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## **Conflict of Interest**

The author (s) declared no conflict of interest and have not received any funds for the project.

# Estimation of Financial Inclusion Index for Low and Lower-Middle-Income Countries

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## Abstract

This study aims to estimate the financial inclusion (FI) index in Low- Income and Lower-Middle- Income (LLMI) Countries. The study used the Principal Component Analysis technique and Euclidean Distance Method to estimate the FI index for 39 LLMI countries over 11 years, from 2010 to 2020. For constructing the index, this study used four dimensions, i.e., “financial access, financial usage, infrastructure & communication technology, and banking cost.” These findings suggest that the exploitation of FI is the reason behind the low FI level in LLMI countries. Moreover, these countries have a higher banking costs compared to high-income countries. Therefore, financial inconsistency and banking competition hinder achieving an ideal FI level. This study also discusses policy recommendations for optimal FI in LLMI countries. From a policy perspective, strong regulation for FI is necessary for countries with unstable economic conditions, such as Ghana, which has an unsuitable economic condition to enhance FI. To increase the level of FI, the government must develop a strategic framework to improve FI. FI policy must focus on initiating, monitoring, and developing FI in the country.

**Keywords:** *Financial access, financial inclusion, financial institution, digital innovation.*

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## Introduction

Financial inclusion (FI) is an important tool the policymakers use for a country's financial and economic development (Demir et al. 2022). It reduces poverty and inequality in a country by making "financial products and services" accessible to individuals (Zulhibri, 2016; Huang & Zhang, 2020). Households living condition improves when they use it rationally (Jungo et al., 2022). Zins and Weill (2016) assert that public authorities use FI to develop all segments of a country by providing them with "easy access to financial products and services." Most of the population in developing and emerging economies cannot access financial products easily. Therefore, entrepreneurship activities in these countries depend on family financial support and borrowing from non-conventional sources at high-interest rates (Huang and Zhang 2020). Given its importance, international donor agencies and developed countries have taken significant initiatives to develop FI in developing and emerging economies (Owen and Pereira 2018). Vo et al. (2021) assert that important components of FI are "articulating employment-oriented growth strategy, investing in human development, reinforcing FI, and multidimensional interventions."

Stability in a country's banking sector enhances the availability of "financial products and services" that profoundly "increase FI" (Anarfo et al., 2020). Banks in a country connect the "financial system with the real economy," while FI increases the effectiveness of monetary policy and controls inflation in a country (Jungo et al., 2022). Thus, the regulatory bodies in a country must focus on "mitigating credit risk and increasing banks stability." Such measures may help most disadvantaged customers who do not have easy access to financial products (Ackah & Asiamah, 2016). Financial regulations are important but could "increase or reduce the efficiency of a country's banks and financial institutions" (Gaganis et al., 2021).

Extant literature documents that to control financial crises apart from financial regulations, policymakers must use some other measures simultaneously (Atellu et al. 2021). At the same time, Anarfo et al. (2020) believe that financial stability in a country enhances the relationship between "financial regulations and FI." FI enhances the banking customer base and increases a country's financial products and services (Atellu et al. 2021).

The customer base increases the "operational cost of a bank and the volume of small transactions" (Musau et al., 2018). New bank customers often have no credit history and lack expertise in using financial products and services. Consequently, it increases "banks' credit risk" (Atellu et al. 2021). At the same time, FI enhances banking stability by

enhancing loan and deposit portfolios and decreasing “financial risk” (Musau et al., 2018). The banking regulation in some developing countries is complex and complicated, due to which individuals invest in pension funds, mutual funds, and insurance companies through financial intermediaries. Such investments retard the development of the financial system (Zainal et al., 2012).

This study investigates whether or not the current level of FI is optimal in low and lower-middle-income (LLMI) countries. For this purpose, this study has constructed the FI index using the combination of the Principal Component Analysis (PCA) and Euclidean Distance (ED) method. The rest of the paper is structured as follows: In Section-2, we have discussed the past literature measuring the FI index. Section 3 relates to the methodology in which we have discussed variables used and sources from where we obtained the data set. Section 4 depicts the empirical research of this study. Section 5 presents the conclusion and policy implications of this study.

## **Literature Review**

Researchers have defined financial inclusion (FI) from different perspectives and contexts. Some have included social activities in the definition of FI, while others have not (Mpofu & Mhlanga, 2022). Exclusion has many forms, including “location, information, and financial knowledge of financial products” (Menon, 2019). Panos and Wilson (2020) define FI as a “lack of access to financial resources.” Niaz (2022) asserts that a well-developed financial system generates economic activities and attracts investments necessary for a country’s development. Individuals in an underdeveloped financial system have to bear high costs to obtain financial goods and services (Nguyen & Du, 2022). Therefore, the policymaker may must develop policies to bring stability to the financial system of a country. Chuc et al. (2022) assert that the quality of financial services is poor in an underdeveloped financial system. Therefore, it is not rational to justify investing in new ventures and deprive the lower-income segment of economic benefits. Most researchers agree that FI is “critical for economic and financial development.” However, most researchers have different perspectives on measuring the FI index and FI rates (Muhammad, Ngah & Obad, 2022).

Different researchers have proposed different models to measure the global index. Therefore global model index varies from country to country depending on the model a country uses (Wang et al., 2022). Reshi and Siddha (2023) assert that the focus of developing countries is to reduce gender discrimination and generate economic activities and employment. Such policies may also reduce discrimination in the finance domain and promote economic development in the vulnerable group of society. Past studies have used different databases to measure FI. For example, Sarma and Pais

(2011) used the World Bank database and economic approach to develop the FI index. Using data sets from different countries, Cicchiello et al. (2021) concluded: "formal financial services are more inclusive of families headed by men." Wang and Guan (2017) estimated the FI rate using a data set of eighty countries that allowed them to compare results between "developed and developing countries." Another researcher using the World Bank data set and social factors, including "income, literacy, and urbanization," concluded that development significantly promotes FI (Sharma & Tuli, 2012). Another study validated the association between "literacy, population, and income" and FI (Kairiza et al., 2017). Kumar (2012), based on the data set of major cities in India, found customers' access to financial and banking services reduces poverty.

Many researchers believe that "income and education" are critical precursors of financial services (Demir et al., 2022). Based on empirical evidence, Park and Mercado (2021) found that banking and financial stability and changes in the financial system are necessary for decreasing inequality. Omar and Inaba (2020) found that increasing FI in sub-Saharan countries reduced poverty in low-income households. The study also documented it increased the households' net worth and social benefits.

Adeola and Evans (2017) document that "FI" promotes prosperity and reduces poverty in a country. A study using "firm-level data from emerging economies" found FI has stimulated economic growth in Middle Eastern countries (Kim et al. 2018). While examining the impact of "FI and bank competition" on firm performance, Chauvet and Jacolin (2017) documented that "FI and bank competition" promotes firm performance, especially in less concentrated bank markets. The study also concluded that a highly competitive bank enhances firm growth, provided FI is high. Based on a data set collected from 31 Asian countries, a study documented that "financial efficiency negatively affects financial efficiency" and positively "affects financial sustainability" (Le, Chuc, & Taghizadeh-Hesary, 2019).

While examining the role of "FI on poverty and income inequality," Mushtaq and Bruneau (2019) concluded, "Information and communication technologies (ICT) promote FI" and economic growth and negatively affect poverty and inequality. Ouechtati (2020) documented that FI "reduces poverty and income inequality" by increasing access to credit to individuals. Another study in developing countries concluded that FI is a critical factor for growth and development in Nigeria. The study used a data set of 53 developing countries (i.e., 2004 to 2017).

## Research Methodology

### Data Source and Variables

We obtained financial indicators from the Financial Access Survey and social indicators from World Development Indicators (World Bank, 2019). Table 1 represents the FI Index and its indicators. The sample size of LLMI countries is 39, including nine low-income countries and 09 lower-middle-income countries depicted in Table 1.

**Table 1: Dimensions of Financial Inclusion (FI) Index and their Financial Indicators**

Dimensions	Indicators/Symbol	Symbol	Countries	Mean Dev.	Std.	Min	Max	Weight
Financial Access	Commercial bank branches /100,000 adults	CBB	Burkina Faso, Guinea, Madagascar,	10.21	12.41	0.41	71.23	0.3
	Commercial bank branches/1,000 km2	CBB <sup>SQ</sup>	Mali, Mozambique, Niger, Rwanda,	8.76	14.17	0.08	83.28	
	ATMs / 100,000 adults adult	ATM	Uganda, Zambia,	17.28	19.12	0.58	106.88	
	ATMs /1,000 km2	ATM <sup>SQ</sup>	Algeria, Angola,	15.60	22.31	0.04	97.59	
Financial Usage	Outstanding loans	OL <sup>CG</sup>	Bangladesh, Benin, Bolivia, Cabo Verde,	37.00	32.55	1.75	222.17	0.2
	Outstanding deposits	OD <sup>CB</sup>	Cambodia,	44.87	35.15	7.93	243.79	
	Gross domestic savings	GDS	Cameroon, Côte	15.70	13.07	-34.55	48.45	
	Financial system deposits to GDP (%)	FSD	d'Ivoire, Egypt, El	41.51	27.92	8.16	154.29	
Infrastructure and Communication Technology	Services, value-added	SV	Salvador, Ghana, Honduras, India,	48.11	8.56	11.95	62.16	0.3
	Access to electricity (% of the population)	Elec	Indonesia, Kenya, Kyrgyz Republic,	63.98	29.77	9.70	100.00	
	Fixed broadband subscriptions (per 100 people)	FBS	Lesotho, Mauritania, Mongolia, Morocco,	2.12	3.05	0.00	18.62	
	Mobile cellular subscriptions (per 100 people)	MCS	Nepal, Nigeria, Pakistan, Philippines,	91.25	31.54	22.28	164.44	
Banking Cost	Bank cost-to-income ratio (%)	BCI	Senegal, Tunisia, Ukraine, Vietnam,	56.53	13.55	26.65	202.04	0.2
	Bank overhead costs to total assets (%)	BOC	Zimbabwe.	4.12	2.16	0.75	12.53	

### Research Model

We used four endogenous variables related to single dimension index, And have presented the principal component's equation below:

$$Dm_i^{FA} = \alpha_1 ATM_i^{SQ} + \alpha_2 ATM_i + \alpha_3 CBB_i + \alpha_4 CBB_i^{SQ} + \epsilon_i$$

$$Dm_i^{FU} = \beta_1 OL_i^{CB} + \beta_2 GDS_i + \beta_3 FSD_i + \beta_4 OD_i^{CB} + v_i$$

$$Dm_i^{ICT} = \gamma_1 SV_i + \gamma_2 Elec_i + \gamma_3 FBS_i + \gamma_4 MCS_i + \Psi_i$$

$$Dm_i^{BC} = \sigma_1 BCI_i + \sigma_2 BOC_i + \Omega_i$$

Let  $C_M(M * M)$  represents the correlation matrix for financial indicators related to the given dimensions.

$$Dm_i^{[FA,FU,ict,bc]} = \frac{\sum_{Q,n=1}^M \rho_V^{[FA,FU,ict,bc]} r_{ni}^{[FA,FU,ict,bc]}}{\sum_{Q,n=1}^M \rho_V^{[FA,FU,ict,bc]}}$$

Here we used  $\rho(1, \dots, M)$  as  $V^{th}$  eigenvalue script, and V indicates the number of Principal Component, and indicators are the eigenvalue of the matrix. Therefore,  $M^{th}$  is the principal component based on the assumption  $\rho_1 > \rho_2 > \rho_3 \dots \dots \rho_m$  and  $r_{ni} = (N = 1 \dots \dots m)$ . Hence  $r_{ni} = iv\rho_V$  represents nth component and  $iv$  is the indicator of the matrix. In this study, we used four dimensions for developing the overall index. We also used the Euclidean Distance Method to estimate the distance between maximum and minimum dimension values.

We have presented the formula for the normalization below:

$$Dm_i^{[FA,FU,ict,bc]} = w_i \frac{V_i^{[FA,FU,ict,bc]} - V_{min}^{[FA,FU,ict,bc]}}{V_{Max}^{[FA,FU,ict,bc]} - V_{min}^{[FA,FU,ict,bc]}}$$

Here country values represent "i" and "w<sub>i</sub>" which are the weights assigned to each dimension, while ( $Dm_i^{FA}$ ,  $Dm_i^{FU}$ ,  $Dm_i^{ict}$  and  $Dm_i^{bc}$ ) refers to financial access, financial usage, infrastructure & communication technology, and banking cost.  $V_i^{[FA,FU,ict,bc]}$  And  $V_{min}^{[FA,FU,ict,bc]}$  represents the lowest value. And  $V_{Max}^{[FA,FU,ict,bc]}$  representing the highest value. We followed the methodology of Sarma (2012) to estimate the final index. We have presented the exact formula below:

$$I = \frac{1}{2} \times \frac{\sqrt{dm_{FA}^2 + dm_{FU}^2 + dm_{ict}^2 + dm_{bc}^2}}{\sqrt{w_{FA}^2 + w_{FU}^2 + w_{ict}^2 + w_{bc}^2}} \times \left( 1 - \frac{\sqrt{(w_{FA} - dm_{FA})^2 + (w_{FU} - dm_{FU})^2 + (w_{ict} - dm_{ict})^2 + (w_{bc} - dm_{bc})^2}}{\sqrt{w_{FA}^2 + w_{FU}^2 + w_{ict}^2 + w_{bc}^2}} \right)$$

The study has divided FI Index into three categories:

1. Low FI index: 0-0.3.

2. Medium FI Index : 0.3-0.5.
3. High FI Index: 0.5-1.

## Data Analysis and Discussion

This study has categorized the FI index into three levels for a comprehensive analysis. For example, the low FI countries have an index value ranging from 0 to 0.3. The medium FI countries have an index value range from 0.3 to 0.5. The higher FI countries have an index value ranging from 0.5 to 1.

Table 2 shows all countries' average FI index values from 2010 to 2020. The average eleven-year index range is [0.0755 to 0.5835]. Ukraine has the highest average FI index, while Niger has the lowest FI. Table 3 shows the FI trend in LLMI Countries.

**Table 2: Overall Financial Inclusion (FI) in Low and Lower-Middle-Income (LLMI) Countries**

Rank	Countries	2010-2020	Rank	Countries	2010-2020	Rank	Countries	2010-2020
1	Ukraine	0.5835	14	Kyrgyz Republic	0.3598	27	Rwanda	0.2305
2	Cabo Verde	0.5661	15	Egypt, Arab Rep.	0.3397	28	Zambia	0.2222
3	El Salvador	0.5644	16	Nepal	0.3358	29	Lesotho	0.2185
4	Vietnam	0.4962	17	Mauritania	0.333	30	Cameroon	0.2182
5	Mongolia	0.4913	18	Cambodia	0.2913	31	Benin	0.2067
6	Bangladesh	0.4816	19	Pakistan	0.2807	32	Mali	0.2049
7	Philippines	0.4668	20	Nigeria	0.2776	33	Mozambique	0.202
8	Tunisia	0.459	21	Algeria	0.2776	34	Angola	0.1996
9	Indonesia	0.4586	22	Ghana	0.275	35	Guinea	0.1848
10	India	0.4421	23	Senegal	0.2625	36	Uganda	0.172
11	Morocco	0.4419	24	Zimbabwe	0.2517	37	Burkina Faso	0.162
12	Bolivia	0.3867	25	Côte d'Ivoire	0.2515	38	Madagascar	0.1361
13	Honduras	0.3849	26	Kenya	0.2412	39	Niger	0.0755



Table 3: Financial Inclusion (FI) Trends in Low and Lower-Middle-Income (LLMI) Countries

Countries	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Algeria	LFI	LFI	LFI	LFI	LFI	LFI	MFI	MFI	LFI	MFI	MFI
Angola	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Bangladesh	MFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI	HFI	HFI	HFI
Benin	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Bolivia	LFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	HFI
Burkina Faso	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Cabo Verde	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI
Cambodia	LFI	LFI	LFI	LFI	LFI	LFI	MFI	MFI	MFI	MFI	MFI
Cameroon	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Côte d'Ivoire	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Egypt, Arab Rep.	LFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI
El Salvador	MFI	MFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI
Ghana	LFI	LFI	LFI	LFI	LFI	LFI	MFI	LFI	MFI	MFI	MFI
Guinea	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Honduras	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI
India	MFI	MFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI	HFI	HFI
Indonesia	LFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI	HFI	HFI	HFI
Kenya	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Kyrgyz Republic	LFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI
Lesotho	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Madagascar	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Mali	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Mauritania	LFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI
Mongolia	MFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI	HFI	HFI	HFI
Morocco	LFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI
Mozambique	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Nepal	LFI	LFI	LFI	LFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI
Niger	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Nigeria	MFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Pakistan	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	MFI
Philippines	MFI	MFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI	HFI	HFI
Rwanda	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Senegal	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Tunisia	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI
Uganda	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Ukraine	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI	HFI
Vietnam	MFI	MFI	MFI	MFI	MFI	MFI	HFI	HFI	HFI	HFI	HFI
Zambia	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI
Zimbabwe	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI	LFI

Source: adapted from various resources

The results show that six countries (i.e., India, Indonesia, Bangladesh, Vietnam, Philippines, and Mongolia) have raised their FI levels in the last five years (Refer to Table 3). Likewise, Algeria, Cambodia, Ghana, and Nepal have achieved medium FI over the last five years. The data explains that Ukraine, Cabo Verde, and El-Salvador belonging to lower middle-income countries during 2010-2020, have achieved higher FI levels. At the same time, three countries (i.e., Mongolia, Bangladesh, and Vietnam) are close to a higher financial level. Thirteen medium FI countries (i.e., Vietnam, Mongolia, Bangladesh, Philippines, Tunisia, Indonesia, India, Morocco, Honduras, Kyrgyz Republic, Egypt, Nepal, and Mauritania) belong to lower-middle-income countries and have index values ranging from 0.3 to 0.5.

Countries with low FI values (i.e., from 0.0 to 0.3 index) from 2010 to 2020 are as follows: Cambodia, Pakistan, Nigeria, Algeria, Ghana, Senegal, Zimbabwe, Côte d'Ivoire, Kenya, Rwanda, Zambia, Lesotho, Cameroon, Benin, Mali, Mozambique, Angola, Guinea, Uganda, Burkina Faso, Madagascar, and Nigeria. The improvement in FI will increase over time. But low-income and lower-middle-income economies have deteriorated due to insufficient income problems. As per index estimation, three out of 39 countries have crossed the threshold of high FI. However, the cost associated with the banking industry is still higher for LLMI countries than in other higher-income and developed countries.

The banking sector in LLMI countries is highly competitive. Therefore, to attract customers, the banking sectors in these countries offer many financial products. Consequently, individuals open multiple accounts without any purpose or keep switching from one financial institution to another. Government policies in these countries have short-term policies to increase FI. Table 4 shows the FI in the year 2019-2020.

**Table 4: Countries' Financial Inclusion (FI) during 2019-2020**

<b>Countries</b>	<b>2019</b>	<b>2020</b>	<b>Countries</b>	<b>2019</b>	<b>2020</b>	<b>Countries</b>	<b>2019</b>	<b>2020</b>
Algeria	0.3096	0.3163	Guinea	0.1914	0.1974	Nepal	0.4435	0.4820
Angola	0.1972	0.2399	Honduras	0.3956	0.3925	Niger	0.1010	0.1060
Bangladesh	0.5762	0.5998	India	0.5082	0.5224	Nigeria	0.2813	0.2756
Benin	0.2177	0.2216	Indonesia	0.5115	0.5131	Pakistan	0.3065	0.3059
Bolivia	0.4586	0.5240	Kenya	0.2762	0.2782	Philippines	0.5622	0.5611
Burkina Faso	0.1922	0.1819	Kyrgyz R.	0.4050	0.4047	Rwanda	0.2421	0.2245
Cabo Verde	0.5978	0.5848	Lesotho	0.2368	0.2409	Senegal	0.2852	0.2800
Cambodia	0.3740	0.4025	Madagascar	0.1499	0.1462	Tunisia	0.5070	0.5272
Cameroon	0.2336	0.2557	Mali	0.2242	0.2382	Uganda	0.1937	0.1870
Côte d'Ivoire	0.2818	0.2874	Mauritania	0.3747	0.3686	Ukraine	0.6102	0.6170

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Egypt.	0.3744	0.3950	Mongolia	0.5228	0.5080	Vietnam	0.5723	0.5927
El Salvador	0.6247	0.6354	Morocco	0.4725	0.4906	Zambia	0.2405	0.2489
Ghana	0.3085	0.3006	Mozambique	0.2167	0.2172	Zimbabwe	0.2352	0.2045

The data in Table 4 shows Burkina Faso, Cabo Verde, Ghana, Honduras, Madagascar, Mauritania, Nigeria, Pakistan, Philippines, Senegal, and Uganda FI index declined in 2020 as compared to the preceding year.

## Conclusion

This paper explored the level of FI for LLMI countries by combining the traditional methodologies of PCA and the Euclidean Distance Method to obtain the weight of the final index using a two-stage process. We estimated the dimensions of the FI index using the PCA method and obtained the weight to calculate the final index using the ED method. This study used four dimensions of FI, i.e. “financial access, financial usage, infrastructure & communication technology, and banking cost” in 39 LLMI countries during 2010-2020.

The findings of this study are that Cabo Verde, El Salvador, and Ukraine achieved high FI among 39 countries. Thirteen countries achieved medium FI: Vietnam, Mongolia, Bangladesh, Philippines, Tunisia, Indonesia, India, Morocco, Honduras, Kyrgyz Republic, Egypt, Nepal, and Mauritania. Countries having low FI are Cambodia, Pakistan, Nigeria, Algeria, Ghana, Senegal, Zimbabwe, Côte d’Ivoire, Kenya, Rwanda, Zambia, Lesotho, Cameroon, Benin, Mali, Mozambique, Angola, Guinea, Uganda, Burkina Faso, Madagascar, and Nigeria. On average, Ukraine has the highest FI, while Nigeria has the lowest. We found that many countries have raised the level of FI but still struggle to achieve a higher level. The results show that the “estimated index” of the targeted countries ranges from [0.05 to 0.635], which aligns with earlier studies like Sarma (2012) and Della-Peruta(2018), and Shen et al. (2021).

## Policy Implications and Future Research

To monitor the level of FI in the country, the government must have a strategic framework for FI policies, also known as the National Financial Inclusion Strategy. FI policy must include initiating the development process of FI in the country. From a policy perspective, strong regulation for FI is mandatory for countries with unstable economic conditions, such as Ghana, which has an unsuitable economic condition for achieving FI. Digital FI includes individuals using electronic payment transfer systems such as mobile phones and the Internet. The inclusion strategy of Zimbabwe focuses on improving its banking system using digital technology.

Furthermore, Kenya initiated “MPesa” to expand financial access. The republics of Madagascar have used mobile networks, such as Orange, Telma, and Airtel, to promote FI. In Pakistan, the FI policy focuses on providing loans to farmers to improve their living standards. Guinea has focused on the microfinance sector to enhance FI. Rwanda has invested in the SME sector to expand financial coverage and the quality of banking services. This study has identified directions for future research. For instance, future studies can use this index to estimate the impact of FI on banking stability. This index also assesses FI’s risk factors and economic impact. Furthermore, future researchers can use updated data to examine the dynamic impact of FI in other domains.

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