



Macro Dimensions of Financial Inclusion Index and its Status in Developing Countries

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Abstract

Promoting financial inclusion is the priority of every country's policymaker and financial experts. So that, every individual as well as business can get equal and affordable financial services. Because financial inclusion deals with providing affordable as well as equal access to financial products and services to the masses of the country, especially to the financially deprived entrepreneur as well as businesses. The importance of financial inclusion is widely recognized but the literature lacks the efficient, comprehensive, and updated measurement of financial inclusion which can be used to judge the accurate level of financial inclusion. This study tries to fulfill this gap by constructing an updated and comprehensive index of financial inclusion for developing countries by using the updated data from 2005 to 2020. This updated data is collected from the world bank, the central banks of every country, and the finance divisions of every country. Furthermore, this study constructs a macro-level multidimensional index of financial inclusion by using socio-economic and financial dimensions. The value of the constructed index lies between 0 to 1. This study divides the score of financial inclusion into three categories 0 to 0.30 for low financial inclusion, 0.31 to 0.50 for medium financial inclusion, and 0.51 to 1 for high financial inclusion. The present index reveals that all developing countries have a medium and lower level of financial inclusion. Estonia is the only country that achieve higher financial inclusion in 2009-10. This proposed index gives the updated measurement of financial inclusion which is easy to compare among economies.

Keywords: Financial Inclusion, Macro Dimension, Socio-Economic, Financial inclusion index

1. Introduction

Financial inclusion is a widely discussed concept among researchers, financial experts, and policymakers (Beck et al., 2007). It gains special attention during the period of financial crises of 2007-08 when the people face severe financial disasters. In a period of financial crisis financial inclusion plays a major role in recovering the economy (Chibba, 2009; Shah & Ali, 2022). The pandemic situation of COVID-19 also highlights the problems faced by the masses in countries having a low level of financial inclusion, because when people remain out of the financial system, they face hurdles in managing their financial needs. A recent report from the world bank also reveals that almost 50% adult population is still out of the formal financial system (Kunt et al., 2021). They are not using any financial products and services. Providing easy and affordable access to financial services to financially deprived businesses and individual is the ultimate objective of financial inclusion. It further provides the ease in availability, access, and usage of formal financial products and services for the masses of the country. It is also considered very helpful in reducing the cost of capital by allocating the available productive resources efficiently (Sarma & Pias, 2011). An inclusive financial system is very helpful in managing finance in day-to-day activities by providing easy and affordable access to appropriate financial products and services to businesses. It also provides help to control informal sources of credit from various money lenders. Furthermore, it provides safe saving practices for the masses of the country, which promote the welfare and efficiency of businesses and individuals in the economy (Sarma, 2008). An inclusive financial system also provides support to investment in every sector of the economy which directly enhances economic growth as well as raises capital formation. It is observed that a well-developed financial system does not mean a higher level of financial inclusion because some segments of the population are still outside the formal financial system (Sarma, 2012).

1.1. Contribution of Study

It is observed that many indicators have been used for financial inclusion in existing studies. The number of bank accounts, number of ATMs, bank deposits, bank credits, and the number of bank branches are the most commonly used indicators in previous studies. In previous studies, many researchers Sarma (2008), Sarma (2012), Chakravarty & Pal (2010), Kunt & Klapper (2013), and Amidzie et al., (2014) constructed index by using various dimensions of financial inclusion. Existing studies have used the UNDP methodology of index construction. All the existing indices have some issues related to methodology and indicators. As analyzed in every existing study the index was constructed by using selected dimensions. For example, Sarma (2008) just used three dimensions of financial inclusion only for 55 countries around the world. Furthermore, Sarma has used just one indicator from every dimension like he uses the number of bank accounts as a percentage of the total population as the indicator of the penetration dimension. The number of ATMs per 1000 people is used as the indicator of availability dimensions later in 2012 author used the number of bank branches per 1000 adults as the availability dimension. The author uses total deposit and total credit as a percentage of GDP as an indicator of usage dimensions. Sarma has followed the UNDP methodology of index construction which is the simple average of sub-dimensions that does not give an appropriate measurement. Furthermore, the author has given different weights to each dimension which creates biases in the results. Chavan et al., (2009) added an outreach dimension to the existing financial inclusion index of Sarma (2008). In (2014) Camara & Tuesta construct the index of financial inclusion by adding some more indicators of the demand and supply side which were previously ignored by Sarma (2008, 2012). The author also used two stage principles component analysis

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(PCA) method to construct the index of financial inclusion so that the issue of assigning weight to each dimension can be solved. This study uses the data of selected 47 countries for the year 2011. This study extends the scope of financial inclusion by using demand and supply side indicators with the help of two-stage principles component analysis (PCA). For the efficient measurement of financial inclusion, various indicator has been taken under consideration from many dimensions (Variables within dimensions) by authors. As per the literature, various financial surveys are also used for financial inclusion (Allen et al., 2012; Kunt & Klapper, 2013; Chikalipah, 2017). Authors used various additional indicators as well as dimensions of financial inclusion i.e., barriers, documentation for borrowers, residential areas, age, education, financial knowledge, unemployment, and income. Ngo (2019) presented the latest index by using five indicators of financial inclusion by using accessibility and usage dimensions only. The author extended the methodology of Sarma (2008: 2012) by adding the inverse Euclidean distance and equal weight to each indicator because each indicator, as well as dimension, is most important to promote financial inclusion. All the existing studies highlight financial inclusion only by using a single indicator from each dimension. Camara & Tuesta (2014) suggest that some socioeconomic factors are necessary to promote financial inclusion i.e., Gross Domestic product per capita, unemployment, infrastructure, and urban population. There is hardly any study in the existing literature that added a socio-economic dimension for measuring financial inclusion.

This study has several contributions to the existing literature in many ways. Firstly, this study is constructing the financial inclusion index by using macro-level variables. Secondly, this study divided the financial inclusion indicators into two macro dimensions socioeconomic dimension and financial dimension. All the existing dimensions, as well as indicators, are included in the present index. For the construction of an index for financial inclusion, this study is following the methodology of Ngo (2019) by adding more indicators in every dimension. Thirdly, this study is constructing an index of 16 years of data from 2005 to 2020 for 87 developing countries (Including Upper middle Income and Lower Middle Income) separately which is previously ignored. Lastly, Sarma (2008; 2012; 2016), Arrora (2009), Kumar et al., (2009), Kunt & Klapper (2013), Camara & Tuesta (2014) Amidzie et al., (2014), Park & Mercado (2018), Ngo (2019) has been constructed index by using the data of the single year 2004 to 2011. But this study is using latest data set for every indicator across the 87 developing countries. This study is constructing a comprehensive as well as the updated index of financial inclusion which include many indicators of each dimension. This multidimensional macro index gives efficient and appropriate measurement for financial inclusion.

1.2. Socio-economic Dimension

The socio-economic dimension of financial inclusion includes the indicators of social elements and economic elements. Social elements include urban population and financial education, economic elements include economic stability and unemployment (Detail is given in table 2).

1.3. Financial Dimension

The financial dimension of financial inclusion includes all the existing three commonly used dimensions i.e., accessibility, availability, and usage. All these three dimensions are measured by a single indicator in existing studies but this study is using multiple indicators for each dimension for the measurement. Furthermore, this study is adding two more macro elements of financial dimension remittances and insurance for efficient measurement of financial inclusion which, are previously ignored by many researchers (Detail of variables is given in table 2).

This paper consists of various sections: section 1 presents the definitions of financial inclusion section 2 presents the index of financial inclusion section 3 research methodology section 4 index computation section 5 provides the conclusion of this paper.

2. Definition of Financial Inclusion

Financial inclusion is defined in various ways by different researchers in the existing literature. Back in 1995-1996 Leyshon & Thrift defined financial inclusion as the process which allow financially deprived individuals and businesses to use formal financial products and services to manage their finance. Financial inclusion is easy and affordable access to necessary financial products and services in the appropriate form (Sinclair, 2001; Pollin & Riva, 2002). Midgley (2005) defines financial inclusion as an increase in the availability of fundamental bank accounts by the financial institution. Financial inclusion is also defined by the Indian committee as the process which commits the availability and access of financial products and services to financially deprived individuals and businesses timely and efficiently as the financial need arises to them (Rangarajan committee, 2008). All the previous researches mainly focus on access to financial inclusion or availability of the financial system. Empirical studies cannot define financial inclusion properly. They mostly focus on the opposite term financial exclusion rather than financial inclusion, which is a process of preventing a specific social group and individuals from attaining access to the financial system. The first relevant indicator of financial inclusion is derived in the early twentieth century. While in recent research financial inclusion is explained in broader terms only access to finance is the only dimension of financial inclusion. There are some other dimensions of financial inclusion i.e., availability, usage, and barriers are explored by various researchers. Sarma (2008) added usage dimensions in financial inclusion by using the volume of credit and deposits as a percentage of GDP. Loans and borrowings are also used for usage dimension by various authors (Park & Mercado, 2018; Camara & Tuesta, 2014; Amidzic et al., 2014; Chakravarty & Pal, 2010). These three dimensions are not sufficient to ensure a fully inclusive financial system, there are some other factors or dimensions that are also suggested by various studies (Camara & Tuesta, 2014). The author suggests that there are some other socio-economic factors of financial inclusion. Ngo (2019) also suggests some socio-economic indicators of financial inclusion i.e.,

unemployment, GDP per capita, and population. A new perceptiveness of financial inclusion is getting the attention of researchers and policymakers.

3. Financial Inclusion Index

Measurement of financial inclusion is an old but growing topic among policymakers, researchers, government, and financial experts. Literature on the measurement of financial inclusion is growing day by day. This topic is still under consideration because there is a lack of consistent methods for the measurement or evaluation of the level of financial inclusion in countries. This comprehensive measurement is said the index of financial inclusion, consisting of various dimensions or indicators of financial inclusion, first constructed (Sarma, 2008). Sarma constructs a multidimensional index by using various variables which are previously used individually as a proxy for financial inclusion (Kempson et al., 2004; Beck et al., 2007). Sarma has divided these variables of financial inclusion into three basic dimensions i.e., availability, accessibility, and usage of banking services by following the UNDP methodology. Sarma has used a mathematical approach aligned with the UNDP method of constructing HDI, HPI, and GDI index, which is consisting of two steps in the first level of each indicator is computed as a sub-index while in the second step, a composite index is developed by aggregation of these indexes through the normalized inverse of Euclidean distance method. This index used only three dimensions and a single proxy for each direction with unequal weight i.e., 1 for access, 0.5 for availability, and 0.5 for usage. This method of assigning weight is mathematically biased as per various authors. Kumar et al., (2009) computed the financial inclusion index for outreach banking by using the distance from average method with the same dimension used by Sarma, (2008). In this research supply-side composite indexes and demand-side, composite indexes are constructed. Arora (2010) criticizes the existing index and includes the dimensions of outreach with 2 variables, ease of transaction with 12 variables, and 6 variables of cost included in the existing index of financial inclusion. Chakravarty & Pal (2010) and Sarma (2012) constructed an index of financial inclusion by adding more indicators in each dimension by using the UNDP methodology of index construction. Amidzic et al., (2014) construct an index of financial inclusion by using factor analysis consisting of five steps. In this study, two dimensions of financial inclusion are used: outreach and the use of financial products and services. In the first step, the researcher select the proxy variables and normalized these variables to remove the effect of the difference in scales. In the second step by using appropriate factors divides the indicators into suitable dimensions. In the third step, weight is assigned to the dimensions based on the importance of indicators. In the fourth step, the researcher constructs two dimensions and in the final step, aggregates to construct an index of financial inclusion with the help of geometric mean instead of arithmetic mean. Camara & Tuesta (2014) construct an index using a different technique of index construction. The author uses principal component analysis (PCA) for index formulation. This study added third-dimension barriers to the index (access, usage, and barriers). In this study, multiple variables are used as explained variables for the construction of the financial inclusion index. This study uses the equation method (and used these variables as causal variables) rather than the weighted average method of UNDP. This study uses PCA to estimate the dependent variable and assigned the weight to each indicator or dimension using PCA, which excludes the subjectivity arising from the author's judgment.

Numerous indicators are used for the construction of an index of financial inclusion. Table 1 shows all the variables used by previous researchers to construct the index of financial inclusion.

Table 1: Variables for Financial Inclusion

Authors & Year	Indicators
Kempson et al., 2004 Beck et al., 2007	<ul style="list-style-type: none"> - Bank accounts (Percentage of the total population) - Number of bank branches - Number of bank branches per 1,000 km² - Number of bank branches per 100,000 people - Number of bank ATMs per 1,000 KM² - Number of bank ATMs per 100,000 people - Number of loans per 1,000 people - The average size of the loan to GDP per capita - Number of deposits per 1,000 people - The average size of deposits to GDP per capita
Sarma, (2008)	<ul style="list-style-type: none"> - Bank accounts (percentage of the total population) - Number of bank branches per 1,000people - The volume of credit and deposit percentage of GDP - Number of bank branches per 1,000 km²
Chakravarty & Pal, (2010)	<ul style="list-style-type: none"> - Number of bank branches per 100,000 people - Number of bank ATMs per 1,000 km² - Number of ATMs per 100,000 people - Number of loans per 1,000 people - The average size of loan percentage of GDP per capita - Number of deposits per 1,000 people - The average size of deposits percentage of GDP

Arora, (2010)	<ul style="list-style-type: none"> - Number of bank branches per 1,000km² - Number of bank branches per 100,000 people - Number of ATMs per 1,000km² - Number of ATMs per 100,000 people - Location to open deposit accounts - Minimum amount to the open checking account - Minimum amount to open saving account - Minimum amount to maintain checking account - Minimum amount to maintain saving account - Number of documents to open checking account - Number of documents to open a saving account - Location to submit a loan application - The minimum amount of consumer loan - The minimum amount of mortgage account - Days to process consumer loan application - Days to process mortgage loan application - The fee to consumer loan percentage of the minimum loan amount - The fee to mortgage loan percentage of the minimum loan amount - The annual fee for a checking account - The annual fee for the saving account - Cost to transfer funds internationally - The amount for using ATMs
Sarma, (2012)	<ul style="list-style-type: none"> - Deposit accounts per 1,000 adults - Number of deposits, bank branches and ATMs per 100,000 people - Total deposits and credits percentage of GDP
Amidzic et al., (2014)	<ul style="list-style-type: none"> - Number of ATMs per 1,000km² - Number of branches ODCs per 1,000km² - Number of household depositors with ODC per 1,000 people - Number of household borrowers with ODC per 1,000 people - Number of people using at least one formal financial service
Camara & Tuesta, (2014)	<ul style="list-style-type: none"> - Distance, lack of necessary documentation, affordability and lack of trust - Number of ATMs per 100,000 people - Number of bank branches per 100,000 people - Number of ATMs per 1,000km² - Number of commercial bank branches per 1,000km²
Park and Mercado, (2015)	<ul style="list-style-type: none"> - Number of ATMs per 100,000 people - Number of bank branches per 100,000 people - Borrowers from commercial banks per 1,000 people - Depositor with commercial banks per 1,000 people - Domestic credit to GDP ratio
Sarma, (2016)	<ul style="list-style-type: none"> - Deposit account per 1,000 people from all financial institutes - Registered mobile money accounts per 1,000 people - Number of bank branches per 100,000 people - Number of ATMs per 100,000 people
Park & mercado, (2018)	<ul style="list-style-type: none"> - Deposits mobilized from the private sector percentage of GDP - Number of bank accounts holder percentage of the total population - Number of populations with credit card and debit card - Number of ATMs per 100,000 people - Number of people who borrow and save percentage of the total population
Ngo, (2019)	<ul style="list-style-type: none"> - Domestic credit percentage of GDP - Number of ATMs per 100,000 people - Number of bank branches per 100,000 people - Domestic credit provides by the financial sector percentage of GDP - Number of depositors with commercial banks per 1,000 people - Deposit in financial sector percentage of GDP.

4. Research Methodology

4.1. Data

In this study secondary data is used to measure financial inclusion, which we collected from the world development indicator (WDI), the Global financial database (GFD), the International monetary fund (IMF) and the ministry of

finance, and the national economic survey of every country. This study uses data from 2005 to 2020 for 87 developing countries. Countries are selected based on data availability.

4.2. Financial Inclusion Index

This study calculates the index of financial inclusion by using the method proposed by Sarma (2012), Sarma (2016), and Ngo (2019). While to reduce the biases this study uses equal weight to each variable as well as to each dimension of financial inclusion because each dimension is equally important. The calculation of subindices is given below in equation 1.

$$d_i = \frac{A_i - m_i}{M_i - m_i} \quad (1)$$

d_i : level of indicators

A_i : Actual value of variable of country i

m_i : Minimum value of the variable of country i

M_i : maximum value of variable of country i

This study has used various indicators of each dimension of financial inclusion based on the literature review. This study added a dimension of socio-economic financial inclusion which is previously ignored. Furthermore, this study summarises the existing dimension of availability, access, and use under one macro dimension of financial indicators of financial inclusion. The present study constructs an index of financial inclusion by developing two macro dimensions of financial inclusion which include all sub-dimensions as well as the variables shown in figure 1.

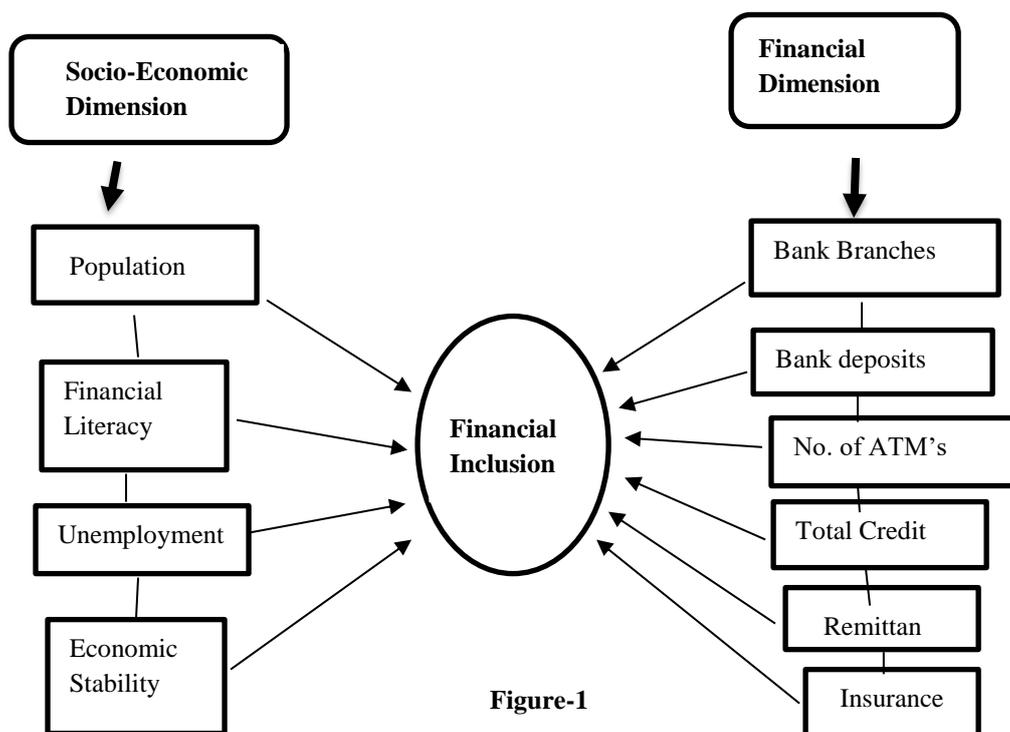


Figure-1

Table 2: Variables used for the Index of Financial Inclusion

Variables	Dimension	Measurement
Urban population	Socio-economic	Percentage of the total population
Financial Literacy	Socio-economic	Borrowers from commercial banks (per 1,000 adults) Depositors with commercial banks (per 1,000 adults)
Unemployment	Socio-economic	Unemployment rate
Economic Stability	Socio-economic	GDP per capita, current U.S. dollars
Bank Deposit	Financial	Financial system deposits, percent of GDP
Bank Branches	Financial	Bank branches per 100,000 people
Insurance	Financial	Insurance and financial services (% of commercial service exports)
No. of ATMs	Financial	ATMs per 100,000 adults
Total Credit	Financial	Bank credit as a percent of bank deposits
Remittances	Financial	Remittances as percent of GDP

In this study the value of d_i indicate the achieved level of a country's indicator i . Ten indicators are contributing to the level of financial inclusion used by this study. So, a country's financial inclusion index is shown at point X= ($d_1, d_2, d_3, d_4, d_5, d_6, d_7, d_8, d_9, d_{10}$) in ten dimensions space. The source of these ten dimensional organized systems is the point O= (0, 0, 0, 0, 0, 0, 0, 0, 0, 0), which reveals the worst condition, whereas, the point I= (1, 1, 1, 1, 1, 1, 1, 1, 1, 1) shows the ideal condition if a country performs the better amongst the sample in dimensions.

Table 3

List of Countries				
Albania	El Salvador	Lebanon	Romania	Costa Rica
Algeria	Equatorial Guinea	Lesotho	Saint Lucia	Djibouti
Angola	Estonia	Libya	Samoa	Dominican Republic
Argentina	Fiji	Malaysia	Sao Tome & Principe	Egypt
Armenia	Gabon	Maldives	Senegal	Kenya
Azerbaijan	Georgia	Mauritania	Solomon Islands	Kyrgyzstan
Bangladesh	Ghana	Mauritius	Suriname	Laos
Belarus	Grenada	Mexico	Tajikistan	Papua New Guinea
Belize	Guatemala	Micronesia	Tanzania	Paraguay
Benin	Guyana	Moldova	Thailand	Peru
Bolivia	Haiti	Mongolia	Tonga	Philippines
Bosnia & Herzegovina	Honduras	Montenegro	Tunisia	Ecuador
Botswana	India	Morocco	Turkey	Ukraine
Brazil	Indonesia	Namibia	North Macedonia	Uzbekistan
Bulgaria	Iran	Nicaragua	Pakistan	Vanuatu
Cameroon	Iraq	Nigeria	Panama	Zambia
China	Jamaica	Comoros	Kazakhstan	Zimbabwe
Colombia	Jordan			

Sources: Listed of the World Bank (2022)

The study of Sarma (2012) and Ngo (2019) examines the financial inclusion index by measuring the distance between X and O as well as the distance between X and I. An X indicates the high value of the financial inclusion index due to the presence of a large distance from O and a small distance from I. While in the presence of more than two dimensions the same distance of two dimension's points from O and minimum distance from I shows a higher level of financial inclusion. That's why to use both distances for investigating the level of financial inclusion, the Present study is following the methodology of Sarma (2012) and Ngo (2019) to use the average of simple Euclidean distance among the X and O as well as inverse Euclidean distance of X and I. In the first step, this study examines the distance between X and O (Denoted by X_1) by applying the normalized Euclidean distance method shown in equation 2. This method of normalization is used to make the value of the financial inclusion index between 0 to 1. The higher value of X_1 indicates that X is away from O, which shows the high level of financial inclusion in countries.

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \dots + d_n^2}}{\sqrt{n}} \quad (2)$$

In the second step inverse distance between X and I (Denoted by X_2) is examined by applying normalized Euclidean distance methods. Equation 3 is showing the normalized Euclidean distance of X to I. This subtrahend should be lower to associate a higher level of financial inclusion. while it is difficult to consider a large X_1 and a small X_2 for the comparison of financial inclusion among countries. That's why the normalized Euclidean distance between X and I is deducted from 1, which is said 'inverse distance'. This makes the next step easier and simpler. The greater X_2 shows a higher level of financial inclusion.

$$X_2 = 1 - \frac{\sqrt{(1-d_1)^2 + (1-d_2)^2 + \dots + (1-d_n)^2}}{\sqrt{n}} \quad (3)$$

In the final step index of financial inclusion is computed by the simple average of X_1 and X_2 . This computed index in equation 4 reveals that both X-O distance, as well as X-I distance, is considered for measuring the level of financial inclusion among countries.

$$FII = \frac{1}{2} (X_1 + X_2) \quad (4)$$

5. Results and Discussion

The present index consists of two macro dimensions of financial inclusion (Socioeconomic and Financial) using data from 87 developing countries (Upper middle income and Lower middle income) for 16 years from 2005 to 2020. This study constructed an index for various developing countries presented in table 3 by using multiple indicators of each dimension presented in table 2 for multiple periods.

Based on computed values of the index for financial inclusion the study has divided the countries into the following three categories.

5.1. High financial inclusion

If the value of the financial index is ranging from 0.51 to 1, it indicates a higher level of financial inclusion.

5.2. Medium financial inclusion

If the value of the financial inclusion index is in the range of 0.31 to 0.50, it indicates a medium level of financial inclusion.

5.3. Lower financial inclusion

If the value of the financial inclusion index lies between 0 to 0.30, it indicates a lower level of financial inclusion. Table 4 shows the values of the financial inclusion index constructed for various developing countries by using the latest data from 2005 to 2020. Results show that every developing country has a different level of financial inclusion each year. Estimated results show that Estonia has the highest level of financial inclusion among 87 selected developing countries from 2005 to 2014. Whereas, Papua New Guinea has the lowest level of financial inclusion during the selected period from 2005 to 2020. Results also reveal that in 2014 Armenia achieved the highest level of financial inclusion from 2015 to 2020.

Table 4-A

Index of Financial Inclusion 2005-2013										
Sr. No	Country	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Albania	0.225	0.235	0.248	0.254	0.276	0.272	0.271	0.271	0.287
2	Algeria	0.201	0.189	0.197	0.188	0.179	0.183	0.183	0.190	0.197
3	Angola	0.106	0.113	0.121	0.124	0.131	0.158	0.154	0.161	0.162
4	Argentina	0.282	0.286	0.286	0.287	0.302	0.312	0.319	0.327	0.340
5	Armenia	0.245	0.263	0.283	0.317	0.361	0.374	0.382	0.406	0.415
6	Azerbaijan	0.147	0.158	0.179	0.191	0.211	0.213	0.210	0.218	0.225
7	Bangladesh	0.107	0.111	0.114	0.118	0.132	0.125	0.129	0.134	0.127
8	Belarus	0.253	0.231	0.235	0.230	0.239	0.242	0.220	0.219	0.223
9	Belize	0.293	0.278	0.279	0.277	0.289	0.280	0.251	0.243	0.239
10	Benin	0.086	0.094	0.093	0.094	0.096	0.097	0.103	0.103	0.096
11	Bolivia	0.154	0.162	0.176	0.168	0.178	0.176	0.185	0.190	0.191
12	Bosnia & Herzegovina	0.326	0.339	0.336	0.326	0.353	0.343	0.344	0.343	0.341
13	Botswana	0.261	0.249	0.255	0.252	0.264	0.269	0.264	0.275	0.286
14	Brazil	0.330	0.332	0.335	0.331	0.360	0.378	0.385	0.397	0.395
15	Bulgaria	0.414	0.429	0.431	0.437	0.463	0.465	0.450	0.445	0.451
16	Cameroon	0.091	0.090	0.089	0.090	0.094	0.094	0.094	0.099	0.093
17	China	0.197	0.214	0.215	0.219	0.229	0.240	0.245	0.253	0.225
18	Colombia	0.286	0.297	0.304	0.301	0.311	0.309	0.304	0.310	0.309
19	Comoros	0.072	0.074	0.076	0.077	0.091	0.088	0.091	0.093	0.072
20	Costa Rica	0.276	0.284	0.301	0.299	0.319	0.321	0.335	0.338	0.336
21	Djibouti	0.211	0.211	0.213	0.216	0.225	0.227	0.225	0.227	0.238
22	Dominican Republic	0.231	0.232	0.229	0.227	0.240	0.241	0.243	0.245	0.250
23	Ecuador	0.240	0.218	0.225	0.222	0.239	0.234	0.223	0.214	0.211
24	Egypt	0.156	0.152	0.151	0.149	0.153	0.154	0.159	0.164	0.173
25	El Salvador	0.302	0.311	0.297	0.286	0.303	0.269	0.265	0.263	0.265
26	Equatorial Guinea	0.219	0.223	0.222	0.234	0.241	0.241	0.247	0.245	0.245
27	Estonia	0.457	0.469	0.480	0.462	0.515	0.507	0.470	0.451	0.460
28	Fiji	0.206	0.221	0.212	0.207	0.215	0.217	0.220	0.222	0.228
29	Gabon	0.249	0.247	0.252	0.247	0.256	0.259	0.259	0.264	0.278
30	Georgia	0.186	0.216	0.244	0.291	0.320	0.309	0.325	0.342	0.353
31	Ghana	0.097	0.100	0.105	0.110	0.112	0.112	0.121	0.127	0.134
32	Grenada	0.264	0.262	0.259	0.254	0.269	0.268	0.263	0.253	0.256
33	Guatemala	0.177	0.184	0.196	0.193	0.202	0.197	0.199	0.205	0.203
34	Guyana	0.184	0.160	0.163	0.156	0.173	0.179	0.179	0.183	0.191
35	Haiti	0.143	0.150	0.152	0.152	0.160	0.156	0.149	0.151	0.155
36	Honduras	0.200	0.214	0.217	0.215	0.228	0.218	0.215	0.217	0.220
37	India	0.097	0.103	0.108	0.110	0.115	0.115	0.116	0.120	0.130
38	Indonesia	0.164	0.163	0.166	0.169	0.175	0.184	0.194	0.213	0.230
39	Iran	0.238	0.245	0.250	0.256	0.278	0.294	0.305	0.312	0.298
40	Iraq	0.195	0.195	0.195	0.196	0.199	0.205	0.206	0.211	0.232
41	Jamaica	0.276	0.271	0.260	0.255	0.268	0.262	0.248	0.255	0.269
42	Jordan	0.326	0.326	0.320	0.304	0.322	0.305	0.298	0.294	0.300
43	Kazakhstan	0.259	0.290	0.318	0.332	0.322	0.332	0.337	0.350	0.381
44	Kenya	0.063	0.071	0.077	0.082	0.087	0.092	0.095	0.098	0.111
45	Kyrgyzstan	0.113	0.126	0.139	0.159	0.166	0.168	0.166	0.171	0.166
46	Laos	0.049	0.048	0.051	0.055	0.063	0.071	0.067	0.074	0.077
47	Lebanon	0.396	0.395	0.385	0.379	0.403	0.395	0.388	0.378	0.381

48	Lesotho	0.208	0.211	0.206	0.194	0.218	0.201	0.193	0.185	0.183
49	Libya	0.298	0.295	0.287	0.285	0.296	0.301	0.272	0.295	0.302
50	Malaysia	0.354	0.359	0.353	0.350	0.363	0.370	0.365	0.370	0.398
51	Maldives	0.179	0.204	0.221	0.224	0.234	0.222	0.211	0.201	0.202
52	Mauritania	0.168	0.167	0.174	0.177	0.189	0.181	0.174	0.179	0.190
53	Mauritius	0.350	0.347	0.345	0.341	0.355	0.360	0.367	0.371	0.382
54	Mexico	0.276	0.279	0.272	0.259	0.270	0.279	0.268	0.271	0.271
55	Micronesia	0.161	0.166	0.163	0.157	0.171	0.181	0.178	0.182	0.185
56	Moldova	0.269	0.292	0.289	0.288	0.304	0.298	0.299	0.300	0.310
57	Mongolia	0.223	0.235	0.258	0.270	0.269	0.268	0.307	0.323	0.337
58	Montenegro	0.323	0.328	0.345	0.401	0.426	0.417	0.418	0.412	0.414
59	Morocco	0.217	0.219	0.224	0.228	0.249	0.245	0.246	0.249	0.253
60	Namibia	0.209	0.218	0.221	0.223	0.238	0.247	0.260	0.263	0.285
61	Nicaragua	0.206	0.218	0.219	0.224	0.221	0.203	0.194	0.194	0.192
62	Nigeria	0.133	0.135	0.138	0.144	0.162	0.154	0.144	0.146	0.151
63	North Macedonia	0.278	0.287	0.303	0.347	0.364	0.362	0.361	0.356	0.358
64	Pakistan	0.114	0.121	0.124	0.126	0.129	0.125	0.121	0.124	0.124
65	Panama	0.348	0.354	0.343	0.324	0.331	0.334	0.328	0.338	0.358
66	Papua New Guinea	0.035	0.037	0.041	0.045	0.049	0.049	0.052	0.056	0.057
67	Paraguay	0.147	0.149	0.148	0.156	0.170	0.184	0.194	0.199	0.190
68	Peru	0.189	0.193	0.197	0.202	0.212	0.215	0.217	0.228	0.235
69	Philippines	0.201	0.201	0.195	0.193	0.209	0.203	0.202	0.207	0.211
70	Romania	0.284	0.308	0.321	0.325	0.336	0.327	0.331	0.316	0.314
71	Saint Lucia	0.310	0.303	0.289	0.274	0.298	0.311	0.314	0.308	0.317
72	Samoa	0.193	0.199	0.195	0.185	0.215	0.211	0.211	0.220	0.217
73	Sao Tome and Principe	0.184	0.195	0.203	0.207	0.217	0.227	0.239	0.243	0.260
74	Senegal	0.135	0.145	0.146	0.147	0.153	0.151	0.150	0.147	0.138
75	Solomon Islands	0.051	0.061	0.071	0.078	0.079	0.072	0.063	0.061	0.057
76	Suriname	0.225	0.238	0.233	0.232	0.254	0.253	0.247	0.259	0.266
77	Tajikistan	0.207	0.225	0.202	0.229	0.204	0.199	0.214	0.217	0.214
78	Tanzania	0.088	0.047	0.055	0.058	0.057	0.060	0.063	0.065	0.062
79	Thailand	0.199	0.226	0.233	0.240	0.254	0.261	0.267	0.277	0.288
80	Tonga	0.224	0.232	0.223	0.233	0.246	0.214	0.204	0.194	0.209
81	Tunisia	0.247	0.255	0.254	0.250	0.267	0.271	0.292	0.292	0.286
82	Turkey	0.388	0.382	0.387	0.380	0.399	0.393	0.390	0.397	0.411
83	Ukraine	0.311	0.327	0.345	0.368	0.405	0.381	0.367	0.366	0.330
84	Uzbekistan	0.140	0.142	0.144	0.145	0.153	0.161	0.182	0.181	0.183
85	Vanuatu	0.120	0.115	0.124	0.133	0.146	0.152	0.158	0.165	0.155
86	Zambia	0.099	0.095	0.093	0.087	0.099	0.116	0.107	0.108	0.112
87	Zimbabwe	0.077	0.074	0.065	0.066	0.098	0.100	0.107	0.120	0.104

Table 4-B

Index of financial inclusion 2014-2020								
Sr. No	Country	2014	2015	2016	2017	2018	2019	2020
1	Albania	0.308	0.311	0.291	0.272	0.252	0.246	0.239
2	Algeria	0.205	0.208	0.196	0.196	0.191	0.191	0.177
3	Angola	0.170	0.168	0.166	0.167	0.156	0.155	0.138
4	Argentina	0.344	0.360	0.345	0.351	0.328	0.315	0.298
5	Armenia	0.458	0.471	0.453	0.449	0.444	0.443	0.407
6	Azerbaijan	0.255	0.239	0.226	0.223	0.215	0.218	0.189
7	Bangladesh	0.139	0.150	0.142	0.143	0.139	0.140	0.126
8	Belarus	0.236	0.224	0.221	0.222	0.215	0.214	0.197
9	Belize	0.249	0.240	0.234	0.222	0.216	0.211	0.181
10	Benin	0.106	0.102	0.103	0.107	0.102	0.105	0.088
11	Bolivia	0.207	0.223	0.235	0.240	0.238	0.248	0.238
12	Bosnia & Herzegovina	0.363	0.362	0.352	0.330	0.314	0.302	0.236
13	Botswana	0.299	0.305	0.297	0.300	0.301	0.301	0.290
14	Brazil	0.404	0.387	0.399	0.398	0.375	0.366	0.333

15	Bulgaria	0.451	0.435	0.400	0.394	0.378	0.377	0.345
16	Cameroon	0.100	0.103	0.107	0.109	0.108	0.109	0.094
17	China	0.280	0.299	0.308	0.311	0.319	0.315	0.233
18	Colombia	0.330	0.332	0.325	0.327	0.312	0.307	0.268
19	Comoros	0.108	0.116	0.114	0.115	0.114	0.114	0.097
20	Costa Rica	0.370	0.374	0.371	0.369	0.363	0.356	0.320
21	Djibouti	0.246	0.251	0.252	0.257	0.257	0.261	0.258
22	Dominican Republic	0.268	0.286	0.282	0.275	0.265	0.264	0.229
23	Ecuador	0.229	0.234	0.224	0.216	0.207	0.204	0.149
24	Egypt	0.177	0.182	0.181	0.180	0.164	0.155	0.155
25	El Salvador	0.297	0.303	0.297	0.284	0.270	0.267	0.254
26	Equatorial Guinea	0.251	0.223	0.218	0.222	0.216	0.210	0.177
27	Estonia	0.468	0.444	0.417	0.409	0.382	0.358	0.339
28	Fiji	0.251	0.268	0.264	0.264	0.251	0.244	0.214
29	Gabon	0.289	0.283	0.282	0.283	0.279	0.280	0.264
30	Georgia	0.375	0.361	0.365	0.364	0.351	0.338	0.325
31	Ghana	0.144	0.170	0.148	0.146	0.139	0.144	0.134
32	Grenada	0.269	0.280	0.273	0.262	0.263	0.255	0.326
33	Guatemala	0.215	0.223	0.225	0.221	0.205	0.204	0.193
34	Guyana	0.202	0.212	0.198	0.198	0.186	0.186	0.174
35	Haiti	0.162	0.177	0.182	0.182	0.180	0.189	0.174
36	Honduras	0.248	0.259	0.254	0.245	0.237	0.239	0.226
37	India	0.144	0.145	0.145	0.146	0.143	0.142	0.137
38	Indonesia	0.243	0.244	0.239	0.247	0.218	0.209	0.192
39	Iran	0.311	0.316	0.328	0.325	0.305	0.300	0.284
40	Iraq	0.233	0.220	0.212	0.220	0.215	0.214	0.199
41	Jamaica	0.280	0.290	0.279	0.278	0.255	0.248	0.242
42	Jordan	0.311	0.316	0.316	0.325	0.316	0.304	0.289
43	Kazakhstan	0.383	0.370	0.374	0.379	0.371	0.373	0.364
44	Kenya	0.135	0.153	0.146	0.150	0.143	0.143	0.127
45	Kyrgyzstan	0.196	0.212	0.224	0.221	0.215	0.204	0.190
46	Laos	0.088	0.095	0.093	0.097	0.094	0.095	0.081
47	Lebanon	0.385	0.396	0.387	0.377	0.367	0.365	0.350
48	Lesotho	0.192	0.198	0.215	0.213	0.203	0.201	0.194
49	Libya	0.306	0.312	0.312	0.297	0.284	0.281	0.253
50	Malaysia	0.401	0.391	0.352	0.342	0.323	0.314	0.284
51	Maldives	0.218	0.215	0.202	0.202	0.192	0.190	0.154
52	Mauritania	0.139	0.143	0.149	0.153	0.154	0.156	0.140
53	Mauritius	0.413	0.420	0.384	0.378	0.352	0.338	0.316
54	Mexico	0.278	0.280	0.269	0.266	0.261	0.260	0.238
55	Micronesia	0.197	0.196	0.194	0.189	0.190	0.184	0.161
56	Moldova	0.319	0.273	0.258	0.254	0.246	0.247	0.231
57	Mongolia	0.368	0.378	0.406	0.372	0.372	0.331	0.300
58	Montenegro	0.426	0.420	0.419	0.396	0.390	0.372	0.350
59	Morocco	0.272	0.278	0.266	0.262	0.252	0.250	0.220
60	Namibia	0.301	0.311	0.326	0.316	0.302	0.296	0.255
61	Nicaragua	0.207	0.214	0.219	0.219	0.222	0.214	0.187
62	Nigeria	0.166	0.172	0.182	0.191	0.182	0.179	0.164
63	North Macedonia	0.371	0.364	0.347	0.339	0.319	0.299	0.269
64	Pakistan	0.130	0.144	0.145	0.145	0.144	0.147	0.140
65	Panama	0.382	0.397	0.383	0.379	0.356	0.349	0.332
66	Papua New Guinea	0.062	0.062	0.057	0.059	0.054	0.051	0.038
67	Paraguay	0.219	0.216	0.220	0.215	0.219	0.216	0.176
68	Peru	0.255	0.303	0.290	0.287	0.282	0.283	0.262
69	Philippines	0.225	0.232	0.229	0.232	0.229	0.232	0.225
70	Romania	0.325	0.319	0.303	0.297	0.282	0.273	0.254
71	Saint Lucia	0.328	0.331	0.308	0.305	0.292	0.295	0.275
72	Samoa	0.235	0.241	0.240	0.237	0.233	0.221	0.193
73	Sao Tome and Principe	0.267	0.286	0.256	0.260	0.242	0.244	0.312
74	Senegal	0.150	0.147	0.142	0.140	0.133	0.131	0.110

75	Solomon Islands	0.071	0.074	0.071	0.072	0.078	0.081	0.066
76	Suriname	0.277	0.284	0.261	0.258	0.248	0.244	0.223
77	Tajikistan	0.254	0.259	0.238	0.229	0.208	0.205	0.166
78	Tanzania	0.088	0.069	0.072	0.074	0.074	0.078	0.063
79	Thailand	0.309	0.310	0.298	0.297	0.287	0.276	0.257
80	Tonga	0.221	0.263	0.258	0.273	0.257	0.247	0.246
81	Tunisia	0.302	0.310	0.304	0.303	0.292	0.287	0.258
82	Turkey	0.423	0.412	0.399	0.391	0.364	0.359	0.332
83	Ukraine	0.345	0.345	0.311	0.311	0.289	0.275	0.246
84	Uzbekistan	0.193	0.182	0.187	0.214	0.226	0.258	0.205
85	Vanuatu	0.182	0.210	0.190	0.168	0.162	0.169	0.157
86	Zambia	0.122	0.125	0.129	0.132	0.128	0.128	0.116
87	Zimbabwe	0.117	0.111	0.110	0.107	0.096	0.092	0.088

In a detailed discussion of the results, this study has divided the countries into three groups based on their score on the financial inclusion index.

5.1.1. High financial inclusion

Countries with a score of 0.51 to 1 indicate a higher level of financial inclusion (Sarma, 2012). According to the analysis of this study, only Estonia achieved a higher level of financial inclusion during 2009-10. This year Estonia's score on the financial inclusion index is 0.515, which lies in a higher level of financial inclusion according to the division. No other country got a higher level of financial inclusion from 2005 to 2020.

5.2.1. Medium financial inclusion

Countries with a score of 0.31 to 0.50 indicate a medium level of financial inclusion (Sarma, 2012). In 2005 only 13 countries (Bosnia and Herzegovina, Brazil, Bulgaria, Estonia, Jordan, Lebanon, Malaysia, Mauritius, Montenegro, Panama, Saint Lucia, Turkey, and Ukraine) achieved a medium level of financial inclusion. because the score of the financial inclusion index of these countries is higher than 0.30. Among these 13 countries, Estonia is on top with an index score of 0.457. Results show that during 2006 Saint Lucia's score of financial inclusion declined and it goes to the lower level of financial inclusion while the other countries have some increase in their score and they remain in the medium level of financial inclusion. In 2006 El Salvador has achieved a medium level of financial inclusion with a 0.311 score on the financial inclusion index. Results show that during 2007 two additional countries Kazakhstan and Romania achieved a medium level of financial inclusion while El Salvador lose the financial inclusion score and decline to a lower financial inclusion range. Estimated results show that during 2008 following countries achieve a medium level of financial inclusion (Armenia, Bosnia and Herzegovina, Brazil, Bulgaria, Estonia, Kazakhstan, Lebanon, Malaysia, Mauritius, Montenegro, North Macedonia, Panama, Romania, Turkey, and Ukraine). In 2009 four additional countries Georgia, Jordan, Colombia, and Costa Rica also achieved a medium level of financial inclusion. In the year 2010, three additional countries Argentina, Libya, and Saint Lucia achieved a higher level of financial inclusion while Colombia and Georgia face a decline in financial inclusion and fell in the range of lower-level countries in 2010. During the year 2011 following countries additionally achieved a medium level of financial inclusion Georgia and Iran while Libya and Jordan face a decline in financial inclusion and lie at a lower level of financial inclusion. during the year 2012 following additional countries achieved a medium level of financial inclusion Colombia and Mongolia. In 2014 only Moldova has achieved a medium level of financial inclusion, Colombia and Iran face a decline in financial inclusion index scores and lie at lower levels of financial inclusion. In 2014 Iran, Jordan, and Libya again achieved a level of medium financial inclusion. Tunisia also achieved a medium level of financial inclusion in 2014. During 2015 and 2016 Albania, Colombia, Namibia, and Thailand achieved a medium level of financial inclusion while Moldova declined toward a lower level of financial inclusion. While Albania and Thailand face a decline in the level of financial inclusion in 2016. Additionally, in 2015 Armenia got the highest score in the financial inclusion index among all 87 developing countries which, shows that Armina got a medium level of financial inclusion. In 2017 Libya face a decline in the level of financial inclusion from medium to low while China achieved a medium level of financial inclusion. In 2018 Ukraine, Iran and Estonia face a decline in financial inclusion from medium to lower levels of inclusion. In 2019 North Macedonia and Bosnia and Herzegovina face a decline in their score on the financial inclusion index and lie among the lower-level financial inclusion countries. In 2020 Sao Tome and Principe and Grenada achieved a higher level of financial inclusion while, Argentina, China, Colombia, Georgia, Jordan, Malaysia, and Mongolia face a decline in index scores and lie at a lower level of financial inclusion countries. Analysis shows that Papua New Guinea is the only country that has the lowest level of financial inclusion from 2005 to 2020. While from 2005 to 2015 Estonia remains the top scorer in the financial inclusion index among 87 developing countries but from 2015 to 2020 Armenia achieves the highest index score among 87 developing countries.

5.3.1. The lower level of financial inclusion

Countries with a low score on the financial inclusion index are those that have a 0.30 or less 0.30 score of the financial inclusion index. In the analysis of this study majority of the selected developing countries fall under the low level of financial inclusion category. Results show that Papua New Guinea is the country having the lowest level of financial inclusion from 2005 to 2020. It is also observed that some developing countries (i.e., Georgia, Iran, Jordan, Moldova,

Mongolia, Namibia, Thailand, Saint Lucia, and Romania are struggling to maintain a medium level of financial inclusion but fail to maintain it for a longer period.

In General, it is observed that the overall level of financial inclusion increased during the time frame of 2005 to 2020. Furthermore, the decline in the level of financial inclusion is expected to decline due to the financial crises of 2007-08 in some countries. All the selected 87 developing countries face some decline in the level of financial inclusion during 2019 and 2020. This decline is due to the pandemic situation of COVID-19 because during this period most people were unable to reach the bank branches. This decline is also arisen due to the higher outreach issues. This pandemic situation mostly affects the indicators of financial access during 2020.

6. Conclusions and Recommendations

Financial inclusion is considered the fundamental element of economic prosperity and helpful in poverty elimination. It is also very helpful in the prevention of social exclusion. When a person attains the right to use formal financial services, it helps to reduce social exclusion. However, in previous studies, lots of efforts are made to measure financial inclusion but it is still incomplete and scarce. Financial inclusion is a multi-dimensional concept that cannot be accurately measured by a single indicator. Previous researchers Sarma (2008), Chakravarty & Pal (2010), Arora (2010), Sarma (2012), Amidzic et al., (2014), Camara & Tuesta (2014), Park and Mercado (2015), Sarma (2016), Park & Mercado (2018), Ngo (2019) has used various indicators of each dimension i.e., access, availability, and usage but every researcher mostly used single element for each dimension which did not give an efficient measurement. This study proposed an index of financial inclusion that comprises many macro-level indicators of several dimensions. This index is further divided into two major macro dimensions i.e., the Socio-economic dimension and the financial dimension. This index was constructed by using the methodology of Ngo (2019) and Sarma (2008-12) which is in line with the United Nations Development (UNDP) index construction method. This constructed index of financial inclusion can be used to draw a comparison of the level of financial inclusion among developing economies. Furthermore, it can be used to observe the progress of economies concerning financial inclusion across time. This index can also be used by researchers to analyze the empirical link between development and the level of financial inclusion. This study presents the financial inclusion index by using the latest data from various developing economies, which shows that most of the large economies having industrial backgrounds like China and India still have a low level of financial inclusion. This study is using sufficient, appropriate updates and a large number of data is used for the measurement of financial inclusion in developing countries. This index covers all the aspects of financial inclusion by summing up all the sub-dimensions i.e., access, availability, usage, insurance, economic, social, and demographic into two macro dimensions of financial inclusion. These two macro dimensions include various indicators of every dimension which gives appropriate measurement for financial inclusion. This study further suggests the level of financial inclusion among various developing countries, which shows that only Estonia achieved a higher level of financial inclusion in 2009-10. The analysis shows that only 13 countries (Estonia, Bosnia and Herzegovina, Brazil, Bulgaria, Jordan, Kazakhstan, Lebanon, Malaysia, Mauritius, Montenegro, Panama, Romania, Turkey, and Ukraine) have achieved a medium level of financial inclusion among 87 developing countries. While all other 74 developing countries have a lower level of financial inclusion most of the year. This constructed index suggests that developing countries should have to improve their policies for the improvement of financial inclusion. So, financially deprived individuals and businesses can avail easy and affordable financial services for improving their productivity.

7. Limitations of the study

The present index has some limitations mainly regarding countries' selection. This index includes only 87 developing countries as per World Bank division criteria. This study has lack geographical elements like rural and urban areas as well as gender elements i.e., males and females. Furthermore, this study did not include the technological advancement in the financial sector which can be added to the index. This index included only macro-level data on financial inclusion across the country, index can be extended by focusing on the country's element of financial inclusion.

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