Assessing the Impact of Traditional Financial Inclusion and Digital Financial Inclusion on Inclusive Growth: Cross-Country Analysis

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Abstract:

The pace of the development of financial technologies contributes to broadening the role of the financial sector in the economy through enhancing Financial Inclusion (FI). Hence, this expanded the role of the financial sector not to be limited to its impact on economic growth only, but it also affects the inclusive growth pillars. The study analyzed the effect of Traditional Financial Inclusion (TFI) and Digital Financial Inclusion (DFI) on inclusive growth (IG) for 103 countries in the year 2021. This analysis is conducted through a cross-section analysis by developing two multiple regression models and using the OLS method to examine the capability of the technological progress in the financial sector to reap more benefits for inclusive growth in the economy. The results of the study indicate that TFI is statistically insignificant which reflects that TFI is not enough to affect the inclusive growth aspects while the DFI has a positive and

statistically significant impact on inclusive growth at a significance level of 1% in which a 1% increase in the DFI increases inclusive growth on average by 2.73%. Hence, the digital transformation in the financial sector fosters inclusive growth.

Keywords: Traditional Financial Inclusion, Digital Financial Inclusion, Inclusive Growth.

1. Introduction

In the pursuit of sustainable economic development, the concepts of inclusive growth and FI have emerged as critical focal points for policymakers and economists worldwide. Inclusive growth aims at assuring that the benefits of economic expansion are equitably shared among all segments of society, particularly the marginalized and disadvantaged. It is an approach that goes beyond simple economic measurements; it promotes the elimination of poverty, the decrease of inequality, and the improvement of general well-being. According to the Asian Development Bank (ADB), inclusive growth is defined as "growth that is sustainable and broad-based across sectors, and that creates productive employment opportunities, thus ensuring equal access to opportunities and benefits for all segments of society, especially the poor and marginalized." (Rauniyar and Kanbur, 2010). Thus, inclusive growth can create opportunities for different segments in the society which contributes to raising the population prosperity (OECD, 2024). The term "inclusive

development" describes the effort to promote the equitable development of all people, especially marginalized (i.e., extremely poor) groups. This group views inclusive growth as a multifaceted idea, meaning it encompasses more than just income growth. The OECD also emphasizes that inclusive growth is when a nation's entire population shares in the benefits of economic expansion. The goal of the inclusive growth economic model is to guarantee that every segment of society gains from economic advancement. Its main goal is to mitigate poverty and inequality by giving everyone the chance to participate in and gain from economic activity. Inclusive growth involves equitable access to resources, social protection, and the creation of employment opportunities that are accessible to marginalized and disadvantaged groups (Rauniyar and Kanbur, 2010).

An inclusive financial system stimulates inclusive growth that aims at creating an environment in which every individual has seamless access to financial services. Moreover, ensuring the engagement of the path of inclusive economic growth and enables them to receive the corresponding benefits of such growth. The goal of FI is to guarantee that everyone -especially the poor and disadvantaged groups- has access to and uses financial services including bank accounts, credit, and savings accounts. This is achieved by integrating people into the official financial system, specifically the unbanked population—those who have traditionally been excluded from financial services

(Siddik and Kabiraj, 2020). Different authors have identified the concept of FI. However, for the theme of this research, FI is defined as a strategy to facilitate quicker and more convenient access to financing for all societal segments, especially underprivileged ones, to foster inclusive growth. (Siddik and Kabiraj, 2015).

DFI marked the officially acknowledged beginning of the era of digital finance in many countries. DFI is one creative approach to enhance financial inclusivity in the global digital and technological age. It can balance efficiency and equity in economic development and combines inclusion with noteworthy benefits like accessibility and accuracy. It simultaneously advances the essential goals of enhancing living standards and expanding financial services for the economy. This financial service model has a major impact on promoting inclusive growth in the economy and implementing long-term sustainable economic development (Wang and Yu, 2024).

In this context, DFI has come to be seen as a transformative force that has the potential to drastically alter the global financial system (Ozili, 2018). Scholarly investigations into DFI and inclusive growth have predominantly centered on promoting economic growth, mitigating income inequality, easing financing obstacles, and enhancing consumption patterns. (Li and Pang, 2023). Accordingly, the objective of this study is to examine

empirically the impact of TFI and DFI on Inclusive Growth by assessing the role that the financial sector digitalization plays in enhancing inclusive growth. The contribution of the present study to the literature has two pillars; first, it attempts to study the effect of DFI and TFI on inclusive growth as a cross-country analysis by employing the Inclusive Growth Index (IGI) developed by UNCTAD. This index is composed of different dimensions including the economy, equality, living conditions, and the environment. Thus, it offers a multidimensional view of growth that extends beyond the traditional economic growth metrics. It was found in other studies that they focus on one or a number of inclusive growth subdimensions, which would not adequately capture the essence of inclusive growth. Second, the paper constructed two indices for FI through the Principal Component Analysis which are TFI and DFI to consider the general emphasis on its overall impact to take into consideration a structural assessment of how the TFI and DFI affect inclusive growth. Consequently, the empirical results contribute to better understanding for the difference between TFI and DFI policies to enhance inclusive growth across a global country level. The structure of the paper is organized as follows. Section 2 presents the relevant literature review. Section 3 presents a regional analysis of TFI and DFI. This section is followed by the data collection and descriptive analysis in section 4. The empirical

analysis and regression results are explained in sections 5 and 6 respectively. Finally, the conclusion is presented in section 7.

2. Literature Review

2.1. Traditional Financial Inclusion and Inclusive Growth

FI is an important factor for achieving inclusive growth, it enables people to overcome financial shocks, promote future investments, and moderate consumption can all contribute to a reduction in both income inequality and poverty. It is a way for individuals with different income levels to be included in the official financial sector and support the formal economy (Zulfiqar et al., 2016). According to Sarma (2016), FI is the procedure that offers easier access, readiness, and usage of financial services for all individuals in the economy. This justification emphasizes the significance of formal financial services usage and access for the entire society, which is one of the key components of a country's inclusive growth.

Although FI has become a key concern on the international policy agenda for sustainable development, research is still in its early phases where very few studies have addressed the relationship between FI and inclusive growth. Alternatively, most of the research has focused on the effects of FI on economic growth, poverty reduction, and gender inequality. The significance of FI in fostering economic development and mitigating socioeconomic

gaps has been recognized by a vast array of empirical research. According to Park and Mercado's (2015) analysis of 37 developing Asian economies, FI caused a major difference in the reduction of poverty and income inequality in those nations (Park and Mercado, 2015). Moreover, Sarpong & Nketiah-Amponsah (2022) found in their study about FI and inclusive growth in Sub-Saharan Africa that financial service usage has a measurable and remarkable effect on inclusive growth. In the same vein, Arandara & Gunasekera (2020) in their study of Sri Lanka, highlighted that as financial services become widely accessible to a broader range of the population there will be a corresponding positive impact on the overall economic growth that benefits all socioeconomic aspects and hence promoting inclusive growth.

2.2. Digital Financial Inclusion and Inclusive Growth

DFI is a cutting-edge strategy to improve financial inclusivity in the digital age. It can strike a balance between efficiency and equity in economic development and blend inclusion with noteworthy benefits like convenience and precision. It simultaneously moves the economy closer to the vital objectives of raising living standards and growing financial services to execute shared development and maintain long-term and sustainable economic growth. This financial services model is crucial and has a significant impact on the promotion of inclusive growth in the economy. (Wang and Yu, 2024).

DFI signifies convenience, accessibility, and inclusivity at the macro and micro levels of the economy. From the perspective of the macroeconomic level, DFI fosters several aspects of inclusive growth. It can help the real economy to grow and promote high-quality economic development (Jiang and Jiang, 2020). Additionally, it significantly increases spending by middle- and lower-class households which in turn reduces the differences in income between these groups and their higher-income counterparts (Yi and Zhou, 2018). Moreover, it raises income levels in low-income areas and helps to lessen regional development disparities (Zhang and Zhang, 2022). On the other hand, from the micro-perspective level, studies have revealed that DFI encourages low-income and rural communities' aspirations and initiatives to pursue entrepreneurship (Li and Yu, 2022). Moreover, it improves creativity in businesses and raises total factor productivity (Zhang et al., 2023).

DFI may influence inclusive growth through two main primary paths. First, by minimizing information gaps and capital mismatches, DFI uses digital technologies to reduce information asymmetry in the traditional financial sector. This lowers barriers to accessing financial services and minimizes their associated costs. Hence, it encourages middle- and lower-class groups to engage in the financial sector to reap financial returns which contributes to raising the technological and human capital standards. This in turn leads to the accumulation of wealth and

reduces the income gap (Wang and Yu, 2024). Second, the enhancement of the quality of human capital created by DFI allows individuals with low incomes and those living in economically disadvantaged areas to be more inclined to make investments. Along with improving their access to and utilization of financial resources for investments and credit as well as raising their financial literacy.

Inclusive growth focuses on ensuring equal opportunities throughout the economic process to foster economic growth and reduce income inequality through improving its three key components which are equal opportunity, income equality, and economic growth. DFI is positively influences these aspects by utilizing digital technology to enhance accessibility, lower costs for inclusive financial services, and transform service delivery (Wang and Yu, 2024).

In literature, different studies have investigated the effects of DFI on economic and inclusive growth. Siddik & Kabiraj (2020) have examined the effects of digital finance on FI using data from 2004 to 2016 on 189 countries. They have found that all digital finance proxies have positive effects on economic growth. The study also demonstrated two case studies in India, the results revealed positive effects of digital finance on FI, resulting in the promoting inclusive growth of the country. Another study by Banna et al. (2020) has highlighted that the endorsement of DFI

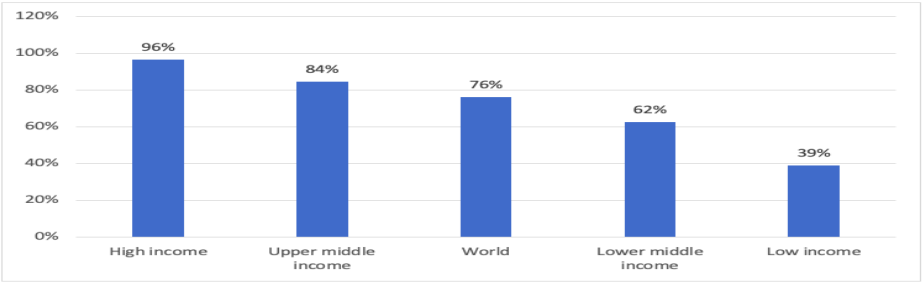
may ensure sustainable economic growth and stability within banks, especially Islamic banks, which is considered a step towards achieving the SDGs. Moreover, Wang and Yu (2024) in their empirical research applied to 31 Chinese provinces from 2011 to 2021 have found a significant impact of DFI on the economic growth of China's east, central, and western regions accompanied by an improvement in income distribution and equal opportunities among individuals. Meanwhile, the study by Shen and Hueng (2021) has emphasized the significant effect of DFI on economic growth in their 105 across-countries analysis. Accordingly, the present study proposes the following hypotheses:

Hypothesis 1: TFI has a positive and significant impact on inclusive growth.

Hypothesis 2: DFI has a positive significant and positive impact on inclusive growth.

3. Regional Analysis of Traditional and Digital Financial Inclusion

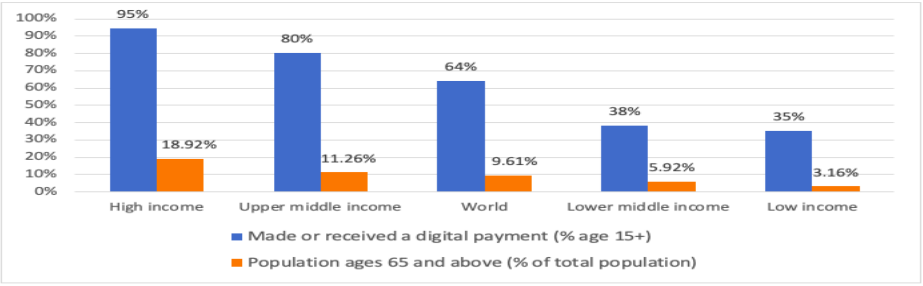
The TFI and DFI differ across different regions of the world. Statistics show that high and upper-middle-income countries tend to have higher percentages of FI. This indicates that there is a correlation between FI and the economic growth of the economy.



Source: Plotted by the authors using data collected from the World Bank database

Figure (1): Adults own a bank account (% age 15+) in 2021

Figure (1) shows that the percentage of adults with a bank account is higher than the world average in high-income and upper-middle-income countries. On the contrary, the percentage of account ownership is low in lower middle- and low-income countries. The statistics in year 2021 who owns a bank account is 96% which indicates that this group of countries are approaching the full TFI. On the other hand, the percentage in low-income countries indicating that less than 50% of the adult population own bank account which indicates that this group of countries needs to devote high efforts to strengthen the TFI to pave the way for the DFI to take place in these countries.



Source: Plotted by the authors using data collected from the World Bank database

Figure (2): Adults Made or Receive Digital Payments (% age 15+) and Population ages 65 and above (% of the total population) in 2021

Figure (2) shows that the percentage of adults who use digital payments is also higher than the world average in high-income and upper-middle-income countries. This is because of the well-developed digital infrastructure in these groups of countries which reflected positively on the DFI. However, high-income countries have the challenge of the age structure of the population as they have a high percentage of elderly age population (above 65 years) as shown in figure (2) shows that high-income countries have a percentage of elderly population almost double the world average. This is considered as an obstacle for these countries to achieve full DFI due to the lower digital literacy among the elder population. On the contrary, the low-income and low middle- income groups are suffering from a lack of access to digital infrastructure which retards the DFI in these countries. However, in contrast to the high-income countries, the age structure in these countries gives a high potential

for the development of digital literacy due to the low percentage of the 65+ population which constitutes 5.92% and 3.16% of the total population in low-middle- and low-income countries respectively. Thus, this group of countries needs to devote more investments for the enhancement of digital infrastructure.

4. Data Collection and Descriptive Statistics

The data used in the study is collected for 105 countries in year 2021. The inclusive growth index is collected from UN Trade & Development (UNCTAD), the urban population (% of the total population) is collected from the World Bank database, the Economic Freedom Index is collected from the Heritage Foundation, the gender inequality index is collected from the World Bank Gender Portal, and the indicators used in the construction of the FI indices are collected from World Bank Findex database.

The descriptive statistics of the abovementioned variables are shown in Table (1).

Table (1): Descriptive Statistics

	INI	DFI	TFI	GIN	EF	URB
Mean	39.74190	-1.29E-16	0.014283	0.295714	64.33204	63.61772
Median	37.00000	-0.355834	0.184165	0.277000	64.00000	66.84900
Maximum	78.10000	3.681699	3.134897	0.680000	89.70000	100.0000
Minimum	8.700000	-2.444318	-3.226396	0.013000	39.10000	18.86000
Std. Dev.	17.72601	1.672488	1.567880	0.193826	9.856293	19.87289
Skewness	0.380679	0.486804	-0.086280	0.154618	-0.089981	-0.329019
Kurtosis	2.158282	2.052592	1.836308	1.714825	2.712545	2.274945
Observations	103	103	103	103	103	103

Source: Authors' calculation by using E-views

5. Empirical analysis

This section empirically analyzes the impact of DFI on inclusive growth by conducting multiple regression models using the OLS method. The inclusive growth index is released by the UNDP for the year 2021, thus a cross-sectional analysis in the year 2021 is conducted for 103 countries that were included in the sample of the inclusive growth index. The study employs two multiple regression models to compare the impact of traditional and DFI on inclusive growth. Principal Component Analysis (PCA) is used to construct two indices for the DFI and TFI to compare the impact of each one of them on inclusive growth. The variables that are used in the construction of the FI indices are shown in Table (2). Gender inequality, economic freedom, and urbanization are included in the regression model as control variables.

Table (2): Financial Inclusion Indicators:

Traditional Financial Inclusion Index	Digital Financial Inclusion Index
Access to bank Infrastructure Number of ATMs per 100,000 adults Number of Branches per 100,000 adults	**Access to digital Infrastructure** Number of mobile cellular subscriptions
Usage Adults with a financial institution account (% age 15+) Adults who own a debit or credit (% age 15+)	**Usage** Adults who use mobile phone or the internet to send money (% age 15+) Adults who use mobile phone or the internet to pay bills (% age 15+) Adults who use mobile phone or the internet to check account balance (% age 15+)

Source: Financial Access Survey (FAS – IMF)

The impact of TFI and DFI on inclusive growth is expressed by the following two equations:

Model (1): $INI_i = ß_0 + ß_1\ TFI_i + ß_2\ GIN_i + ß_3\ EF_i + ß_4\ URB_i + \varepsilon_i$ (1)

Model (2): $INI_i = ß_0 + ß_1\ DFI_i + ß_2\ GIN_i + ß_3\ EF_i + ß_4\ URB_i + \varepsilon_i$ (2)

Where:

INI_i = Inclusive Growth Index in country i.

DFI_i = DFI in country i.

TFI_i = TFI in country i.

GIN_i = Gender Inequality Index in country i

EF_i = Economic Freedom in country i.

URB_i = Urbanization in country i, measured by the urban population (% of total population).

ε_i = error term in country i.

Equations (1) and (2) capture the impact of TFI and DFI on inclusive growth respectively. According to the Principal Components Analysis output in the appendix. For the TFI analysis, PC1 is used in model (1) because its Eigenvalue = 2.433285 > 1 and it explains 60.3% of the variation of the TFI variables as shown in Table A.1 in the appendix. For the DFI analysis, PC1 is used in model (2) as its Eigenvalue = 2.756677 > 1 and it explains 68.92% of the variation of the TFI variables as shown in Table A.3 in the appendix.

6. Regression Results

Model (1) analyzes the impact of TFI on inclusive growth while model (2) captures the impact of DFI on inclusive growth. The two models are designed to detect whether the integration of financial technology and the promotion of the digitalization mechanisms in the financial sector have affected considerably the inclusive growth aspects which reflect the economic, social, and environmental pillars.

The results shown in Table (3) indicate that the change in the explanatory variables explains about 69% of the variation in inclusive growth as represented by the adjusted R-squared. While in model (2), the Adjusted R-squared indicates that the variation in the explanatory variables explains about 71% of the variation in inclusive growth. These results show that the explanatory power is higher for model (2) with the digitalization aspect in explaining the variation in inclusive growth. Thus, it can be concluded that the digitalization of the financial sector can contribute considerably to explaining the variations in inclusive growth.

Table (3): Regression Analysis Results

Model (1)					Model (2)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-43.16697	7.756259	-5.565437	0.0000*	C	-9.512468	11.89578	-0.799651	0.4270
TFI	-0.187197	1.119509	-0.167213	0.8675	DFI	2.734323	0.925827	2.953385	0.0044*
GIN	-12.37908	9.164763	-1.350726	0.1799	GIN	-18.41361	6.920581	-2.660702	0.0099*
EF	1.102089	0.122558	8.992392	0.0000*	EF	0.646134	0.159730	4.045157	0.0001*
URB	0.249426	0.059201	4.213234	0.0001*	URB	0.198496	0.071016	2.795092	0.0069*
R-squared	0.703107				R-squared	0.726380			
Adjusted R-squared	0.690989				Adjusted R-squared	0.708727			
S.E. of regression	9.866896				S.E. of regression	9.062568			
Sum squared resid	9540.853				Sum squared resid	5092.069			
Log likelihood	-379.3740				Log likelihood	-240.1489			
F-statistic	58.02124				F-statistic	41.14792			
Prob(F-statistic)	0.000000				Prob(F-statistic)	0.000000			
Durbin-Watson stat	1.812764				Durbin-Watson stat	1.514034			

Source: Authors' calculation by using E-view

The regression results reveal that the key variable in the model (1) which is TFI is statistically insignificant which reflects that TFI is not enough to affect the inclusive growth aspects. This result is consistent with the study by Amr et al. (2023) who found that TFI measured by no. of ATMs per 100000 adults has an insignificant effect on economic growth in the short run in 6 European countries and Ifediora et al (2022) who found that the usage dimension of the FI has insignificant impact on economic growth in Sub-Saharan Africa. On the contrary, the estimate of the DFI which is the key variable in model (2) shows that DFI has a positive and statistically significant impact on inclusive growth at a significance level 1% in which a 1% increase in the DFI increases inclusive growth on average by 2.73%. This result highlights the role of digital transformation in the financial sector which allows for strengthening the positive impact of the DFI on the economic, social, and environmental aspects in such a way that fosters inclusive growth. This result is consistent with the study of Salman and Ismail (2023) who found that digital finance

contributes significantly to limiting the CO2 emissions in Egypt in the long run which addresses the environmental part in the inclusive growth index employed in this study. It also confirms the results of Shen et al. (2021) who found that DFI has a positive and significant impact on economic growth and a spillover effect on other neighboring countries.

For gender inequality (GIN), the results show that in model (1) it is insignificant while in model (2) it has a negative and significant impact on inclusive growth at a significance level of 1% where a 1% increase in gender inequality leads to a reduction in inclusive growth on average by 18.41%. These results can be attributed to the lower efficiency of traditional financial services in benefiting disadvantaged groups, while digital financial services are more efficient in satisfying the customers' requirements by being tailored to different groups' financial needs which has a higher impact on lowering the gender inequality (Chen et al. 2023). This high value of the gender inequality coefficient explains the negative consequences that can be reflected in the inclusive growth as a result of the exclusion of females from digital financial services. Hence, the higher the percentage of females who are excluded from the financial sector services, the lower will be the inclusive growth in the economy.

These results are consistent with the studies of Suri and Jack (2016) who found that access to the mobile money system in Kenya has a positive and significant impact on per capita consumption by lifting 2% of households out of poverty which is a main cause of the gender inequality. The effect of the mobile money system has impacted more females which showed an improvement in their financial behavior through leveraging their financial resilience, especially for females who left the agricultural sector and joined the business sector. It also supports the findings of Lee et al. (2021) who experimented on rural migrants to urban areas in Bangladesh by introducing mobile banking to very poor classes, they found that extreme poverty was reduced, and consumption increased by 7.5% through transforming the traditional transfer money methods to digitalized alternatives. They have found that the impact was considerable and significant on females. Thus, it is found that the introduction of digital financial services in the model improved the significance of the gender inequality index in terms of its significant impact on inclusive growth.

The economic freedom is statistically significant at a 1% significance level and has a positive impact on inclusive growth in which a 1% increase in economic freedom leads to a 1.10% increase in inclusive growth which decreased to 0.64% by the introduction of the digitalization in model (2). This can be explained by the importance of economic freedom in the conduct

of traditional financial services to impact significantly inclusive growth. The provision of traditional financial services in such a way that includes those who are excluded from the financial sector is considered as the first step that paves the way for the provision of digital financial services to the excluded groups, hence when the economy proceeded in the digital phase, the impact of economic freedom on inclusive growth begin to decline, however, it is still positive and significant in stimulating inclusive growth. This result is consistent with Brkić et al. (2020) and Thuy (2022) who conducted a panel analysis and found that economic freedom stimulates economic growth. For urbanization, the results indicate that it has a positive and significant impact on inclusive growth at a significance level of 1% in which a 1% increase in urbanization leads to a 0.24% increase in inclusive growth which decreased to 0.19% by the introduction of the digitalization in the financial sector. This can be explained by the findings of Pan et al. (2024) who found that the relationship between urbanization and green development which includes the environmental pillar of inclusive growth is a U-shaped relationship. Which means that initially urbanization affects negatively green development due to its negative impact on the environment as a result of the over exploitation of resources to develop urban cities, then it supports green development in the later phases. Since the impact of urbanization on inclusive growth in the present study is positive and

significant, this means that it reflects the second phase of green growth which is part of the inclusive growth index indicating the higher level of urbanization that impacts inclusive growth positively. In this phase, as urbanization surges, green technology replaces the construction of infrastructure. Thus, it can be concluded that the lower effect of urbanization on inclusive growth in model (2) which integrates digital services compared to model (1) is due to the more effective role of digital transformation in inclusive growth which overwhelms the impact of urbanization as green technologies in this phase begin to replace the construction of infrastructure in driving and stimulating inclusive growth.

7. Conclusion

The study analyzed the impact of TFI and DFI on inclusive growth to capture the different dimensions of the growth of the economy rather than tackling the economic growth solely. The study concluded that the integration of financial technology into the financial sector is essential to foster inclusive growth. This is because the traditional techniques for FI are not enough to enhance and foster inclusive growth in the digital era. This is shown in the insignificant impact of TFI on inclusive growth which was changed to a positive and significant impact for the DFI on inclusive growth. This result highlights the necessity of devoting more investments to digital infrastructure, especially in developing countries that suffer from the

lack of access to digital financial services as a result of the weakness of digital services in this group of countries. In the meanwhile, developing countries has a high potential to promote DFI due to the age structure in this group of countries which is characterized by a very low percentage of elderly population. On the contrary, developed countries have a strong digital infrastructure but suffer from the obstacle of the high percentage of the elderly population which needs higher efforts to develop digital literacy among this age group of population.

References:

Amr, N., Yasser, N., & Raafat, A. (2023). Evaluation of the Financial Inclusion's Effect on Economic Growth: Evidence from Selected European Countries. *Evaluation*, 2(2), 81-101.

Arandara, & Gunasekera, S. (2020). Financial Inclusion and Inclusive Growth: What Does It Mean for Sri Lanka?. *World Bank Policy Research Working Paper*, (9204). http://dx.doi.org/10.2139/ssrn.914525

Banna, H., Hassan, M. K., and Alam, M. R. (2020). Digital Financial Inclusion, Islamic Banking Stability and Sustainable Economic Growth. *Islamic Perspective for Sustainable Financial System*, 131-152. DOI: 10.26650/B/SS10.2020.017.07

Brkić, I., Gradojević, N., & Ignjatijević, S. (2020). The impact of economic freedom on economic growth? New European dynamic panel evidence. *Journal of Risk and Financial Management*, *13*(2), 26. https://doi.org/10.3390/jrfm13020026

Chen, S., Doerr, S., Frost, J., Gambacorta, L., and Shin, H. S. (2023). The fintech gender gap. *Journal of Financial Intermediation*, 54, 101026. https://doi.org/10.1016/j.jfi.2023.101026

Heritage Foundation. https://www.heritage.org.

Ifediora, C., Offor, K. O., Eze, E. F., Takon, S. M., Ageme, A. E., Ibe, G. I., and Onwumere, J. U. (2022). Financial Inclusion and Its Impact on Economic Growth: Empirical Evidence From Sub-Saharan Africa. *Cogent Economics & Finance*, 10(1), 2060551. https://www.tandfonline.com/doi/pdf/10.1080/23322039.2022.2060551

Jiang, C. L., and Jiang, C. T. (2020). Can Digital Inclusive Finance Promote High-Quality Development of Regional Economy: Based on Empirical Evidence Of 258 Cities. *Journal of Hunan University of Science & Technology (Social Science Edition)*, 3 (75-84). https://doi.org/10.13582/j.cnki.1672 - 7835.2020.03.009

Lee, B. J. N., Morduch, J., and Ravindran, S. (2021). Poverty and Migration in the Digital Age: Experimental Evidence on Mobile Banking in Bangladesh. 13(1), 38–71.
https://doi.org/10.1257/app.20190067

Li, W. and Pang, W. (2023). Digital inclusive finance, financial mismatch and the innovation capacity of small and medium-sized enterprises: Evidence from Chinese listed companies. *Heliyon*, 9(2).
https://doi.org/10.1016/j.heliyon.2023.e13792

Li, Y., Tan, J., Wu, B., and Yu, J. (2022). Does digital finance promote entrepreneurship of migrant? Evidence from China. *Applied Economics Letters*, *29*(19), 1829-1832.
https://doi.org/10.1080/13504851.2021.1963404

OCED The Organization for Economic Co-operation and Development (OCED 2024). http://www.oecd.org/inclusive-growth/

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329 -340.
https://doi.org/10.1016/j.bir.2017.12.003

Park, C. Y. and Mercado, R. (2015). Financial inclusion, poverty, and income inequality in developing Asia. *Asian Development Bank Economics Working Paper Series*, (426).

Pan, Y., Teng, T., Wang, S., Wang, T. (2024). Impact and mechanism of urbanization on urban green development in the Yangtze River Economic Belt. Ecological Indicators, 158, 111612.
https://doi.org/10.1016/j.ecolind.2024.111612

Rauniyar, G., & Kanbur, R. (2010). Inclusive growth and inclusive development: A review and synthesis of Asian Development Bank literature. *Journal of the Asia Pacific Economy*, *15*(4), 455-469.
https://doi.org/10.1080/13547860.2010.517680

Salman, D. and Ismael, D. (2023). The effect of digital financial inclusion on the green economy: the case of Egypt. *Journal of Economics and Development*, 25(2):120-133. https://doi.org/10.1108/JED-05-2022-0087

Sarma, M. (2016). Measuring financial inclusion for Asian economies. Financial inclusion in Asia: Issues and policy concerns, 3-34. https://doi.org/10.1057/978-1-137-58337-6_1

Sarpong, B. and Nketiah-Amponsah, E. (2022). Financial inclusion and inclusive growth in sub- Saharan Africa. *Cogent Economics & Finance*, 10(1): 2058734 https://doi.org/10.1080/23322039.2022.2058734

Shen, Y., Hu, W., & Hueng, C. J. (2021). Digital financial inclusion and economic growth: a cross-country study. *Procedia computer science*, *187*, 218-223. https://doi.org/10.1016/j.procs.2021.04.054

Siddik, M. N. A., Sun, G., & Kabiraj, S. (2015). Financial inclusion and its determinants: A study of Bangladesh. *Indian Journal of Finance*, *9*(6), 7-29. http://dx.doi.org/10.17010/ijf%2F2015%2Fv9i6%2F70988 Siddik, M. N. A., & Kabiraj, S. (2020). Digital finance for financial inclusion and inclusive growth. *Digital transformation in business and society: Theory and cases*, 155-168. https://doi.org/10.1126/science.aah5309

Thuy, D.T.B. (2022). Impacts of Economic Freedom on Economic Growth in Developing Countries. *Global Changes and Sustainable Development in Asian Emerging Market Economies.* 1: 35-44. https://doi.org/10.1007/978-3-030-81435-9_3

UN Trade & Development (UNCTAD). https://unctad.org.

Wang, Q. and Yu, H. H. (2024). A study on the impact of digital financial inclusion on inclusive growth in China: The mediating effect of innovation. *International Journal of Innovative Research and Scientific Studies*, *7*(3), 1030-1042. https://doi.org/10.53894/ijirss.v7i3.3040

World Bank Database. https://data.worldbank.org

World Bank Findex database.

https://www.worldbank.org/en/publication/globalfindex

World Bank Gender Portal. https://genderdata.worldbank.org/en/home

Yi, X. and Zhou, L. (2018) Does digital financial inclusion significantly influence household consumption? Evidence from household survey data in China, *Journal of Financial Research*, vol. 11, pp. 47–67. http://www.jryj.org.cn/EN/abstract/abstract538.shtml

Zhang, S. Hu, Y. and Zhang, Y. (2022) Digital financial inclusion, capital misallocation, and regional income disparity, *Journal of Finance & Economics, vol. 5, pp. 1–14,* 2022. https://doi.org/10.52783/jes.4622

Zhang, W., Chen, F., Liu, E., Zhang, Y., & Li, F. (2023). How does digital inclusive finance promote the financial performance of Chinese cultural enterprises?. *Pacific-Basin Finance Journal*, *82*, 102146. https://doi.org/10.1016/j.pacfin.2023.102146

Zulfiqar, K., Chaudhary, M. A., & Aslam, A. (2016). Financial inclusion and its implications for inclusive growth in Pakistan. *Pakistan Economic and Social Review*, *54*(2), 297-325.

Appendix

I) TFI principal component Analysis Output

Table A.1: Eigenvalues

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.433285	1.571897	0.6083	2.433285	0.6083
2	0.861388	0.227536	0.2153	3.294674	0.8237
3	0.633852	0.562379	0.1585	3.928526	0.9821
4	0.071474	---	0.0179	4.000000	1.0000

Table A.2: Eigenvectors

Variable	PC 1	PC 2	PC 3	PC 4
Number of ATMs per 100,000 adults	0.438344	0.315377	0.839295	0.063055
Number of Branches per 100,000 adults	0.349502	0.802024	-0.484328	0.005579
Adults with a financial institution account (% age 15+)	0.577594	-0.383042	-0.209549	0.689749
Adults who own a debit or credit (% age 15+)	0.593371	-0.332525	-0.130764	-0.721276

II) DFI principal component Analysis Output

Table A.3: Eigenvalues

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.756677	1.759958	0.6892	2.756677	0.6892
2	0.996719	0.821331	0.2492	3.753396	0.9383
3	0.175387	0.104171	0.0438	3.928783	0.9822
4	0.071217	---	0.0178	4.000000	1.0000

Table A.4: Eigenvectors

Variable	PC 1	PC 2	PC 3	PC 4
Number of mobile cellular subscriptions	-0.072761	0.993676	0.083848	0.016826
Adults who use mobile phone or the internet to send money (% age 15+)	0.565409	-0.025829	0.817738	-0.104644
Adults who use mobile phone or the internet to pay bills (% age 15+)	0.584075	0.055908	-0.306148	0.749670
Adults who use mobile phone or the internet to check account balance (% age 15+)	0.577819	0.093888	-0.480154	-0.653270