

Financial Inclusion Convergence in Low-Income and Lower-Middle-Income Countries

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Abstract

This research investigates the potential existence of financial inclusion convergence and its link with the growth convergence of 39 Low-Income (LI) and Lower-Middle-Income (LMI) countries. This study employs the club convergence technique proposed by Phillips and Sul (2007) to analyze the financial inclusion index based on different financial indicators to determine that LI and LMI countries converge in local and international practices to achieve financial inclusion. The findings support the growth convergence for all countries. Moreover, there is no conclusive evidence of financial inclusion convergence when considering all countries in the sample. However, the study does identify the existence of financial inclusion convergence within specific cluster clubs. This club convergence approach is also applied to other indicators, such as financial availability and the size of financial intermediaries, including bank credit to bank deposits, Central Bank assets, and liquid liabilities. The results indicate that per capita growth convergence aligns with financial inclusion convergence among the identified cluster clubs. The size of financial intermediaries also plays a little role in supporting financial inclusion and economic growth. The convergence of financial inclusion can be possible through sharing innovative digital products and ideas within these countries.

Keywords: Economic convergence; financial inclusion; economic growth; financial intermediaries; financial development.

JEL Classification: G21, O1

1. Introduction

Among the many alternatives taken into consideration, financial inclusion is widely acknowledged as the key to addressing individual accessibility to financial services in LI and LMI countries. Ouma et al. (2017) have defined financial inclusion as a fundamental element of development policy in most LI and LMI countries. Policymakers in LI and LMI countries are increasingly concerned about the higher proportion of financial exclusion within their nations.

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They have dedicated significant time and effort to find effective solutions for economic downturns and financial crises.

Rysin et al. (2021) explained financial convergence can be defined as the blending and overlapping of activities and interests among participants in various sectors of the global financial market. It involves connecting and combining efforts to enhance these entities' competitiveness collectively. Convergence acts as a mechanism of modification, where the activities of financial sector participants extend into other sectors of the world financial market. This extension can occur either forcibly or voluntarily. In the aggressive form of convergence, a participant from a specific financial sector incorporates aspects or functions originally found in other sectors without involving representatives from those other sectors. Financial inclusion improves accessibility to financial services and fosters inclusive development in LI countries. An inclusive financial system is crucial in reducing poverty and promoting sustainable development. The increased availability of diverse financial products contributes to establishing an inclusive financial system. Individuals from vulnerable sectors can effectively utilize their income for saving, investing in education, and managing portfolios for business initiatives under this system, as suggested by Ibrahim and Aliero (2020).

Do international financial inclusion practices tend to align towards common standards, or do they diverge? If they diverge, what factors contribute to this divergence? On the other hand, if they converge, what recent developments have fostered this alignment? The first aspect addresses the controversies and challenges surrounding the financial inclusion agenda. In contrast, the second aspect explores the current progress and initiatives promoting the financial inclusion convergence of countries' practices. Financial inclusion is a supporting factor for economic growth. Convergence in economic growth leads to convergence in financial inclusion among LI and LMI countries. For this purpose, this study assesses financial inclusion index convergence, financial availability convergence, financial development convergence, and growth convergence among these countries. Therefore, using the methodology of the club convergence hypothesis approach proposed by Phillips and Sul (2007) to analyze the financial indicators.

Fintech activity can enhance cross-border competition in the financial services sector. Baig et al. (2022) explain "Fintech Ecosystem" is widely recognized to describe the interdependencies and potential for innovative value creation. This process involves working together to create new products, meet customer demands, and eventually integrate subsequent waves of innovation. Frost (2020) explains variations in regulations across different markets and the possibility of regulatory arbitrage. Ensuring that such cross-border expansion is accompanied by sufficient cooperation between global regulators. This collaborative approach will help maintain financial stability, protect consumers, and support fintech firms operating in multiple jurisdictions.

The rest of the paper is organized as follows: Section 2 covers the previous related literature. Section 3 explains the research method and data sources of variables for the estimation of data analysis. Section 4 analyzed the chosen financial indicators to test the hypothesis and obtained empirical results. Finally, Section 5 concludes the research study and provides policy recommendations and future research suggestions.

2. Literature review

Barrientos (2007) has defined economic convergence as a process in which countries attain the same level of economic growth. From previous literature, the studies used beta convergence and gamma convergence methods to estimate economic convergence. Aghion (2004) has estimated countries' convergence hypothesis for financial development. The foundation of this study is based on Schumpeter's Growth Theory for different economies. The convergence of financial development is possible with three concepts: (i) coverage of the cost of technology transfer, (ii) the prior level of threshold investment with adequate transfer technologies, and (iii) Provision of external finance to technological innovators by agencies. This study found that financial intermediation and economic growth have a significant positive association. This study uses private credit indicators as a proxy variable of financial intermediation. Private credit, including liquid liabilities, is crucial to financial development.

Durlauf et al. (2005) have suggested that the field of growth econometrics is still in its infancy, highlighting the need for researchers to innovate and develop novel econometric approaches to test the convergence hypothesis effectively. Specifically, they highlight the need for novel methodologies to assess both the transitional dynamics of growth paths and the long-term convergence of various economies. Fung (2009) improves the traditional convergence test by considering how the financial and real economic sectors interact. The author examines whether economic and financial development diverges or converges. Credit given to the private sector and quasi-money were used by the author as two separate variables to represent financial development. According to the results of his study, economic and financial development is converging conditionally in middle-income and high-income countries.

Capital investment in financial services has increased because of a global trend towards financial liberalization and the shift to market-based structure economies. By opening new branches in urban and rural areas, domestic and foreign banks have taken advantage of this chance to reduce the distance between them and their clients. Demirgüç-Kunt and Klapper (2012) has explained that accessibility to financial institutions has a big impact on people's decision to use financial services. Therefore, even if the institutions and technical knowledge remain the same, reducing the physical distance can have a positive effect on the integration of households and businesses into the formal financial system.

Apergis et al. (2012) have estimated the convergence of financial development to examine convergence with various financial intermediaries through the club convergence method. The indicators of financial intermediaries are financial institutions, including banks, Assets/GDP, Deposits/GDP, Real PCGDP, and fixed capital investments. This study did not find any existence of convergence in countries. Bregu et al. (2021) have examined whether innovative services' benefits apply to all developing countries. M-Pesa is a technological service provided through formal channels for saving and other remittance purposes. This service has provided chances for service providers working in the formal market. This study has examined the literature on M-Pesa application in cross-country analysis. The findings highlighted the factors influencing mobile money diffusion are mobile market landscape, financial alternatives, regulation environment and market share of service providers. Ibrahim and Aliero (2020) have examined the relationship between financial inclusion and income convergence. The dataset used in this study is based on longitudinal three waves of a household survey of Nigeria through quantile regression. This study demonstrated the strong relationship between per capita income and financial inclusion. The initial wave demonstrated the result of income divergence. However, in the second wave, income convergence existed in the middle-income and higher-income countries, and finally, the lowest income level converged in the third wave.

An inclusive financial system is vital in reducing extreme poverty, promoting sustainable, inclusive economic growth, growing prosperity, and enhancing overall economic development. These systems can bring tangible benefits to individuals belonging to impoverished and low-income segments of society; while this perspective mainly focuses on macro-level outcomes, the suggested theory of change primarily addresses the effects at the household and entrepreneurs. By establishing an inclusive financial system, Isukul et al. (2019) have suggested individuals from low-income backgrounds gain access to opportunities for saving, borrowing, and building financial assets. Furthermore, financial inclusion facilitates individuals to invest in businesses and entrepreneurial ventures. Moreover, financial inclusion empowers the underprivileged to manage their consumption patterns more effectively and protect themselves against socioeconomic vulnerabilities. Cull et al. (2021) enhance the inclusivity of financial sectors and play a crucial role in mobilizing savings and investments within the productive sector. Additionally, it helps reduce information, contracting, and transaction costs across the entire economy, leading to economic growth.

Yang et al. (2021) analyzed the convergence in the banking industry, which examined the corporate social responsibility (CSR) convergence in China and Nordic countries. The top eight banks are selected as a sample study based on eight CSR reporting categories, including 60 indicators. The findings of this study are the existence of convergence in Chinese banks and Nordic Banks. Nguyen et al. (2021) have estimated the convergence in financial inclusion among the provinces of Vietnam. The Kernel Density distribution technique is used to estimate the convergence of provinces. This study found that financial inclusion boosts

in urban areas compared to rural-based provinces. Das et al. (2021) have estimated the convergence of credit in the districts of West Bengal. This study examines the relationship between per capita credit and average growth rate among the districts during 1980-2014 through unit root models, beta-convergence, and sigma-convergence. The finding of this study showed the divergence among districts.

Avoumatsodo (2023) identified the degree to which financial development has influenced the adoption of new technologies as a factor influencing the variations in the convergence of the productivity gaps worldwide. The examination of sectoral convergence assumes that if every nation possessed the same levels of aggregate production and financial institution development, they would employ technology equally. However, it is important to consider other elements, such as firm coordination, in this research. Dar and Nain (2023) investigated the convergence of financial development among SAARC members from 1990 to 2020. The timeframe is determined by data availability and the initiation of affiliate-wide financial reform policies. A border and comprehensive index measuring financial development is constructed using PCA. This study evaluated unconditional convergence and conditional convergence using panel techniques. However, after controlling for various economic and institutional factors, this study finds no evidence for convergence. Important determinants of the financial development of South Asian Association for Regional Cooperation (SAARC) nations include economic growth, institutions, trade openness, and government expenditure. The results of the study indicate that the members of the SAARC have not been able to derive advantageous outcomes from their collaborative efforts within the area. Martinho (2023) has examined that international organizations and governments have implemented efforts to promote the convergence of socioeconomic indicators between countries. Convergence in policy measures contains external and internal shocks during the COVID-19 pandemic and global financial crisis. This study investigated convergence related to the pandemic. The findings of the study suggested that the pandemic affected the financial convergence, but the magnitude is less as compared to during the global financial crisis.

This study contributes to the convergence of financial inclusion among LI and LMI countries. Previous literature has covered the rare studies of financial inclusion among regions and states within a single country. Previous literature supported the convergence of financial development in cross-country analysis. Therefore, financial development is linked with financial inclusion via channels of financial transactions. This study estimates the progress in achieving financial inclusion and economic growth in LI and LMI countries. Furthermore, examines the impact of the size of financial intermediaries linked with financial inclusion.

3. Research Methodology

3.1 Variables and Data Sources

The sample for this study was chosen from LI and LMI countries due to the prevalence of financial inclusion exploitation in these nations. These nations are under external pressure

to enhance financial inclusion in order to achieve macroeconomic stability within their borders. However, in doing so, they encounter many risks associated with financial inclusion, including issues related to consumer protection, fraud, and cybercrimes. Moreover, these economies possess few resources to effectively address the challenge of mitigating financial inclusion risk. The research methodology employed in this study is the stratified convenience sample technique, which has been chosen to investigate the subject of financial inclusion in LI and LMI economies. The selection of countries for analysis is based on the availability of data pertaining to pertinent indicators. The sample study for this research project includes a selection of 39 nations out of a total of 82 countries in the specified groupings. These 39 countries were chosen based on the availability of required data, with 9 classified as LI countries and 30 classified as LMI countries. Table 1 defines the list of financial indicators used to estimate the convergence hypothesis.

Table 1
Description of Financial Indicators

Financial Indicators	Description	Data Source
Financial Inclusion Index	The financial inclusion index is constructed through four dimensions: financial access, financial Usage, Communication Technology, and banking cost. Financial Access includes the indicators of Commercial bank branches per 100,000 adults, Commercial bank branches per 1,000 km ² , ATMs per 1000 adults, and ATMs per 1000 km ² . Financial Usage includes the indicators of Outstanding loans from Commercial Banks, Outstanding deposits to Banks, Gross domestic savings, and financial system deposits. Infrastructure and Communication Technology include Services, value-added, access to electricity, fixed broadband subscriptions, and Mobile cellular subscriptions. Banking Costs include the indicators of Bank cost to income ratio and Bank overhead costs to total assets.	Financial Access Survey and World Development Indicators
Bank Branches per 100,000 people	Total branches 100,000 inhabitants of the country.	FAS, IMF
ATMs per 100,000 people	Total ATMs per 100,000 inhabitants of the country.	FAS, IMF
Bank branches per 1000 km ²	The total branches per thousand square kilometers area of the country.	FAS, IMF
ATMs per 1000 km ²	Total ATMs per 1000 km ² area of the country	FAS, IMF
Outstanding deposits to commercial banks	Total deposits made to banks by financial institutions.	FAS, IMF

Table to be continued

Outstanding loans from commercial banks	Loan outstanding of commercial banks	FAS, IMF
Financial System Deposits to GDP (% of GDP)	All deposits per GDP by banks and financial institutions	International Financial Statistics (IFS), IMF
Gross domestic savings (% of GDP)	The total disposable income deducts consumption	World Development Indicators (WDI), World Bank (WB)
Services, value added (% of GDP)	Services included value added in retail trade	WDI, WB
Access to electricity (% of population)	Access to electricity in the population	WDI, WB
Fixed broadband subscriptions (per 100 people)	The population with fixed high-speed internet subscribers.	WDI, WB
Mobile cellular subscriptions (per 100 people)	Subscribers of mobile phone services using cellular technology.	WDI, WB
Bank cost to income ratio (%)	Bank's operating expenses are calculated as the sum of others operating income and net interest revenue	Global Financial Development (GFD), WB
Bank overhead costs to total assets (%)	The portion of operating expenses in total assets	GFD, WB
GDP per Capita growth	Country's GDP divided by population	World Bank
Bank credit to bank deposits (%)	Comparative financial intermediation growth indicator shows bank credit to deposit ratio. Banks that run efficiently and invest heavily in credit have a higher ratio.	World Bank
Central bank assets to GDP (%)	Central bank GDP has higher values for this index imply a less developed financial system, which hinders economic progress.	World Bank
Liquid liabilities to GDP	This measure of financial intermediation includes data from deposit money banks, the central bank, and other financial institutions.	World Bank

The span of this study of 39 sample countries including 9 low-income countries Burkina Faso, Guinea, Madagascar, Mali, Mozambique, Niger, Rwanda, Uganda, Zambia and 30 lower-middle income economies including Algeria, Angola, Bangladesh, Benin, Bolivia, Cabo Verde, Cambodia, Cameroon, Côte d'Ivoire, Egypt, El Salvador, Ghana, Honduras, India, Indonesia, Kenya, Kyrgyz Republic, Lesotho, Mauritania, Mongolia, Morocco, Nepal, Nigeria, Pakistan, Philippines, Senegal, Tunisia, Ukraine, Vietnam and Zimbabwe are from 2010 to 2021.

3.2 Club Clustering and Convergence Model

Phillips and Sul (2007) cluster club convergence methodology is an empirical technique for researching economic transition and convergence. It extends the technology-enhanced neoclassical growth model under spatial and temporal heterogeneity. This method differs from others, considering transitional divergence a potential consequence that does not preclude growth convergence. This possibility is realized empirically by incorporating time series and cross-sectional heterogeneity into the neoclassical model's technological parameters. Consequently, the transition dynamics of real per capita income have the following functional shape:

$$\text{LogPCG}_{it} = \text{Log}\ddot{PCG}_i + \text{Log}T_{i0} + [\text{LOG}\overline{PCG}_{i0} - \text{LOG}\overline{PCG}_i]e^{-\beta^i} + v_{it}t$$

Let PCG_{it} represent the per capita growth of country i at time t ; The initial and steady-state levels of per capita real income are denoted as \overline{PCG}_{i0} and \overline{PCG}_i , respectively. The symbol v_{it} represents the time-varying coefficient of the exponential function that describes the evolution of these levels the current status of technology T_{i0} , specifically in terms of its advancements and applications of country i at time t , while β^i denotes the adjustment speed of country i at that particular time. This model expands upon the neoclassical growth model by incorporating the concept of convergence rate.

The rate of technical progress, denoted as β^i , is country-specific and subject to temporal variation. As the variable $e^{-\beta^i} \rightarrow 0$ as $t \rightarrow \infty$ approaches infinity, the logarithm of LogPCG_{it} follows a long-term trajectory that is ultimately determined by the term $v_{it}t$.

$$\text{LogPCG}_{it} = d_{it} + v_{it}t$$

The variable d_{it} encapsulates the transitional dynamics, while the variable $v_{it}t$ depicts the idiosyncratic routes of technological progress across time. The component referred to as $v_{it}t$ encompasses aspects that are universally shared by countries. The common factor technology is symbolized by ρ_{it} . The second equation can be reformulated as.

$$\text{LogPCG}_{it} = \frac{(d_{it} + v_{it}t)}{\rho_i} \rho_t = \rho_t \sigma_{it}$$

Cross-country disparities in real the symbol ρ_t represents the shared steady growth path, which is the underlying unobservable factor. The symbol σ_{it} indicates a time-varying factor loading that captures the individualized transition route of country i towards ρ_t . Therefore, the variable σ_{it} quantifies the degree to which country i derives advantages from the shared technological advancements. During the transitional period, the variable σ_{it} exhibits fluctuations. If the country approaches to ρ_t , then the individual transition coefficient, denoted as H_{it} , approaches the value of σ_{it} as $t \rightarrow \infty$ approaches infinity.

$$H_{it} = \frac{\text{Log}PCG_{it}}{\frac{1}{N} \sum_{i=1}^N \text{Log}PCG_{it}} = \frac{\sigma_{it}}{\frac{1}{N} \sum_{i=1}^N \sigma_{it}}$$

It provides the output logarithm of country *i* as a percentage of the average output logarithm of all the countries at time *t*, when the relative transition coefficient, H_{it} , approaches unity as $t \rightarrow \infty$, or, in other words, when:

$$\widehat{H}_{it} = \frac{1}{N} \sum_{i=1}^N (H_{it} - 1)^2 \rightarrow 0 \text{ as } t \rightarrow \infty$$

It is necessary to estimate σ_{it} in order to achieve convergence. When one takes into account both the geographical and temporal aspects, there are too many parameters to evaluate. In order to tackle this matter, researchers put out the subsequent semiparametric characterization of σ_{it} :

$$\sigma_{it} = \sigma_i + \varphi_{it} L(f)^{-1} t^{-\theta}$$

The time-invariant part of the country-specific factor loading, denoted as σ_{it} , is influenced by various factors. The function $L(f)$, which represents a slowly varying increasing trend, tends to increase indefinitely as *t* approaches infinity. The parameter α represents the decay rate of the cross-sectional variation over the transitions, indicating the speed at which convergence occurs. Additionally, the random error variable φ_{it} is weakly autocorrelated and follows an distribution (independent and identically) with mean 0 and standard deviation 1.

The technique of the Phillip and Sul (2007) framework consists of two distinct steps. The evaluation of panel convergence involves the utilization of the log t-test. Additionally, a clustering method is employed to execute the log t-test on subsets of data in cases where the null hypothesis of convergence is rejected for the entire sample.

Null Hypothesis $H_0: \sigma_i = \sigma$ with $\theta \geq 0$ for all *i*

Alternative Hypothesis $H_1: \sigma_i \neq \sigma$ for all *i* $\sigma_i = \sigma$ with $\theta < 0$

These hypotheses suggest a state of overall divergence if $\sigma_i \neq \sigma$ for all *i* with $\theta < 0$, or a state of club convergence with if $\sigma_i \neq \sigma$ for all *i* with $\theta < 0$. The log t-regression model is formulated under the null hypothesis of growth convergence.

$$\log(\widehat{H}_1 / \widehat{H}_t) - 2 \log L(f) = c + \bar{\beta} \log t + \varepsilon_{it}$$

For $t = \{RT\}, \{RT\}+1, \dots, T$ and $L(f) = \log t$ upto 5. Here $RE[0.2, 0.3]$ the term “fraction” refers to the proportion of the original sample that is eliminated prior to doing the regression analysis. The process of data trimming allows for a more concentrated analysis of the transitional dynamics during the latter time, aligning with the desired asymptotic features of the test.

The statistical analysis, namely the one-sided t-test, is conducted to test the hypothesis of $\theta \geq 0$ using $\beta = 2\theta$ and employing Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors. The null hypothesis of convergence is rejected at the 5% level if the chi-square statistic exceeds the critical value $t_b < -1.65$.

3.3 Estimation of Financial Inclusion Index

The financial inclusion index is estimated through two methods. The first method, Principal Component Analysis (PCA), estimates four index dimensions. These dimensions are financial access, financial usage, infrastructure & communication technology, and banking cost. The dimension results are further estimated for the weight of the final index. Finally, the second method is the Euclidian distance method applied to estimate the final index. The weight given based on the PCA method are financial access (0.3), financial usage (0.2), Infrastructure & Communication Technology (0.3), and banking cost (0.2). The computation of the following index is as follows:

$$I_1 = \frac{\sqrt{d_1^2 + d_2^2 + d_3^2 + d_4^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2 + w_4^2}}$$

$$I_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)^2 + (w_4 - d_4)^2}}{\sqrt{w_1^2 + w_2^2 + w_3^2 + w_4^2}}$$

$$Index = \frac{I_1 + I_2}{2}$$

Here d is the dimension of the index and final index is computed on the basis of Euclidean Distance method.

4. Results and Discussion

For the estimation convergence, the club convergence technique is used to estimate through the financial inclusion index, GDP per capita Growth, Branches per 1000 km², Bank credit to bank deposits, central bank assets to GDP and liquid liabilities to GDP.

4.1 Panel Convergence

Table 2 reports the test of the full convergence hypothesis for the financial inclusion index, GDP per capita Growth, Branches per 1000 km², Bank credit to bank deposits, central bank assets to GDP, and liquid liabilities to GDP. According to the convergence methodology of Philips and Sul (2007), if the log t-test result is less than the crucial value of -1.65, the null hypothesis of convergence is rejected. From the analysis, the t-statistic is -3.0247 for the financial inclusion index, the t-statistics is -36.438 for commercial bank branches per 1000 km², the t-statistics is -6.2973 for bank credit to bank deposits, the t-statistics is 24.145 for liquid liabilities to GDP and the t-statistics is -5.65 for central bank assets to GDP, which is smaller than -1.65 at 5% significant level. Thus, the null hypothesis is rejected for 2010-2021 and panel divergence. On the other side, per capita growth t-statistics is -0.8544, which is greater than the critical value of -1.65 at a 5% significance level, which supports the convergence of per capita growth in LI and LMI countries.

Table 2
Test for Panel Convergence

Variable	Countries	b-coefficient	t-statistics	Remarks
Financial Inclusion	Honduras, Cameroon, Zimbabwe,	-1.6347	-3.0247	Divergence
Per Capita Growth	Madagascar, Niger, Mali, Algeria,	-0.3429	-0.8544	Convergence
Commercial Bank Branches per 1000 km ²	Philippines, Tunisia, Cambodia, Benin, Bolivia, Guinea, Rwanda, Nigeria, Mauritania, Lesotho,	-0.9841	-36.4380	Divergence
Bank credit to bank deposits	Mongolia, Kenya, India, Ukraine, Vietnam, Bangladesh, Angola,	-0.9129	-6.2973	Divergence
Central Bank Assets to GDP	Egypt, Senegal, Zambia, Côte d'Ivoire, El Salvador, Morocco, Burkina Faso, Nepal, Kyrgyz	-0.7670	-5.65	Divergence
Liquid Liabilities to GDP	Republic, Ghana, Indonesia, Pakistan, Uganda, Mozambique, Cabo Verde	-1.2696	-24.1447	Divergence

4.2 Club Convergence Hypothesis

Table 3 shows that the convergence club has an estimated five cluster clubs. Three countries (Bolivia, Mongolia, and Nepal) out of the thirty-nine countries from the first club are converging, whereas the second club, including six countries (Honduras, India, El Salvador, Morocco, Ghana and Tunisia) are converging with t- statistic is -0.04 at 5% level of significance. The third club (Bangladesh, Cabo Verde, Cambodia, Egypt, Indonesia, Mauritania, Pakistan, and Ukraine), including eight countries, converges with a t-statistic of -0.675 at a 5% significance level. The fourth club (Benin, Burkina Faso, Côte d'Ivoire, Kenya, Kyrgyz Republic, Philippines, Rwanda, Senegal, Zimbabwe), including nine

countries, converges with a t-statistic equal to -1.183 at a 5% level of significance. The fifth club (Algeria, Angola, Cameroon, Guinea, Lesotho, Madagascar, Mali, Mozambique, Niger, Nigeria, Uganda, Vietnam, and Zambia), including thirteen countries, converges with the t-statistic is -1.604 at 5% level of significance.

Table 3
Financial Inclusion: Convergence Club Hypothesis

Clubs	Countries	b-coefficient	t-statistics	Remarks
Club 1	Nepal, Bolivia, Mongolia.	0.118	0.708	Convergence
Club 2	Honduras, India, El Salvador, Morocco, Ghana, Tunisia.	-0.048	-0.049	Convergence
Club 3	Cambodia, Mauritania, Cabo Verde, Indonesia, Egypt, Bangladesh, Pakistan, Ukraine	-0.226	-0.675	Convergence
Club 4	Rwanda, Benin, Philippines, Zimbabwe, Burkina Faso, Kenya, Côte d'Ivoire, Senegal, Kyrgyz Republic.	-3.018	-1.183	Convergence
Club 5	Nigeria, Angola, Algeria, Zambia, Vietnam, Uganda, Guinea, Mozambique, Cameroon, Lesotho, Madagascar, Niger, Mali.	-5.444	-1.604	Convergence

Table 4
Commercial Banks Branches per 1000 km²: Convergence Club Hypothesis

Club	Countries	b-coefficient	t-statistics	Remarks
Club 1	Nepal, Cabo Verde, Philippines, India, Pakistan	-0.1840	-1.1785	Convergence
Club 2	Cambodia, El Salvador, Morocco, Tunisia, Indonesia, Ghana,	0.2809	0.5878	Convergence
Club 3	Vietnam, Senegal, Kenya, Bolivia, Honduras, Côte d'Ivoire, Rwanda, Lesotho, Nigeria, Egypt, Uganda, Kyrgyz Republic, Benin	-0.2825	-1.0691	Convergence
Club 4	Zimbabwe, Cameroon, Angola, Madagascar, Mongolia, Algeria, Niger, Burkina Faso, Mozambique, Guinea, Zambia, Ukraine, Mauritania, Mali	-0.0905	-0.2596	
Non-Converging	Bangladesh			

Table 4 reports the result of Commercial Bank Branches per 1000 km². It observes four different clubs with t-statistics equal to -1.1785, 0.5878, -1.0691, and -0.2596 at a 5% level of significance, in which all four clubs are converging, and Bangladesh is the single non-converging country. Club one includes five countries (Cabo Verde, India, Nepal, Pakistan, Philippines), club two includes six countries (Cambodia, El Salvador, Ghana, Indonesia, Morocco, Tunisia), club three includes thirteen countries (Benin, Bolivia, Côte d'Ivoire, Egypt, Honduras, Kenya, Kyrgyz Republic, Lesotho, Nigeria, Rwanda, Senegal, Uganda, Vietnam), and club four includes fourteen countries (Algeria, Angola, Burkina Faso, Cameroon, Guinea, Madagascar, Mali, Mauritania, Mongolia, Mozambique, Niger, Ukraine, Zambia and Zimbabwe).

The evidence of convergence in five clubs for the test of financial inclusion reveals that the gap in financial inclusion between these countries is shrinking and achieving higher growth in finance at affordable cost. The failure in convergence of all countries is the gap in the level of advancement of financial technology adopted by many countries. The convergence of financial inclusion is possible in subgroups that share the same intensity of financial stability. Fintech is a booster to achieve financial inclusion in the economy while reducing the infrastructure cost of establishing Bank Branches in unbanked and underserved areas. Bahadir and Valev (2015) suggested that regulations in financial institutions also play a significant role in achieving financial inclusion. Financial services in the banking industry have undergone rapid changes since the conclusion of the major crisis from 2007 to 2010. Emerging business models that embrace the convergence of numerous technical developments have sparked these shifts by questioning long-standing and established industry conventions. Ketterer (2017) analyzed that transformative developments in the industry will likely lead to improved and expanded access to financial resources for companies and individuals, which results from inclusion within the financial system. However, certain obstacles and risks could hinder or delay this process. Identified barriers include the response of existing industry players, the need for appropriate and timely regulation, affordable and reliable digital connectivity (such as broadband access), and the potential for unforeseen and highly disruptive changes arising from the payments sector.

Fintech firms can initiate the new era of digital finance, increasing financial access to unbanked areas. Aziz and Governor (2015) explains that Base-of-the-pyramid (BoP) providers function as collective investment vehicles, possessing features that expose them to the possibility of runs. Such providers may include financial cooperatives accepting savings, microfinance and microcredit organizations authorized to take deposits or loans and subject to different regulations from traditional bank deposits, and nonbank financial institutions issuing e-money. However, the current scale of such activities is not likely to pose systemic risks in most markets. If banks significantly refinance microcredit or other BoP credit portfolios (especially if they use these lenders to bypass regulation and supervision) and nonbank financial institutions acting as collective investment vehicles, it could potentially lead to

destabilization. This risk may be exacerbated if micro-lenders can offer long-term loans and investment products alongside microcredit, increasing maturity and liquidity transformation risks.

Table 5 reports the results for Bank Credit to Bank Deposit. The club convergence algorithm results indicate four clubs with t-statistics for the first club is 1.5907, including three countries, Bolivia, Cambodia, and Tunisia, while the second club with t-statistic of 0.2517, including countries Rwanda, Bangladesh, Senegal, Mali, Nepal, El Salvador, Niger, Kenya, Kyrgyz Republic, Mongolia, Cameroon, Mauritania, Madagascar, and Honduras. The t-statistics for the third club, including countries are Uganda, Morocco, Benin, Algeria, Indonesia, Lesotho, Cabo Verde, Ghana, Mozambique, India, Ukraine, Philippines, Guinea, Zimbabwe, Côte d'Ivoire, Pakistan, Burkina Faso, Nigeria and Egypt with t-statistics is -1.6428 at 5% significance level and fourth club including countries are Angola, Zambia with t-statistics is -0.1566 at 5% significance level. The potential for deposit growth exists when more individuals and businesses engage with banking services and initiate payment transactions. Initiatives aimed at promoting financial inclusion can have an impact on the bank credit-to-deposit ratio. Simultaneously, as financial inclusion expands, there may be a parallel rise in the demand for loans, thus influencing the credit component of the ratio. Bank credit to bank deposit ratio, central bank assets to GDP, and liquid liabilities to GDP are the measures of financial development. Apergis et al. (2012) analyze financial inclusion as interconnected with financial development as the stronger the financial sector boosts consumer confidence and influences investing in financial institutions.

The higher participation rate enables banks to expand their branches to cover a larger population and earn profitability on these services. The banking industry faced imperfect financial structure, and religious barriers revolutionized the economy. This transformation boosts the banking industry, and some countries approve the IMF stabilization programs for the financial system transition. IMF reports show these economies' economic rankings and financial indicators have improved. The collaboration of the banking industry with non-bank financial institutions can revolutionize the economy.

Table 5

Bank credit to bank deposits (%): Convergence Club Hypothesis

Clubs	Countries	b-coefficient	t-statistics	Remarks
Club 1	Bolivia, Cambodia, Tunisia	0.5921	1.5907	Convergence
	Rwanda, Bangladesh, Senegal, Mali, Nepal, El Salvador, Niger, Kenya,			Convergence
Club 2	Kyrgyz Republic, Mongolia, Cameroon, Mauritania, Madagascar, Honduras	0.0450	0.2517	Convergence
	Uganda, Morocco, Benin, Algeria, Indonesia, Lesotho, Cabo Verde, Ghana, Mozambique, India,			
Club 3	Ukraine, Philippines, Guinea, Zimbabwe, Côte d'Ivoire, Pakistan, Burkina Faso, Nigeria, Egypt	-0.3339	-1.6428	Convergence
	Club 4			
Non- Converging Group	Vietnam			

Table 6

Central bank assets to GDP (%): Convergence Club Hypothesis

Clubs	Countries	b-coefficient	t-statistics	Remarks
Club 1	Bolivia, Benin, Philippines, Nigeria, Kenya, Morocco, Mozambique, Algeria, Mali, Kyrgyz Republic, Tunisia	-.1910	-.9795	Convergence
	Burkina Faso, Zambia, El Salvador, India, Madagascar, Vietnam, Pakistan, Côte d'Ivoire, Indonesia, Lesotho,			Convergence
Club 2	Egypt, Niger, Ghana, Cambodia, Cabo Verde, Honduras, Mongolia, Guinea, Bangladesh, Nepal, Ukraine, Uganda, Angola, Cameroon, Senegal, Mauritania, Zimbabwe, Rwanda	-.0581	-.1626	

Table 6 reports the results for variable central bank assets to GDP. From the analysis, the formation of two main clubs, with 11 countries (Algeria, Benin, Bolivia, Kenya, Kyrgyz Republic, Mali, Morocco, Mozambique, Nigeria, Philippines, Tunisia) in club one and 28 countries (Burkina Faso, Zambia, El Salvador, India, Madagascar, Vietnam, Pakistan, Côte d'Ivoire, Indonesia, Lesotho, Egypt, Niger, Ghana, Cambodia, Cabo Verde, Honduras, Mongolia, Guinea, Bangladesh, Nepal, Ukraine, Uganda, Angola, Cameroon, Senegal, Mauritania, Zimbabwe, and Rwanda) converging in club two. Central bank asset to GDP convergence varies per country. A country's economic and monetary policy dynamics can be understood by comparing GDP and central bank assets. Financial crises and global economic changes like international trade affect central bank holdings. Countries may converge as they adapt to global practices for global convergence.

Table 7

Liquid liabilities to GDP (%): Convergence Club Hypothesis

Clubs	Countries	b-coefficient	t-statistics	Remarks
Club 1	Bolivia, Cabo Verde, Cambodia, Morocco, Nepal, Vietnam.	-.09	-0.12	Convergence
	Mali, Tunisia, Egypt, Algeria, Bangladesh, Mongolia, India,			Convergence
Club 2	Philippines, Mozambique, Honduras, Pakistan, Kyrgyz Republic, Côte d'Ivoire, Senegal, Burkina Faso and El Salvador	-.19	-1.02	Convergence
	Rwanda, Ghana, Mauritania, Indonesia, Angola, Zambia Nigeria, Ukraine, Benin, Lesotho, Madagascar, Kenya and Guinea			
Club 3	Cameroon, Niger, Uganda, Zimbabwe	0.8	0.53	Convergence

Table 7 reports the results for these liquid liabilities to GDP. The club convergence algorithm results indicate four convergent clubs with t-statistics equal to -0.12, -1.02, -0.18, and 0.53, respectively. Club one contains six countries (Bolivia, Cabo Verde, Cambodia, Morocco, Nepal, Vietnam), while club two includes sixteen countries (Mali, Tunisia, Egypt, Algeria, Bangladesh, Mongolia, India, Philippines, Mozambique, Honduras, Pakistan, Kyrgyz Republic, Côte d'Ivoire, Senegal, Burkina Faso, and El Salvador), club third including thirteen countries (Mali, Tunisia, Egypt, Algeria, Bangladesh, Mongolia, India, Philippines, Mozambique, Honduras, Pakistan, Kyrgyz Republic, Côte d'Ivoire, Senegal, Burkina Faso, and El Salvador) and fourth club including four countries (Cameroon, Niger, Uganda and Zimbabwe) are converging. Liquid liabilities converging with GDP signifies the dynamic changes within a nation's financial and economic framework. As nations undergo the process of development and modernization, there is a tendency for their financial systems

to experience deepening, resulting in an increase in the proportion of liquid assets to GDP. The ratio has the potential to offer valuable insights into a nation's financial stability, the level of accessibility of its financial services, as well as its advancements in the realm of economic development. It is essential to note, however, that not all nations will experience the same convergence rate, as various policies and factors can influence the speed and direction of this trend.

5. Conclusion and Policy Implications

This study concludes there is absence of financial inclusion convergence for all countries while these countries converge towards stable economic growth. However, convergence exists in cluster clubs of financial inclusion, economic growth, financial availability, and financial development. Convergence in countries can be possible through credit intermediation, a channel in which borrowers can get loans from creditors and ensure prudential regulations in which creditors are repaid timely. Banking regulations are mandatory for the efficient provision of credit intermediation. The degree of public trust in banks and nonbank credit intermediaries impacts banking stability. Innovations like BOP products are concerned with providing digital financial services and prudential regulatory measures. The credit, proceeds through digital transaction platforms, have limited access to formal financial intuitions. BOP service providers act as financial channels for the provision of financial inclusion. These services include bank deposits, microcredit organizations, microfinance, and savings. The digital payment channel can be successful through short-term financing. It is beneficial to enhance the duration of short-term financing of bank credit portfolios and micro-credit refinancing.

Future research studies will work on global financial inclusion policy, which supports policy convergence applicable for all countries and solutions plan for the risk associated with financial inclusion. Some countries are progressing towards preparing the National Financial Inclusion Strategy framework. Those countries still need to prepare the NFIS following the objectives of other countries. Therefore, inclusion convergence is possible if countries prepare a strategic framework to promote financial inclusion. Financial intermediaries also support the growth convergence for LI and LMI countries.

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