul almalii fi alduwal al'arabiat , Journal of Economics and Human Development, 9 (1),PP 90-105 .
- Binyah Aljabouri, M. K. A. (2019). Dawr almasarif al'iislamiat fi ziyadat al'umq almalii: Dirasat tatbiqiat 'ala almasarif al'iislamiat al'urduniat (2010-2017). Master's thesis, Al al-Bayt University.
- Bouziane, W., Wafi, M., & Saied, I. (2023). Waqi' wattahdiyat alshumul almalii: Dirasat halat ba'd alduwal al'arabia]. Journal of Economic and Management Research, 4 (1), PP682-699.
- Bukhush, L. (2022). Athar tatwur alnizam almalii 'ala alnumuw alaiqtisadii fi aljazayir dirasat tahliliat waqiyasiat lilfatrat (1990-2020). Doctoral dissertation, University of Hadj Lakhdar Batna.
- Dardour, A. (2022). The impact of financial depth on the effectiveness of monetary policy in Algeria: An econometric study during the period 1990-2019,Journal of Research in Financial and Accounting Sciences, 7(1), PP 191-209.
- Izzam, A. M. (2017). Financial depth indicators for financial markets and their impact on economic growth, case study: Palestine Stock Exchange,Unpublished master's thesis. Al-Azhar University, Gaza.
- Sudani, N. (2022). Waqi' alshumul almalii fi alduwal al'arabia ma'a al'iisharat 'iilaa mubadarat alshumul almalii lilmintaqa al'arabia , Journal of Corporate Finance and Accounting, 2(2),PP 66-79.
- Tirchi, M., & Bouflih, N. (2016). A study of financial depth indicators in Algeria in light of monetary and financial reforms, Journal of Financial and Banking Studies.(3)
- Tirchi, M., Turku, M., & Bouflih, N. (2018). The impact of financial depth on economic growth in Algeria during the period (1995-2015), Les Cahiers du CREAD, 34(4),PP 109-137.