How to Cite:
Aoudia, K. (2025). Analytical essay of the level of financial inclusion in Algeria (2015-2023). *International Journal of Economic Perspectives*, *19*(5), 1755–1767. Retrieved from https://ijeponline.org/index.php/journal/article/view/991

Analytical essay of the level of financial inclusion in Algeria (2015-2023)

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***Abstract*---**This article aims to measure the financial inclusion in Algeria using a multidimensional index of financial inclusion (IFI), proposed by Samra Mandira, based on the indexes of the dimensions of financial inclusion. This index will be between 0 and 1, where 0 represents a situation of complete financial exclusion, and 1 indicates a situation of complete financial inclusion. The index will be very useful for knowing the level and degree of financial inclusion in Algeria and for comparing it over time and with other countries. In order to respond to the problem of our research which is: "**What is the level of financial inclusion in Algeria?",** we will rely on statistical data collected from data published by the Bank of Algeria, the International Monetary Fund and the World Bank, in particular the Global Index of 2021. After analyzing the various indexes of the dimensions of financial inclusion, we were able to calculate a multidimensional index of financial inclusion for Algeria for the period from 2015 to 2023. The results indicate that this index is around 0.5 during these years, which indicates an average financial inclusion in Algeria, but which remains insufficient. Thus, it is necessary to find solutions that would allow the promotion of financial inclusion in Algeria.

***Keywords*---**Financial inclusion, Algeria, multidimensional index, Index of Financial Inclusion, level of financial inclusion.
Jel classification: G21, G24.

Introduction

Financial inclusion is about enabling individuals and businesses to access a range of financial products and services that are useful and adapted to their needs at an affordable cost. By strengthening financial inclusion, several opportunities can be realized, because access to affordable financial services plays a vital role in poverty reduction, economic growth and resilience to crises as

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Submitted: 27 March 2025, Revised: 18 April 2025, Accepted: 04 May 2025

well as bringing immense economic and social benefits, hence the great attention from Central Banks as well as major international institutions on the issue of financial inclusion.

In Algeria, financial inclusion is one of the priorities of the Bank of Algeria. The Bank has launched several initiatives to strengthen the pillars of financial inclusion. Therefore, it is important to expand the national banking network, bring banks closer to citizens, and offer new services that meet their needs. It is also necessary to accelerate the pace of reforms and develop a national strategy for financial inclusion.

The research problem:
In this work we will try to answer the following main question:

"What is the level of financial inclusion in Algeria?"

Importance of the study:

The calculation of the multidimensional index of financial inclusion for Algeria is very important because it will allow us to know the level of current financial inclusion and it can be used to compare it with those of previous and future years and also compare it with the level of financial inclusion in other countries of the world.

Research objective:
Our objective in this article is to analyze the degree and level of financial inclusion in Algeria by calculating the financial inclusion index in Algeria.

Adopted Methodology
In order to address the research problem, the descriptive and analytical method was adopted to analyze a set of key financial inclusion indicators used by the Bank of Algeria and the World Bank.

The work plan:
We organized our work as follows:

1. Definition and dimensions of financial inclusion;
2. Importance and objectives of financial inclusion;
3. Methodology for calculating the financial inclusion index;
4. Calculation of the IFI for Algeria from 2015 to 2023.

1. Definition and dimensions of financial inclusion

1.1. Definition of financial inclusion

"Financial inclusion, by definition, concerns people who encounter such difficulties in accessing or using their banking practices that they cannot or no longer lead a normal social life: it aims to remedy banking exclusion."(Felix Zogning, 2017).

“Financial inclusion is also the provision of sound and affordable financial services to people who do not have bank accounts and to those who do not have access to the formal financial system.”(Felix Zogning, 2017)

According to the Bank of Algeria, financial inclusion means: "The availability and use of all financial services by different segments of society, including institutions and individuals, especially those who are marginalized, through official channels, including current and savings accounts, payment and transfer services, insurance services, financing and credit services, and innovations in more suitable financial services with competitive and reasonable prices. It also works to protect the rights of consumers of financial services by supporting them so that they can properly manage their funds and savings to prevent some consumers from resorting to informal channels and tools, not subject to any control by supervisory bodies and which charge relatively high prices, leading to the non-satisfaction of needs for financial and banking services through these channels. Financial inclusion is measured by the availability in terms of supply of financial services and their uses in terms of demand, as well as by the quality of these services."(Bank of Algeria)

According to the World Bank, financial inclusion is: "The ability of individuals and businesses to access a range of financial products and services that are affordable, useful, tailored to their needs, and offered by responsible and reliable providers." (The World Bank).

Based on the previous definitions, financial inclusion can be defined as: A situation in which basic financial services are guaranteed and made available to large segments of low-income and underserved groups, at an affordable cost, while enabling them to understand and access these services.

1.2. The dimensions of financial inclusion:

In order to measure the level of financial inclusion, we must choose indicators that represent the different dimensions of financial inclusion. In our research, we will use the dimensions proposed by Samra Mandira (2008, 2012) who conducted one of the first and most important research on the financial inclusion index. She used three dimensions to calculate the IFI, which are: banking penetration, availability of banking services and the use of banking products and services, and which she considered important for financial inclusion. These three dimensions are as follows:

1.2.1 Accessibility or Banking penetration (dimension 1):

An inclusive financial system should have as many users as possible. The proportion of people having a bank account is a measure of the banking penetration of the system. Thus, if every person in an economy has a bank account, then the value of this measure would be 1. We use number of deposit bank accounts per 1000 adult population as an indicator of this dimension (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012).

1.2.2. Availability of banking services (dimension 2):

The services of an inclusive financial system should be easily available to its users (Samra, Index of Financial Inclusion, 2008). We use the number of bank branches per 100.000 population and the number of ATM per 100.000 people to measure the availability dimension Two separate indexes will be calculated for bank branches and ATMs. Then, a weighted average of these two indexes, using 2/3rd weight for bank branch index and 1/3rd weight for ATM index is considered as the index for the availability dimension. (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012).

1.2.3. Usage (dimension 3):

Having a bank account is not enough for an inclusive financial system; it is also imperative that the banking services are adequately utilized. The utilization can be in many forms – for credit, deposit, payments, remittances, transfer etc. Despite having access to the formal financial services, some people are unable to use the financial services, due to various reasons. (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012). The appropriate indicators for this dimension would be the volume of credit and deposit to adult individuals as a proportion of GDP.

2. Importance and objectives of financial inclusion

Financial inclusion is very important and it has certain objectives. This importance and these objectives consist of the following:

- Financial inclusion creates competition between financial institutions, so they work on the quality of their products and their diversification to attract the greatest number of customers;
- Financial inclusion focuses on low-income populations and provides them with financial services in order to integrate them into the formal financial sector;
- Access to financial products and services makes everyday life easier and helps households and businesses plan for long-term goals or cope with unforeseen events. An individual with a current account will be more likely to use other financial services, such as credit or insurance, to start or expand a business, to invest in education or health, to manage risks and overcome financial shocks, all of which will improve their overall standard of living. (The World Bank);
- Access to financial services is considered a factor for progress on seven of the 17 Sustainable Development Goals (The World Bank).

3. The index of financial inclusion (IFI) calculation methodology

To calculate the financial inclusion index, we will refer to the one proposed by Samra Mandira in her various research projects. To construct this multidimensional index, she used the same method used by the United Nations Development Program (UNDP) to develop development indexes such as the HDI and HPI.

M. Samra notes that there has been an intensive debate about how financial inclusion should be measured. In consequence, she recommends using the Index of Financial Inclusion (IFI). "The IFI is multidimensional, it satisfies many important mathematical properties and can be used to compare levels of financial inclusion across economies and over time. But the availability of data is the biggest constraint on its usefulness". (Samra, Measuring financial inclusion using multidimensional data, 2016)

Samra defines IFI as: "The index of financial inclusion is a measure of inclusiveness of the financial sector of a country. It is constructed as a multidimensional index that captures information on various aspects of financial inclusion such as banking penetration, availability of banking services and usage of the banking system. The IFI incorporates information on these dimensions in one single number lying between 0 and 1, where 0 denotes complete financial exclusion and 1 indicates complete financial inclusion in an economy." (Mandira Samra, 2008)

As we have seen previously, the measurement of financial inclusion takes into account three dimensions: banking penetration, the availability of financial services and finally the use of these services. Thus, to be able to calculate the IFI, we must first calculate the index of each of these three dimensions of financial inclusion.

The dimension index d_i, is computed by the formula (1): (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012)

$$di = wi \frac{Ai - mi}{Mi - mi} \qquad (1)$$

This dimension index measures the country's achievement in the ith dimension of financial inclusion.

Where:

w_i represents the weight attached to the dimension i, w_i is between 0 and 1: $0 \le w_i \le 1$, it indicates the relative importance of the dimension i in quantifying the inclusiveness of a financial system;

A_i represents the actual value of dimension i;

m_i represents the lower limit on the value of dimension i, fixed by some pre-specified rule;

M_i represents the upper limit on the value of dimension i, fixed by some pre-specified rule.

We use this formula to compute each of the 3 dimensions index. This formula ensures that d_i varies between 0 and 1. The higher the value of d_i, the higher is the achievement in dimension i.

If we take in consideration n dimensions of financial, a country's will be represented by a point X = (d1 , d2 , d3 , ….,dn). In this n-dimensional space, the point O = (0, 0, 0,…,0) represents the point indicating the worst situation and the point W = (w1 , w2 ,…..wn) represents the best situation. So, to compute IFI, first we have to compute X1 (distance between X and O) and X2 (inverse distance between X and W) and then take a simple average of X1 and X2 to compute IFI, the final index (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012).

To compute X1 and X2 we use these formulae (2) and (3):

$$X1 = \frac{\sqrt{d1^2 + d2^2 + \cdots + dn^2}}{\sqrt{(w1^2 + w2^2 + \cdots + wn^2)}} \qquad (2)$$

And

$$X2 = 1 - \frac{\sqrt{(w1-d1)^2 + (w2-d2)^2 + \cdots + (wn-dn)^2}}{\sqrt{(w1^2 + w2^2 + \cdots + wn^2)}} \qquad (3)$$

And

$$IFI = \frac{1}{2}\,[X1 + X2] \qquad (4)$$

The IFI formula (4) is a simple average of X1 and X2, thus incorporating distances from both the worst point and the ideal point (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012).

The lack of adequate data on important indicators that characterize the availability and usage dimensions of financial inclusion renders us to give relatively less weight to these dimensions in this index. To compute the IFI, Samra has provided the following weights: 1 for the index of banking penetration, 0.5 for the index of availability and 0.5 for the index of usage. According to these given weights, we can represent a country K by a point (p_k , a_k , u_k) in the three dimensional space, such that $0 <= p_k <=1$, $0 <= a_k <=0.5$, $0 <=u_k <=0.5$, where p_k , a_k and u_k are the dimension indexes for country k computed using formula (1). In the three dimensional space, the point (0,0,0) will indicate the worst situation (complete financial exclusion) and the point (1,0.5,0.5) will indicate the best or ideal situation (complete financial inclusion) in the present context (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012).

The IFI_k for the country k is measured by this simple average:

$$IFI_k = \frac{1}{2}\left[\frac{\sqrt{pk^2 + ak^2 + uk^2}}{\sqrt{1{,}5}} + \left(1 - \frac{\sqrt{(1-pk)^2 + (0{,}5-ak)^2 + (0{,}5-uk)^2}}{\sqrt{(1{,}5)}}\right)\right] \qquad (5)$$

We can explain graphically the 3-dimensional IFI bye this figure:

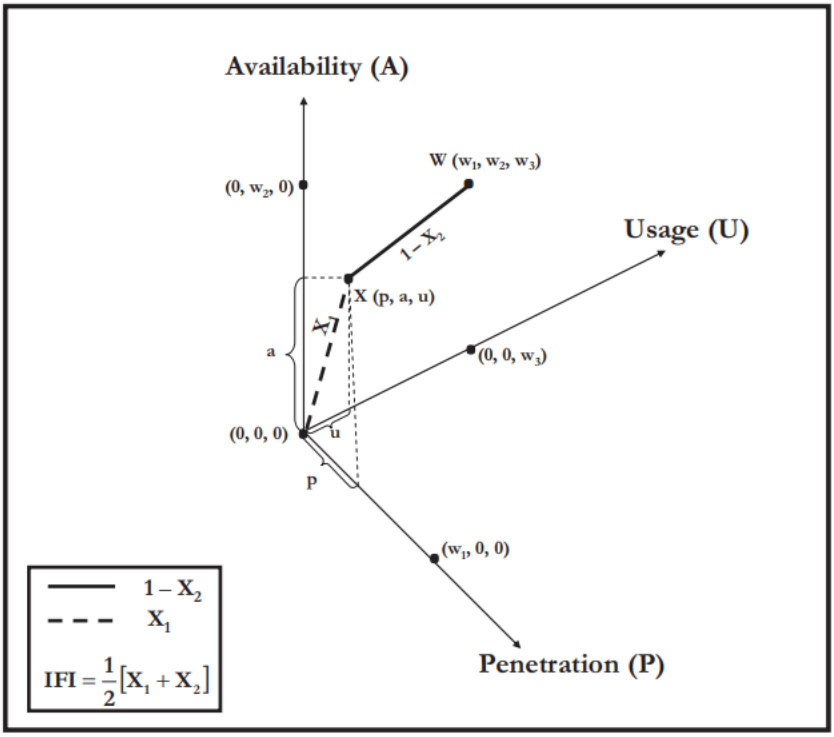

Figure 1: Graphical axplanation of a 3-dimensional IFI

Source: Sarma, M. (2012), «Index of Financial Inclusion: A Measure of Financial Sector Inclusiveness», Berlin Working Papers on Money, Trade, Finance and Development, N°. 07/2012; P 13. https://ideas.repec.org/p/mtf/wpaper/1207.html

In this Figure, each of the three dimensions of IFI is represented by an axis in the three-dimensional space. The point W= (w1,w2,w3) represents the ideal point and the point X=(p,a,u) represents a particular country's achievements in these dimensions. A country that has an inclusive financial system should be closer to the ideal point W than a country that is less financially included. (Samra, Index of Financial Inclusion – A measure of financial sector inclusiveness , 2012)

4. Computation of IFI for Algeria for the years 2015 – 2023

4.1. The financial inclusion ratios in Algeria from 2015 to 2023

The following table represents our data matrix from the financial inclusion reports published by the International Monetary Fund, the World Bank, and the Bank of Algeria, over a nine-year period (from 2015 to 2023). This data includes the various ratios required to calculate the indices of the three dimensions of financial inclusion, namely banking penetration, the availability of financial products, and finally their use. These last three dimensions represent the constructive partial indices of the financial inclusion index.

Table 1: The financial inclusion ratios in Algeria from 2015 to 2023

	2015	2016	2017	2018	2019	2020	2021	2022	2023
Number of deposit bank accounts per 1000 adult	563,58	579,52	524	520	559	506,25	506,04	520	541,3
Number of bank branches per 100.000 population	5,26	5,25	5,28	5,33	5,34	5,30	5,31	5,29	5,27
Number of ATM per 100.000 people	8,44	8,61	9,11	9,46	9,21	9,64	9,81	11,54	11,17
The volume of credit to adult individuals as a proportion of GDP.	43,53	45,15	47,03	48,77	47,02	53,5	38,93	31,58	32,83
The volume of deposit to adult individuals as a proportion of GDP.	49,87	46,48	48,78	49,45	47,93	55,12	53,03	49,56	50,02

Source: Different reports published by the International Monetary Fund, the World Bank and Bank of Algeria

4.2. Calculation of the indexes of the three dimensions of the financial inclusion

4.2.1. The penetration index

We will use this formula to compute the penetration index:

The penetration index = $\frac{Ai-mi}{Mi-mi}$

Table 2: The penetration index in Algeria from 2015 to 2023

Year / dimension	Penetration	Penetration index
2015	561 Max (M_i)	1
2016	545	0,708879184
2017	524	0,326783115
2018	520	0,254002911
2019	540	0,61790393
2020	506,25	0,00382096
2021	506,04 Min (m_i)	0
2022	520	0,254002911
2023	541,3	0,641557496

Source: Author's calculation

According to Table 2, we can clearly see that the number of accounts per 1000 adults in Algeria experienced a decline between 2015 and 2018, as it went from 561, the highest level of penetration over the study period with a penetration index equal to 1, to 520. Then it increased in 2019 where it was 540, then it decreased to 504 in 2020 and 2021, it recorded its lowest level in 2020 with 506 accounts per 1000 adults with a penetration index equal to 0 for this year, this can be explained by the consequences of the Covid19 crisis on banking penetration in Algeria. Then it increased to 520 in 2022 and 541 in 2023.

4.2.2. The availability index

To compute the availability index, we will calculate two separate indexes for bank branches and ATMs. Then, a weighted average of these two indexes, using 2/3rd weight for bank branch index and 1/3rd weight for ATM index is considered as the index for the availability dimension. To compute the IFI, Samra has provided the weight 0.5 for the index of availability, so we will use this formula:

The availability index = 0,5 $\left(\frac{\mathrm{Ai-mi}}{\mathrm{Mi-mi}}\right)$

Table 3: The availabitity index in Algeria from 2015 to 2023

Year / dimensions	Bank branches per 100.000 population	Index 1 (for bank branches)	number of ATM per 100.000 people	Index 2 (for ATM)	Availability index 0,5×(2/3Index 1+1/3Index2)
2015	5,26	0,1111111111	8,44 **Min (m_i)**	0	0,0370370370
2016	5,25 **Min (m_i)**	0	8,61	0,0548387097	0,009139784
2017	5,28	0,3333333333	9,11	0,2161290323	0,147132616
2018	5,33	0,8888888889	9,46	0,3290322581	0,351135006
2019	5,34 **Max (M_i)**	1	9,21	0,2483870968	0,374731182
2020	5,30	0,5555555556	9,64	0,3870967742	0,249701314
2021	5,31	0,6666666667	9,81	0,4419354839	0,295878136
2022	5,29	0,4444444444	11,54 **Max(M_i)**	1	0,314814814
2023	5,27	0,2222222222	11,17	0,8806451613	0,220848267

Source : Author's calculation

From the Table3, we note that the number of bank branches per 100,000 adults in Algeria has remained stable between 2015 and 2023 with 5 bank branches per 100,000 adults.

According to the same table, we note that the number of ATMs per 100,000 adults has seen an evolution in Algeria, during the period 2015-2023. Indeed, this indicator went from 8 ATMs per 100,000 adults in 2015, to 11 1TM per 100,000 adults in 2023. However, and despite this improvement recorded, Algeria still remains far behind, compared to the averages achieved in countries with high financial inclusion.

4.2.3. The usage index

To compute the usage index we will use this formula:

The usage index = 0,5 $\left(\frac{\mathrm{Ai-mi}}{\mathrm{Mi-mi}}\right)$

Table 4: The usage index in Algeria from 2015 to 2023

Year	The volume of credit to adult individuals as a proportion of GDP.	The volume of deposit to adult individuals as a proportion of GDP.	The volume of credit and deposit to adult individuals as a proportion of GDP.	The usage index
2015	43,53	49,87	93,4	0,223071324
2016	45,15	46,48	91,63	0,190866084
2017	47,03	48,78	95,81	0,266921397
2018	48,77	49,45	98,22	0,31077147
2019	47,02	47,93	94,95	0,251273653
2020	53,5	55,12	108,62 Max (M_i)	0,5
2021	38,93	53,03	91,96	0,196870451
2022	31,58	49,56	81,14 Min (m_i)	0
2023	32,83	50,02	82,85	0,031113537

Source : Author's calculation

According to the results presented in the Table4, we note that the volumes of deposits and loans of commercial banks in Algeria have increased between 2016 and 2020, than a drop went from 53.5 in 2020 to 32.83 in 2023 which can be explained by the drop in credits. These recorded volumes remain low compared to countries that record high financial inclusion indices.

4.3. The index of financial inclusion (IFI) in Algeria from 2015 to 2023

To compute the index of financial inclusion we use the formula (5) explained before where:

$$IFI_k = \frac{1}{2}\left[\frac{\sqrt{pk^2 + ak^2 + uk^2}}{\sqrt{1,5}} + \left(1 - \frac{\sqrt{(1-pk)^2 + (0,5-ak)^2 + (0,5-uk)^2}}{\sqrt{(1,5)}}\right)\right]$$

Table 5: The index of financial inclusion (IFI) in Algeria from 2015 to 2023

Year	Penetration index (p)	Availability index (a)	Usage index (u)	$X1=\frac{\sqrt{p^2+a^2+u^2}}{\sqrt{1,5}}$	X2= 1- $\frac{\sqrt{(1-p)^2+(0,5-a)^2+(0,}}{\sqrt{(1,5)}}$	IFI = $\frac{1}{2}$ [X1 + X2]
2015	1	0,037037037	0,223071324	0,837111124	0,440472622	0,638791931
2016	0,708879184	0,009139784	0,190866084	0,599457029	0,529942675	0,564699852
2017	0,326783115	0,147132616	0,266921397	0,512844548	0,649133781	0,580989164
2018	0,254002911	0,351135006	0,31077147	0,435424832	0,640041602	0,537733217
2019	0,61790393	0,374731182	0,251273653	0,624695751	0,386052222	0,505373986
2020	0,00382096	0,249701314	0,5	0,456337115	0,838658497	0,647497806
2021	0	0,295878136	0,196870451	0,290174482	0,86931132	0,579742901
2022	0,254002911	0,314814814	0	0,330278085	0,74869006	0,540084072
2023	0,641557496	0,220848267	0,031113537	0,554579738	0,533079877	0,543829807

Source : Author's calculation

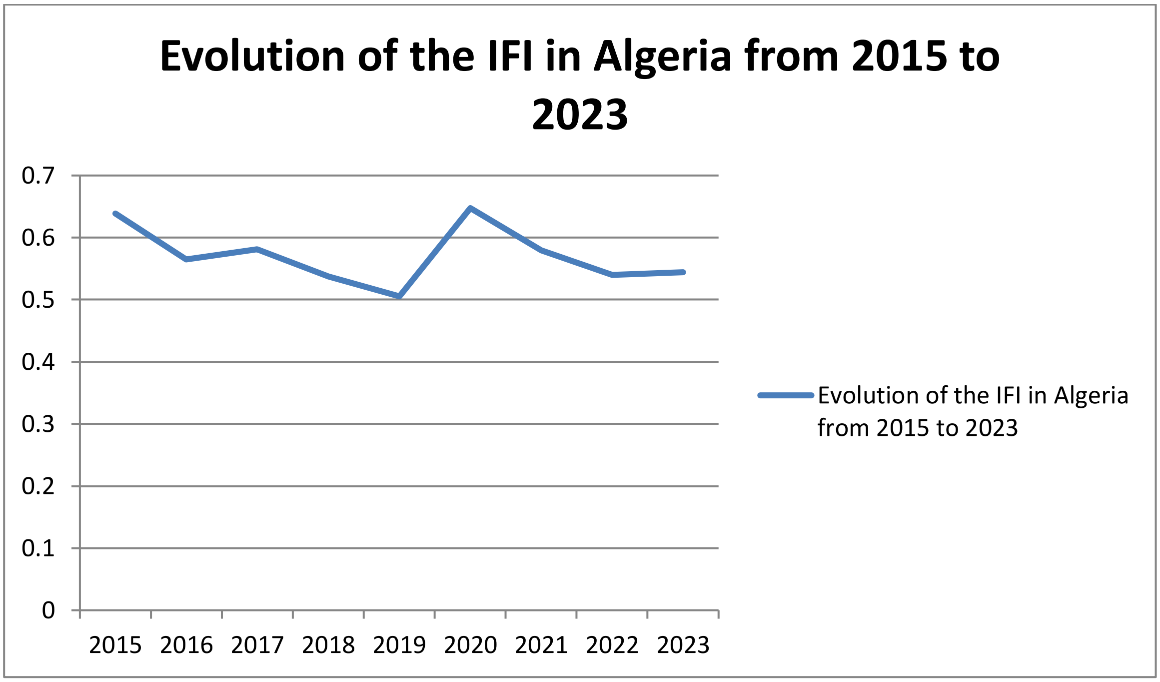

Figure 2: Graphic representation of the Index of Financial Inclusion in Algeria from 2015 to 2023
Source: Constituted according to the results of table 5

Interpretation of results:

In the definition given By Samra to the IFI, IFI is one single number lying between 0 and 1, where 0 denotes complete financial exclusion and 1 indicates complete financial inclusion in an economy. Thus, in order to give a clearer assessment of the results obtained, and to know the positioning of Algeria in terms of level of financial inclusion, we try to classify the periods into three categories according to their IFI values.(Abbes, 2021)

First Category "high financial inclusion": The IFI is between 0.6 and 1;

Second Category "medium financial inclusion": The IFI is between 0.3 and 0.6;

Third Category "Low Financial Inclusion": The IFI is less than 0.3.

According to the results obtained in the table5, we can clearly see that Algeria is in the second category, where the level of financial inclusion is considered average, for almost the entire period from 2015 to 2023. It can also be noted that the IFI decreased between 2020 and 2022. It went from **0.64** in 2020 where the usage index was at its highest level, at **0.57** in 2021 and **0.54** in 2022. This can be explained by the consequences of the Covid19 crisis on financial inclusion in Algeria. Because this led to a remarkable decline in the indices of the three dimensions of financial inclusion. According to the table, we can clearly see that the penetration index is at its lowest level in 2021, and the usage index is at its lowest level in 2022.

Conclusion

Financial inclusion is essential for economic development and the reduction of poverty and social exclusion. Thus, access to and use of financial services is particularly important for the most vulnerable groups in society, namely medium-sized and small businesses, youth, and women.

In this article, we tried to measure financial inclusion in Algeria, for the period from 2015 to 2023, by calculating a multidimensional index of financial inclusion. To do this, we referred to the work of Samra Mandira, and we used the formulas proposed by the latter for the calculation of the indices of the three dimensions of financial inclusion which are the penetration index, the availability index and the usage index, to then arrive at the calculation of the financial inclusion index which takes them into consideration. Generally, throughout this study period, this index is between 0.50 and 0.64, which represents an average degree of financial inclusion in Algeria. In order to promote financial inclusion we can propose the following recommendations:

Recommandations:

- Strengthen financial infrastructure and facilitate the expansion of the network of financial services agencies to facilitate citizens' access to financial services;
- Establish an appropriate legislative and regulatory framework to support the financial inclusion process by aiming to facilitate banking transactions and ensure users' access to financial services;
- Strengthening the legal and regulatory framework that governs the protection of consumers of financial services, because given the growth and development of the financial sector and the complexity of financial products and services offered to customers as well as the evolution of electronic financial instruments and the expansion of these services, the concept of financial protection of consumers has been the focus of interest in recent times;
- Develop national payment and settlement systems to facilitate financial transactions and their settlement;
- Design strategies promoting the substitution of electronic payments for cash;
- Diversify the financial services offered to individuals by innovating new savings, insurance, loan and payment products and developing services that meet their needs. Customer requirements and needs should be targeted before putting financial services and products on the market;
- Promote competition between providers of financial products and services, which would improve competitiveness between financial institutions and thus maintain a high level of quality of services;
- Create an environment that allows for the exploitation of opportunities related to "fintech" and new technologies by expanding the offer of digital financial services as well as payment by technological means in order to facilitate access to financial services at the lowest cost and with greater efficiency;

- Provide necessary information to customers regarding the benefits and risks associated with financial services and inform customers of any changes in products and services;
- Design national financial education strategies and raise awareness of financial products and services, which would improve citizens' financial knowledge;
- Subject informal channels to control and work towards their entry into legality;
- Develop Islamic finance which can constitute another source of financing for the economic sector.

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