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The role of digital financial inclusion on promoting sustainable economic growth through banking stability: *Evidence from Bangladesh*

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Abstract

In this current era of 4th industrial revolution, accelerating digital finance is considered as one of the significant means for the banking sector stability that subsequently leads to economic growth. However, both the negative and positive effects of financial inclusion bring the question whether digital finance is good for sustainable growth or not. Hence, this paper aims to examine the role of digital financial inclusion on promoting sustainable economic growth through banking stability in Bangladesh using the data of 2011-2018 from Orbis bank-focus and financial access survey (FAS) databases by deploying panel corrected standard errors and two-stage least square-instrument variable methods. The study also aims to shed light on the impact, prospect and limitations of the digital financial inclusion and how its proper application in the banking sector of Bangladesh can bring sustainable financial growth to achieve the sustainable development goals (SDGs) using the projection data until 2030 by employing forecasting technique. The results suggest that digital financial inclusion leads to economic growth and an integrated digital financial inclusion by banks is not only a phenomenon for attaining the SDGs, rather it is a thing that demands to be implemented carefully for the economic stability of the bank itself. Therefore, the government, policymakers, standard setters as well as regulatory bodies can see digital financial inclusion as a changing agent that can bring a revolutionary development in the overall financial sector of Bangladesh which will advance the attainment of the SDGs by 2030.

Keywords: sustainable development goals, sustainable economic growth, digitization, banking stability, Bangladesh

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1. Introduction

In this current era of 4th industrial revolution, accelerating digital finance is considered as one of the significant means for the banking sector stability that subsequently leads to sustainable economic growth. With the very sharp advancement of technology, scholars and financial analysts have been contemplating the adoption of digital financial inclusion (hereafter DFI) in the recent years although in 1997 a leading telecommunication company of the Philippines provided financial services to the unbanked (USAID, 2013). DFI refers to those financial services that can be enjoyed through electronic devices in a cashless manner without much pain by which both the service providers and receivers get benefitted. Though the post-global financial crisis (GFC) period has made the scholars ponder over the application of financial inclusion as a means of getting rid of that economic recession (Ahamed & Mallick, 2019), the application of DFI has gained the attention of the financial analysts in recent years. This paper intends, in the context of Bangladesh, to determine the role of DFI on sustainable economic growth through banking stability to achieve the sustainable development goals (SDGs) by 2030.

The SDGs are the goals that aim to lead the world towards a peaceful and harmonious abode to survive in. These goals are considered as the blueprint to turn this chaotic and almost culminated world into a more sustainable one where every individual is expected to enjoy a better and quality living without feeling the fear of any threat, conspiracy, conflict and war as well. One of the prime focused areas of the SDGs is the sustainable financial growth that can be attained through banking sector. There is a $2.5 trillion investment gap to achieve the SDGs by 2030 (Wilson, 2016) which can be reduced by the banking sector along with other financial institutions (Niculescu, 2017).

When in a country the stability of the banking industry becomes questioned, the country's overall economic condition is thought to be collapsed. So, banking stability is a must for sustainable economic growth that banks can achieve through financial inclusion and most significantly through DFI. In the current world, scholars give more focus on both financial and digital financial inclusion for poverty reduction (Ozili, 2018). Kim et al. (2018) show that financial inclusion leads to financial growth and both are very intrinsically related to each other. According to Ahamed and Mallick (2019), integrated financial inclusion by banks is not only a phenomenon for SDGs, rather it is a thing that demands to be implemented carefully for the betterment of the bank itself or for their own growth and stability.

Thus, considering the significance of DFI, it has been given much focus by almost all the countries of the world and in this regard the emerging Asian countries are not lagging behind where Bangladesh is also advancing towards the implementation of DFI as a part of its Vision 2021[1]. The banking industry of Bangladesh is going to carry out their most of the transactions through a cashless manner which is the main moto of DFI in order to keep pace with the current advancement of the world. Many financial service agents are providing digital

financial services where the famous names are Bkash, Sure Cash, Rocket, M Cash and latest one is Nagad owned by the Government.

Despite its importance, the empirical studies on the relationship between DFI and banking stability are scarce except few studies such as in one hand, Ahamed and Mallick (2019) who emphasise on bank stability and financial inclusion in general rather than focusing on DFI, in other hand, Ozili (2018) and Koh et al. (2018) who review the importance of digital finance and financial inclusion but did not provide any empirical evidence. Hence, this study fills the gap by providing the empirical evidence of the role of DFI on banking stability to promote sustainable economic growth in developing countries particularly in Bangladesh. Besides, this study tries to shed light on the impact, prospect and limitations of the DFI and how its proper application in the banking sector of Bangladesh can bring sustainable financial growth.

This study adds value to the existing literature of DFI and banking stability in a number of ways. Firstly, this study wants to measure the DFI index of Bangladesh using the latest data which broaden the path of the researchers who want to conduct empirical study on DFI as most of previous empirical studies mainly focus on financial inclusion in general. Secondly, it intends to find the relationship between DFI and banking stability as such association helps to figure out how DFI plays a vital role in achieving SDGs through banking stability. Finally, this paper expects to highlight the impacts, limitations, the way-forward, and policies of DFI that will help government and policy makers of developing countries, particularly Bangladesh to understand the role of DFI on promoting sustainable growth which in turn help achieving the SDGs by 2030.

The remaining part of the paper is designed in the following structure. Literature review is drawn in the Section 2. Section 3 comprises of a detailed discussion of methodology. Section 4 depicts the findings of the study and their discussions while Section 5 gives conclusion and policy recommendations.

2. Literature review

Since DFI is the digitised phase of financial inclusion and they both inter connected with each other, so this section gives an account of both the terms and their relation to bank stability which subsequently brings the sustainable economic growth.

2.1 Financial Inclusion and Digital Financial Inclusion

Financial inclusion has been an issue of great concern to scholars and become a global agenda undoubtedly. On the basis of geographical location and the socio-economic status of the country, the definition of financial inclusion differs. Sarma (2012) defines "A process that ensures the ease of access, availability and usage of formal financial system for all members of an economy" (p. 3).

[1] *Vision 2021 is the motto of the current government of Bangladesh which dreams to make Bangladesh a fully digitised country by 2021.*

The prime focus of DFI is to create a connection between the poor people and their peers and a range of providers (Koh et al., 2018) as well as to reach formal financial services to the poor, rural and unprivileged or unbanked people (Ozili, 2018). DFI refers to those services that clients can enjoy through their personal computers, laptops, mobile phones, the internet or cards from anywhere (Ozili, 2018). The services of DFI include internet banking, mobile banking, SMS banking, credit card, debit card, E-wallet and a cashless transaction in every finance related affair that are carried out sitting in anywhere through electronic device with data connection. Basically, to implement DFI, a smart phone having internet connection is a must. According to Gomber et al. (2017), digital financial services include innovative financial products, finance related software and a great way of interaction and communication with the customers and such services are provided by FinTech and other finance related service providers. It can transform people from cash-based to cashless transaction where they need a mobile phone which is owned by almost 50% people of the developing countries (World Bank Group, 2013). Digital financial services have a long-run positive impact on banking performance (Ozili, 2018) that gives benefits to the government through generating higher tax revenue (Manyika et al., 2016). It aims to gathering underprivileged population under the umbrella of formal financial services as noted by CGAP. (2015). Most of the countries of the world are turning into this service. According to Pénicaud and Katakam (2019), more than 80 countries of the world are launching digital financial services through mobile phone. Since it promotes cashless transaction everywhere, clients do not feel fear of cash hijacking or cash missing out. It also brings welfare to the people (CGAP., 2015).

2.2 Financial/ Digital Financial Inclusion and Bank Stability

The Executive Director of the Alliance for Financial Inclusion (AFI) Hannig (2017) says, "The adoption of digital finance will have a significant impact not only on financial inclusion, but also inclusive economic growth." DFI increases the profitability of the banks that brings financial growth and stability (Ozili, 2018).

García and José (2016) say that DFI and banking stability goes in parallel line. By 2025, DFI will have a great impact on the GDP of developing and emerging countries that will increase the GDP by $3.7 trillion and will create 95 million jobs in all sectors as stated by McKinsey World Institute.

To see the impact of SWIFT on the stability of banking sector, Scott et al. (2017) conduct an empirical study examining 6848 banks of 29 American and European countries over a period of 1998 to 2005 and find a long-term positive impact of it on the profitability of the banking sector. The empirical study of Neaime and Gaysset (2018) on MENA countries shows a very close association between financial inclusion and bank stability. Beck et al. (2014) say that financial inclusion is viewed as one of the important drivers of financial growth and stability of the banking sector.

Realising the impact of DFI found through previous studies, most of the countries of the world including Asian countries have established national policies of

financial inclusion focusing on digital finance. Since, integration of digitalization in the financial inclusion is a noble mechanism to reach out to the people with more convenient financial support through utilization of technologies, the current study endeavours to dig deep into the opportunities and prospects of DFI to achieve sustainable economic growth through banking stability in Bangladesh. The existing literature has limitations to explore the impacts of the DFI on sustainable economic growth through banking sector stability. The proposed study will add value to the prompt implementation of inclusive digital finance which will ultimately facilitate the achievement of sustainable operation of financial institutions and contribute to the sustainable economic growth.

3. Methodology

The study has two folds analysis: i) To investigate empirically the relationship between bank stability and DFI, and ii) To shed light on the impact, limitations, the way-forward of the DFI that can bring sustainable financial growth to achieve the SDGs. The following data and methods have been used to analyse the former one. Previous literature, various reports and forecasting data have been used to analyse the latter one.

3.1 Data

Though, along with banking sector, a good number of financial companies are rendering finance related services, but this study merely considers the data of banking sector. Initially, the study has considered the annual data of 82 banks operating in Bangladesh.

4. Methods

Bank stability

This study uses Z-score as a proxy for banking stability following Ahamed and Mallick (2019) as Z-score has been widely used in the banking and finance literature and considered unbiased parameter of bank riskiness (Fang et al., 2014). Z-score has been measured in the following way.

$$Z - score_{it} = \frac{ROAA_{it} + EQT_{it}}{\sigma(ROAA)_{it}} \quad (1)$$

Where $ROAA_{it}$, EQT_{it} and $\sigma(ROAA)_{it}$ are the return on average assets, the equity to assets ratio, and the standard deviation of return on average assets of bank i in year t, respectively. The score can be interpreted that if the number of standard deviations is below the mean, the returns would have to drop before all equity in the bank gets depleted (Ahamed & Mallick, 2019). The natural logarithm of Z-score has been used in this study in order to minimise the skewness.

4.1 Digital Financial inclusion proxies

As the purpose of this study is to test the role of DFI on the stability of banks to promote sustainable economic growth in Bangladesh, digital financial proxies have been measured using the data of FAS database over the period of 2011 to 2018. In this regard, both the financial outreach and usage penetrations have been considered for DFI based on the previous study (Ahamed & Mallick, 2019; Beck et al., 2007; Ozili, 2018). However, the selection of proxies will be different from the previous studies as they have considered the financial inclusion, whereas, this study considers the digital financial inclusion. As a part of geographic and demographic outreach penetration, number of active mobile money agent outlets per 100,000 adults and per 1,000 km2 have been considered, while number of active mobile money accounts per 1,000 adults and number of mobile banking transactions per 1,000 adults have been considered as a part of the usage of financial service penetration. Since the proxies used in building the DFI are highly correlated with each other, hence, this study develops an inclusive index of DFI to capture the common variation among the proxies using principal components analysis (henceforth PCA). This index will sufficiently deal with the problem of multicollinearity and over-parameterisation as a single measure of DFI (Ahamed & Mallick, 2019).

4.2 Bank-specific and macro-economic variables

This study controls the bank-specific as well as macroeconomic variables. Following the Fang et al. (2014), ratio of total loans over total assets (Loan ratio) has been used to account for liquidity risk of individual banks.

To control potential size effect and the loan portfolio risk of an individual bank, this study uses logarithm of total assets (Bank size) and the ratio of loan loss provision to total loans (Loan loss provision) respectively. The ratio of non-interest income to total operating income (Income diversification) has been considered to control the ambiguous effect of off-balance sheet activities. As the better management quality can reduce excessive risk-taking tendency, so the ratio of total earning assets to total assets (Management quality) has been taken into consideration. The equity ratio (Capitalisation) has been used to control the capital risk as well-capitalised banks are assumed to take less risk. This paper uses several macroeconomic variables such as GDP growth (annual GDP growth rate) to control economic growth and business cycle, and good governance to control institutional effect. Good governance index is constructed using standardised approach of Kaufmann et al. (2010) governance indicators which is consisted of six components such as, Control of Corruption, Government Effectiveness, Political Stability and Absence of Violence/Terrorism, Regulatory Quality, Rule of Law, and Voice and Accountability.

4.3 Estimation technique

To examine the impact of DFI on bank stability, the following baseline regression analysis has been used in this study.

$$Bank\ stability_{it} = \int (Digital\ Financial\ Inclusion_t\ ,\ Bank\ Specific_{it},\ Macroeconomic\ Specific_t) \quad (1)$$

In this study, log *(Z-score)* has been considered as dependent variable as a proxy for bank stability. *Digital financial inclusion* is the key independent variable for the study in which both the individual component and aggregate index have been considered for the analysis. Besides, *Bank size, Loan ratio, Loan loss provision, Income diversification, Management quality and Capitalisation, GDP growth and Good governance/Institutional Quality* have been taken into account for bank-specific macroeconomic specific variables. Following Alfadli and Rjoub (2019) this study uses panel-corrected standard errors (PCSE) method of Beck and Katz (1995) to examine the fundamental relationship between the variables. There are mainly two reasons behind choosing this method, such as i) it reduces the prevailing sequential correlation and cross-sectional dependency problems and ii) using a suitable instrument, it captures the likelihood of endogeneity among the dependent factors and some of the independent factors in a particular model (Alfadli & Rjoub, 2019). Besides, Panel Two-Stage Least Squares - Instrumental Variables (2SLS-IV) method has been used for the robustness of the results.

5. Results and Analysis

The findings of the analysis of the relationship between bank stability and DFI are illustrated in this section. In addition, the impact, limitations and the way forward of DFI which can bring sustainable financial growth to achieve the SDGs are also discussed in this section.

5.1 Digital financial inclusion and bank stability

Descriptive statistics

The descriptive statistics of bank stability, bank size, loan ratio, loan loss provision, income diversification, management quality, capitalization, GDP growth, good governance, and digital financial inclusion are illustrated in Table 2. The table reports the mean, standards deviation, along with maximum and minimum value for each variable in the sample. Few observations from this table are noteworthy. First, the ln (Z-score) has an average value of 3.93 with a standard deviation of 1.05, indicating that on average ROAA would have to fall by 3.93 times of their standard deviation to annihilate bank equity. The fairly high standard deviation suggests a yearly variation in the level of bank stability in Bangladesh. Moreover, the mean value of the logarithm of bank total assets and standard deviations are 7.37 and 1.13 respectively. Thus, a fairly low yearly variation is suggested by these results. On

average, Bangladesh has achieved 6.7% growth in their GDP over the year 2011 to 2018. Furthermore, Bangladesh has, on average, 212 active mobile money agent outlets per 100k adults and 1833 outlets per 1000 km2. In addition, on average, the number of active mobile money accounts and the number of mobile money transactions per 1000 adults are approximately 3 and 7 respectively. The average statistics of DFI are in line with financial inclusion insight (FII) survey tracker report of 2018. The report suggests that the number of mobile money account and money transaction in 2018 is increasing in Bangladesh compared to 2015 and among all the mobile money agents, bKash of Brac Bank Ltd. has consistently remained the dominant mobile money services provider.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Bank Stability (log (Z-score))	285	3.928	1.17	1.571	7.327
Bank Size (log (total assets)	336	7.374	1.126	4.571	9.449
Loan Ratio (Ratio of total loans over total assets)	336	0.646	0.132	0.172	0.932
Loan Loss Provision (Ratio of loan loss provision to total loans)	336	0.006	0.004	-0.01	0.021
Income Diversification (Ratio of non-interest income to total operating income)	336	0.557	0.305	0.005	1.698
Management Quality (Ratio of total earning assets to total assets)	336	0.869	0.044	0.731	0.932
Capitalization (Ratio of total equity to total assets)	336	0.093	0.17	-0.887	0.567
GDP growth (annual %)	336	6.734	0.597	6.014	7.864
Good Governance/ Institutional Quality (Standardized results of six elements of good governance such as control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and voice and accountability.					
Digital Financial Inclusion					
Number of active mobile money agent outlets per 100,000 adults	336	212.34	145.617	2.5	419.49
Number of active mobile money agent outlets per 1,000 km²	336	1833.211	1292.032	19.6	3685.8
Number of active mobile money accounts per 1,000 adults	336	3.493	2.609	-2.659	5.77
Number of mobile money transactions per 1,000 adults	336	7.496	3.01	0.811	9.879
Digital Financial Inclusion Index (PCA results of 4 components of digital financial proxies)					

Source: Orbis bank focus, WDI and FAS

In order to see the association between bank stability and DFI, initially the panel-corrected standard errors regression has been considered. We control bank-specific factors such as, bank size, loan ratio, loan loss provision, income diversification, management quality, capitalization, as well as macro-economic factor such as GDP growth and good governance for the analysis.

In our analysis, the DFI is divided into two main dimensions: financial outreach (mobile money agent per 100k adults and per 1000 km2) and usage of the customers

(number of mobile money accounts and money transactions per 1000 adults). Model 1 & 2 show the relationship between bank stability and DFI (financial outreach penetration) in which model 1 demonstrates the demographic penetration (number of active mobile money agent outlets per 100,000 adults) and model 2 displays the geographic penetration (number of active mobile money agent outlets per 1,000 km2) of financial outreach. Model 3 & 4 exhibit the relationship between bank stability and DFI (usage of the customer's penetration) in which model 3 & 4 use the number of active mobile money accounts per 1,000 adults and the number of mobile money transactions per 1,000 adults respectively as a proxy for DFI. Model 5 uses the digital financial inclusion index (index has been created by PCA). The sample is divided into two panels based on year: i) Panel A: all years (2011 to 2018) and ii) Panel B: 2013-2018.

The sample has been split wondering that initial stage's (2011 and 2012) data may not be able to reflect the real scenario of the improvement as mobile financial services in Bangladesh has been introduced in 2010, hence, most data carry negative and missing value.

Table 2: Panel corrected standard errors (PCSE) regression results

	Panel A: 2011-2018					Panel B: 2013-2018				
Bank Stability	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Digital Financial Inclusion	-0.002**	-0.001**	-0.114**	-0.095***	-0.139**	0.002**	0.001**	0.394***	0.307***	0.181***
	(0.001)	(0.001)	(0.048)	(0.035)	(0.060)	(0.001)	(0.001)	(0.095)	(0.111)	(0.054)
Bank Size	-0.113	-0.114	-0.110	-0.108	-0.111	-0.015	-0.015	-0.014	-0.015	-0.014
	(0.181)	(0.181)	(0.182)	(0.182)	(0.182)	(0.166)	(0.166)	(0.165)	(0.165)	(0.165)
Loan Ratio	-0.066	-0.068	-0.031	-0.014	-0.040	-0.297	-0.297	-0.339	-0.355	-0.328
	(0.584)	(0.584)	(0.588)	(0.588)	(0.586)	(0.510)	(0.510)	(0.510)	(0.513)	(0.509)
Loan Loss Provision	-22.654	-22.614	-22.976	-23.239	-22.953	-7.060	-7.075	-7.436	-7.111	-7.418
	(17.812)	(17.818)	(17.785)	(17.771)	(17.774)	(17.083)	(17.082)	(17.006)	(17.002)	(17.019)
Income Diversification	-0.683**	-0.683**	-0.673**	-0.670**	-0.678**	-0.865***	-0.865***	-0.885***	-0.895***	-0.879***
	(0.278)	(0.278)	(0.275)	(0.274)	(0.277)	(0.250)	(0.250)	(0.252)	(0.254)	(0.251)
Management Quality	-3.797*	-3.797*	-3.772*	-3.763*	-3.778*	-1.871	-1.872	-1.926	-1.927	-1.915
	(2.174)	(2.174)	(2.177)	(2.176)	(2.176)	(2.032)	(2.032)	(2.037)	(2.038)	(2.036)
Capitalization	3.696*	3.692*	3.763*	3.805*	3.749*	3.443*	3.444*	3.442*	3.379*	3.453*
	(1.942)	(1.942)	(1.951)	(1.957)	(1.949)	(1.914)	(1.914)	(1.904)	(1.898)	(1.908)
GDP growth	0.100	0.117	0.021	-0.008	0.064	-0.305**	-0.330**	-0.435***	-0.337***	-0.501***
	(0.110)	(0.113)	(0.104)	(0.104)	(0.102)	(0.130)	(0.138)	(0.072)	(0.097)	(0.099)
Institutional Quality	0.205	0.191	0.150	0.220	0.203	0.038	0.047	0.039	-0.139	-0.108
	(0.173)	(0.170)	(0.141)	(0.150)	(0.157)	(0.131)	(0.127)	(0.074)	(0.126)	(0.101)
Constant	7.970***	7.844***	8.539***	8.994***	7.823***	7.592***	7.753***	7.114***	5.623**	9.497***
	(2.662)	(2.693)	(2.561)	(2.494)	(2.689)	(2.452)	(2.472)	(2.367)	(2.321)	(2.582)
Year fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Obs.	285	285	285	285	285	244	244	244	244	244
R-squared	0.234	0.233	0.234	0.235	0.234	0.198	0.198	0.201	0.200	0.201

Standard errors are in parenthesis
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

1. Number of active mobile money agent outlets per 100,000 adults
2. Number of active mobile money agent outlets per 1,000 km²
3. Number of active mobile money accounts per 1,000 adults
4. Number of mobile money transactions per 1,000 adults
5. Digital Financial Inclusion Index

For panel A, the findings (in Table 2) suggest that DFI has a significant impact on bank stability in Bangladesh. However, interestingly, the result shows a negative association between DFI and bank stability. This can be explained by the fact that the practice of digital finance in Bangladesh is at the very early stage that takes some time to impact positively on the banking stability and consequently the economy as a whole. This is because, when a country adopts a new technology, it takes a long drive to reach maturity level or to cope-up with the existing development patterns which is also called "drive to maturity" by the Stages of Economic Growth model of Rostow (1959). Besides, from Figure 1 it is visible that the value of number of mobile money agent outlets, mobile money accounts and transactions are almost zero or no variation at all during 2011 to 2012. Thus, the evidence shows that in Bangladesh the DFI has negative effect on banking stability while considering the early period's data. However, from 2013 onwards, the indicators of DFI in Bangladesh are in upward trend. Therefore, after excluding the year 2011 and 2012 from the sample of Panel B, the results show a significant positive relationship between DFI and bank stability. This suggests that the economy of Bangladesh is well-capable of adopting new technological advancement rapidly.

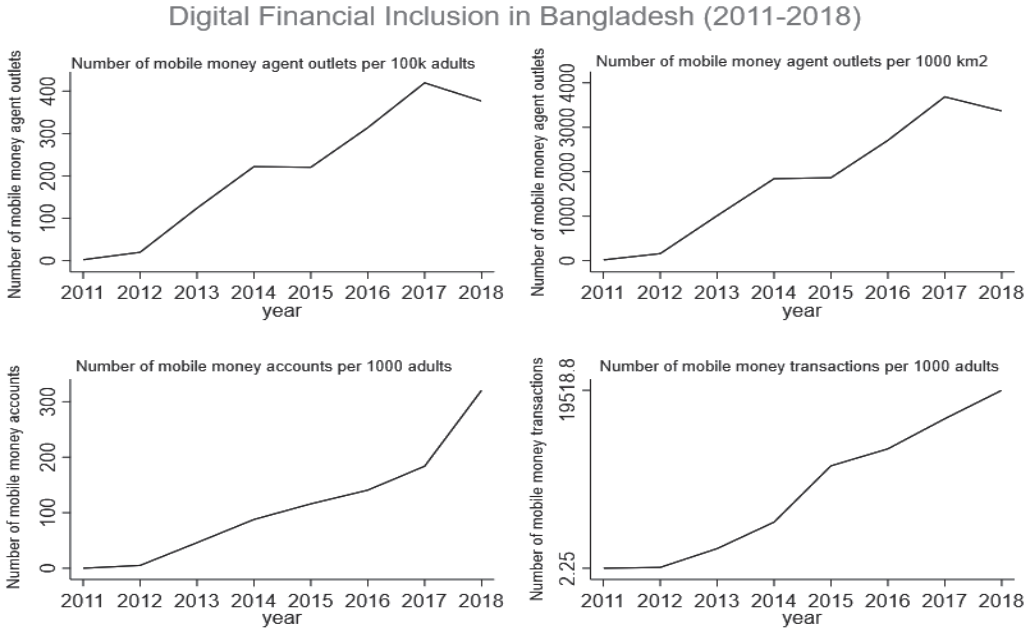

Figure 1: Digital Financial Inclusion in Bangladesh (2011-2018)

The findings of Panel B suggest that more inclusive digital financial system is highly related with greater banking stability (a greater estimated Z-score indicates more stability, i.e., less risk taking) and therefore, better sustainable economic

growth in all specifications. Though the number of money agent outlets indicators has weaker relationship with bank stability, however, the number of mobile money accounts and frequency of transaction has stronger association with bank stability. For example, the mean value of Z-score (3.93) has both the statistical and economical value. The coefficients of Z-score can be interpreted as semi-elasticity as this paper uses the natural logarithm of Z-score and normal value of DFI index. Hence, a one standard deviation increases in the index of DFI, which equals 1.94, is associated with an increase in the Z-score of 35% (0.181*1.94) in column 5 of Panel B. This suggests that DFI enriches the soundness of individual banks. These findings are similar with the view that a system with inclusive financial services tends to reinforce banking stability (Ahamed & Mallick, 2019; Morgan & Pontines, 2014), and that higher degree of financial inclusion mitigates excessive risk-taking of an individual bank. The geographic penetrations' results are also supported by the previous studies (Berger & DeYoung, 2001; Rossi et al., 2009) in which a positive impact of geographic diversification on reducing distance between banks and borrowers is found.

The economic impact of the results, in particular, suggests that inclusive digital finance may help banks lower costs by minimising manual paperwork and documentations as well as maintaining fewer bank branches (Manyika et al., 2016). DFI, as an instrument, helps financial and monetary system regulators to reduce high inflation levels in developing and poor countries by restricting circulation of the amount of physical cash. Besides, it can improve the welfare of individuals and businesses that have a reliable digital platform with which to access funds in their bank accounts to carry out financial transactions (CGAP., 2015). Therefore, with inclusive financial sector, banks enjoy greater financial stability and overall the country promotes sustainable economic growth.

Robustness

Though possible reverse causality (endogeneity) is a common identification issue in any banking study, however, the potential for reverse causality might be less of a concern in this analysis as this study is a single country study and it investigates the impact of DFI (a country-level indicator) on bank stability (bank-level indicator). However, in order to robust the results, this study conducts a 2SLS-IV technique.

Table 3: 2SLS-IV regression results

	Panel A: 2011-2018					Panel B: 2013-2018				
Bank Stability	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Digital Financial Inclusion	-0.002**	-0.001***	-0.261***	-0.212***	-0.301***	0.002**	0.001**	0.943**	0.143**	0.789**
	(0.001)	(0.001)	(0.091)	(0.073)	(0.104)	(0.001)	(0.001)	(0.389)	(0.062)	(0.246)
Bank Size	0.010	0.875*	0.993**	1.027**	0.936*	0.094	0.776	0.534	0.725	1.118
	(0.125)	(0.481)	(0.501)	(0.506)	(0.490)	(0.130)	(0.491)	(0.762)	(0.497)	(1.144)
Loan Ratio	0.233	1.253	1.405	1.447	1.331	-0.251	-0.133	-0.477	-0.205	0.355
	(1.082)	(1.515)	(1.522)	(1.522)	(1.516)	(1.104)	(1.559)	(1.756)	(1.554)	(2.257)
Loan Loss Provision	-17.486	-9.786	-9.647	-9.890	-9.793	-6.411	-4.662	-8.836	-5.535	1.259
	(16.511)	(17.297)	(17.254)	(17.223)	(17.250)	(16.449)	(16.928)	(19.543)	(16.878)	(25.764)
Income Diversification	-0.828***	-1.219***	-1.147**	-1.117**	-1.179**	-1.007***	-1.146**	-1.135**	-1.144**	-1.162**
	(0.317)	(0.469)	(0.466)	(0.465)	(0.467)	(0.318)	(0.461)	(0.454)	(0.457)	(0.526)
Management Quality	-4.471**	-5.883**	-5.733**	-5.699**	-5.808**	-2.491	-3.613	-3.928	-3.679	-3.167
	(2.085)	(2.637)	(2.632)	(2.627)	(2.630)	(2.116)	(2.564)	(2.700)	(2.559)	(3.083)
Capitalization	6.069***	11.029***	11.663***	11.887***	11.369***	5.524***	8.750***	8.025***	8.599***	9.780**
	(1.598)	(2.265)	(2.359)	(2.394)	(2.310)	(1.606)	(2.318)	(3.000)	(2.348)	(3.837)
GDP growth	0.162	0.114	-0.125	-0.195	-0.024	0.036	-0.093	-0.872	-0.322	1.211
	(0.139)	(0.151)	(0.148)	(0.156)	(0.144)	(0.374)	(0.408)	(1.611)	(0.264)	(4.132)
Institutional Quality	0.368	0.449*	0.331	0.468**	0.434*	0.314	0.283	-0.051	0.067	1.300
	(0.243)	(0.234)	(0.209)	(0.238)	(0.230)	(0.298)	(0.279)	(0.650)	(0.370)	(3.146)
Year fixed effect	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Obs.	285	285	285	285	285	244	244	244	244	244
R-squared	0.305	0.317	0.321	0.323	0.321	0.314	0.323	0.332	0.333	0.157

Standard errors are in parenthesis
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

1. Number of active mobile money agent outlets per 100,000 adults
2. Number of active mobile money agent outlets per 1,000 km^2
3. Number of active mobile money accounts per 1,000 adults
4. Number of mobile money transactions per 1,000 adults
5. Digital Financial Inclusion Index

To address any potential endogeneity problem, the recent empirical studies on financial inclusion have been searched as there are very few studies on DFI. Following Ahamed and Mallick (2019) this study considers proportion of Mobile cellular subscriptions (per 100 people) in South Asia except Bangladesh as an instrumental variable for 2SLS-IV technique. It is argued that better communication infrastructure reduces the cost of banking service delivery and makes the broadening of bank branches more cost effective (Beck et al., 2007) and mobile phone use can help overcome infrastructural deficiencies to accelerate financial inclusion in many countries with limited physical and financial infrastructure (Allen et al., 2014).

The 2SLS-IV regression model does not change any result of the above analysis rather it shows a stronger relationship between DFI and bank stability by providing higher coefficient. These findings robust the PCSE regression results and suggest that inclusive digital financial system has a strong positive impact on bank stability in Bangladesh regardless of penetration and specifications. Therefore, accelerating digital finance in Bangladesh is considered as one of the significant means for the banking sector stability that subsequently leads to economic growth.

5.2 Impact, limitations and the way forward of the DFI in Bangladesh

Like other countries, Bangladesh is investing its endless effort to employ DFI since it is a part of the Vision 2021 as declared by the current Prime Minister Sheikh Hasina that dreams to see Bangladesh as a digital country. Bangladesh Bank initiated a department named financial inclusion department in 2015 in order to encourage women entrepreneurs and promote financial education. Although Bangladesh, a developing country having unemployment problem, low per capita income and high rate of inflation, has many private and public banks, its financial inclusion is impeded by its poverty line (Mani, 2016). Apart from this, the infrastructure of the banking is very poor (Islam & Mamun, 2011). In spite of having so many bank branches in Bangladesh, the overall progress has not been so visible since they have mostly focused on urban population instead of being concentrated to growing needs of their customers (Khalily, 2016). Although bank branches are increasing, poor people are still away from formal banking services since banks require so many papers and a good amount to open a bank account (Mani, 2016). However, the current scenario of financial inclusion in Bangladesh is in changing trend because of the implementation of DFI. In this era of competition, most of the banks are endeavouring to provide clients friendly services. Active account, Access to mobile phone, Access to internet, and Digital payment activities have boosted up in Bangladesh to 40%, 74%, 20%, and 34% respectively in 2017. Furthermore, Bangladesh has been able to empower women by implementing digital financial activities, for example, around 62% and 21% of female have mobile access and made/received digital payments respectively in 2017 (in Figure 2).

Moreover, compared to India and Pakistan, the DFI position of Bangladesh in terms of gender and income (poorest 40%) inequality is very remarkable (In Figure 2) that shows how fast Bangladesh is stepping up towards DFI.

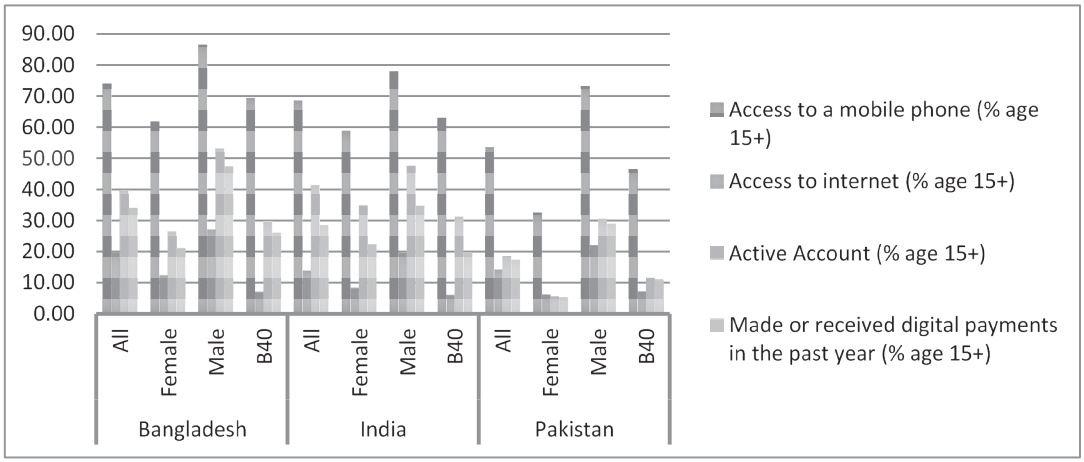

Figure 2. DFI comparison among Bangladesh, India and Pakistan in 2017. Source: WDI

Apart from a number of positive sides DFI has some challenges or risks too. Wyman (2017) mentions many types of negative sides of mobile money banking system like cloning of the SIM card, lack of transparency, data privacy, phone hacking, network and server breakdown, money laundering as well as financing terrorism. Adeoti (2011) states several threats of automatic teller machine (ATM) in the context of Nigeria like fake cards, card jamming, duplicate ATMs, card swapping and so on. Besides, lack of digital literacy of the customers hinders the advancement of DFI (Obiano, 2009). Lack of high speed and easily affordable internet connection is also a threat for DFI (Ozili, 2018). However, the proper regulatory body can minimise the risks by implementing effective monitoring channels (Ketterer, 2017).

Based on the present progress, adoption capability and long-term positive effects on banking stability, DFI will lead to greater economic stability and increase financial intermediation for its customers as well as for the economy of Bangladesh as a whole. Additionally, DFI will benefit the government by providing a platform to facilitate the increase in aggregate expenditure which subsequently generates higher tax revenue arising in the volume of financial transactions. Furthermore, it will promote economic empowerment by enabling asset accumulation and, for women in particular, increasing their economic participation.

Serial no.	Description	October, 2017	October, 2018	October, 2019	% Δ (2018-2019)
1	No. of Banks currently providing the Services	18	18	16	
2	No. of agents	774,892	868,747	954,290	4.69%
3	No. of registered clients in Lac	577.59	668.14	773.95	7.34%
4	No. of active accounts in Lac*	279.87	349.80	290.11	-9.33%
5	No. of total transaction	164,363,165	201,883,762	227,246,774	5.91%
6	Total transaction in taka(in crore BDT)	27,633.88	32,473.62	37,762.54	7.53%
7	No. of daily average transaction	5,302,038	6,512,379	7,330,541	5.91%
8	Average daily transaction (in crore BDT)	891.42	1,047.54	1,218.15	7.53%
9	Product wise information		Amount (in crore BDT)		
a.	Inward Remittance	6.26	60.73	24.99	-41.69%
b.	Cash In transaction	11,722.21	13,285.59	13,625.77	1.26%
c.	Cash Out Transaction	10,588.33	12,206.01	12,645.15	1.77%
d.	P2P transaction	4,043.33	5,109.16	8,988.79	27.52%
e.	Salary Disbursement (B2P)	382.55	586.83	860.46	18.91%
f.	Utility Bill Payment (P2B)	233.64	350.97	499.73	17.49%
g.	Merchant Payment	142.92	325.13	410.40	11.59%
h.	Government Payment	113.95	13.49	101.83	76.60%
i.	Others	400.69	535.72	605.43	6.11%

Source: Bangladesh Bank, 2019 (Mobile Financial Services Data), Note: 1 lac = 0.10 million and 1 crore = 10 million

In spite of having so many visible and invisible constraints, Bangladesh is continuously moving forward in terms of implementing digital financial services as shown in Table 4. It shows the ascending trend of adoption of mobile financial services in the transaction of both private and public sectors. In addition to that the

forecasting upward trend data of DFI (in Figure 3) suggests that Bangladesh has great potential to achieve SDGs by 2030 through DFI if proper policies can be taken into consideration.

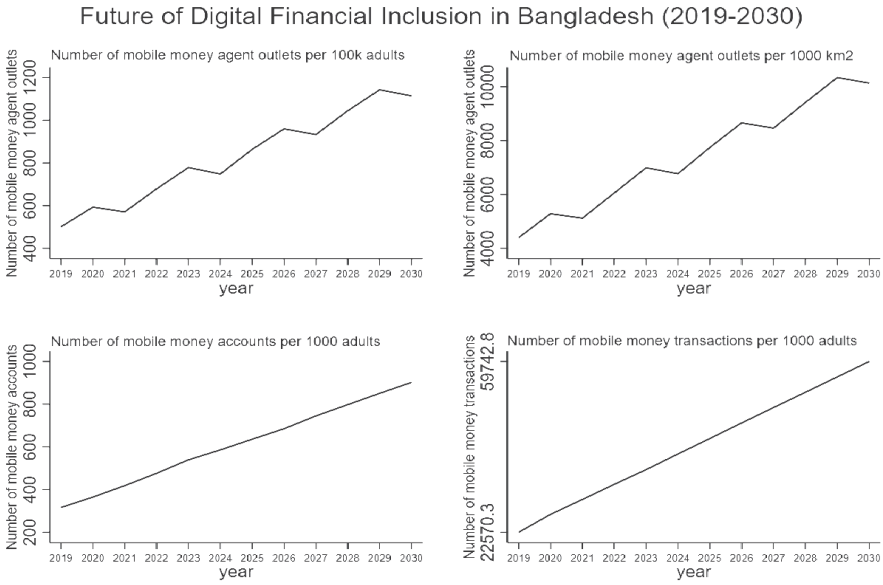

Figure 3. The forecasting data of DFI of Bangladesh (2019-2030)

6. Conclusion and Policy Recommendations

Digital financial inclusion helps to improve economic wellbeing of individuals and businesses. Using a sample of 43 banks of Bangladesh, this study provides empirical evidence that greater DFI is positively associated with individual bank stability which suggests that DFI leads to economic growth and an integrated DFI by banks is not only a phenomenon for attaining the SDGs, rather it is a thing that demands to be implemented carefully for the economic stability of the bank itself. Therefore, the government, policymakers, standard setters as well as regulatory bodies can see DFI as a changing agent that can bring a revolutionary development in the overall financial sector of Bangladesh. Thus, the government and policy makers of Bangladesh should outline efficient action plans and implement the following policies regarding the inclusion of digital finance in the banking industry of Bangladesh which will advance the attainment of the SDGs by 2030.

- ✓ First of all, people should provide with digital financial literacy and make sure their electronic devices are supported with latest technology and different applications germane to DFI. For DFI, mobile phone or electronic devices must have uninterrupted internet connection. If the internet buffers, users will face service interruption that might make them reluctant from DFI.

✓ Poor households who are unbanked now should be bankable. In this case banks or other financial institutions should consider the economic status of the poor people, meaning that while lending them money they should think of less profit. The banks should also introduce services how these people can open account sitting in the house through their electronic devices.

✓ It is very shocking that from Bangladesh people cannot send money to other countries. Sometimes parents of middle or lower middle-income families cannot send their issues, who are studying abroad, tuition fees through a proper channel. This causes them to send money through illegal channels that deprives the national economy to earn more revenue. That is why, government should reconsider the implementation of proper channel in the financial system to send money to other countries.

✓ Political stability should be ensured since any kind of financial growth or developmental activities are impeded when there is political chaos and instability in a country.

✓ Awareness campaign among people regarding the prospects of the use of digital finance should be arranged.

✓ Time tested and time demanding business model should be introduced that will create employability. This employability will make people savings minded which will encourage them to use digital financial services.

✓ Government should launch programmes to augment poor people's livelihood and make them capable to earn their livelihood.

✓ After all, there will have a strong, independent, proficient and unbiased regulatory body who will supervise all the activities in terms of DFI and adopt innovative and time-tested policies to make it a successful journey.

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