

Research Article

Comparative Analysis of Mobile Finance Markets in SAARC Nations: Drivers of Financial Inclusion

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Abstract

The study was conducted at the time of increasing demand to provide insight into the role of financial technologies in inclusive economic growth among the South Asian economies. Even though there is a rapid growth in mobile financial services in the region, there is a dearth of comparative evidence on the role of such innovations in promoting the financial inclusion phenomenon in various countries situated in the SAARC region. Filling this gap, the study offers a timely insight into policies to be improved by policymakers, regulators, and financial institutions to improve digital finance strategies and enhance equitable access to financial systems. The paper analyses the mobile finance markets as a proportion of the total economy among SAARC countries, focusing on factors affecting financial inclusion. The data has been collected from WDI from 2012 to 2022, demonstrating one of the latest studies focused on SAARC nations regarding MFS and Financial inclusions. After cleaning the data, the indicators from Bangladesh, India, and Pakistan were retained to maintain the accuracy of the results derived from this study. Five indicators, such as financial inclusion, mobile money transactions, GDP growth rate, individuals using the internet, and the number of mobile cellular subscriptions, were adopted from earlier research to compare the MFS market. This study shows that MFS markets have grown significantly over the past decade. However, the growth of a few MFS indicators has been steady since 2020 due to COVID-19 and other global issues. The results of panel regression revealed that mobile money transactions and mobile cellular subscriptions have a significance in improving financial inclusion in SAARC nations. Therefore, this research offers significant perspectives for authorities and mobile financial service providers to use effective mobile money methods in order to attain higher levels of financial inclusion in SAARC countries.

Keywords

Mobile Financial Service, Financial Inclusion, Panel Data, SAARC

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1. Introduction

The ever-evolving advancement of technologies, especially those built around mobile platforms, redesigns the geography of financial markets, particularly in developing regions of South Asia. As per Afroze and Rista, Mobile financial services (MFS) can be described as a relatively new model of providing financial products that offer a greatly extended list of services using mobile devices [2]. Kabir et al. stated that this has created equal opportunities and opened a channel, especially to the under-banked regions or those with limited infrastructure [26]. The South Asian Association for Regional Cooperation (SAARC) includes Bangladesh, India, Pakistan, Sri Lanka, Nepal, Bhutan, the Maldives, and Afghanistan as its member nations. The South Asian nations currently pose diverse yet very challenging grounds for MFS to operate and extend across. These countries present a 'natural' sample regarding their level of economic advancement, the state of their financial systems, and the level of mobile phone usage, which makes them ideal for comparing and testing the effects of the volume of mobile finance on the total economy and enhanced availability of official financial services.

According to Song and Chun, Financial inclusion is one wherein an individual or business has a quality account with an authorized financial institution that provides a minimal quantitative amount of financial services to manage the client's accounts, savings, credit, transactions, and insurance needs sustainably and responsibly [50]. Dass and Pal found that there has been a remarkable improvement in many areas of the world. However, the problem of exclusion persists where large cross sections of the population are financially locked out of the formal financial systems, hailing mainly from the developing world [13]. Concerning South Asia, the levels of financial exclusion are high because of such factors as poverty, financial illiteracy, and the weak development of financial systems. Nevertheless, the new possibilities of mobile financial services can help to overcome these problems because mobile financial services can create a possibility of connecting people with a financial system at lower costs.

The SAARC region has billions of people, which is nearly 20% of the total population of the world. However, many SAARC countries still belong to rural areas where conventional banking facilities are either not available or are quite expensive. Such environments, therefore, have recognized mobile financial services as a critical enabler of financial access. Since customers with Financial Institutions can transact straight from their smartphones without needing to visit an ATM or bank office, mobile money has significantly transformed how financial services are provided to previously excluded customers, particularly those who live in rural or remote areas. Sultana explained that this intervention is not only enhancing personal incomes but also enhancing economic transformation, given that the informal players locked out of the financial system are being brought in by this scheme [51].

Therefore, mobile financial services cover all forms of financial activities that can be done on a portable device, mobile banking, payment, and mobile money transfer. It has aided the unbanked population in developing nations to obtain the most basic financial services they cannot afford to access. Mas and Morawczynski analysed Kenya's adoption of mobile money services like M-Pesa, which is revolutionary for the country's financial services industry, and the utilization of mobile technologies for financial services delivery. So, such successful initiatives have inspired the SAARC region, where governments and private players will see mobile financial services as the general potential mover of the consequences generally known as financial inclusion [33].

The financial infrastructure of the SAARC member-states cannot be considered homogeneous: there are important differences regarding financial inclusion. Lenka and Barik addressed that India, for instance, has shown tremendous progress in offering financial services, especially using the Pradhan Mantri Jan Dhan Yojana (PMJDY) to open bank accounts, where millions of accounts in rural areas have been opened [32]. Furthermore, the Indian government has endorsed the expansion of UPI, increasing the use of electronic payments and mobile financial services. The same can be said with the release of financial services on mobile devices, where growth in Bangladesh has been very rapid, including services such as bKash, which is now one of the dominant mobile money providers in the country. However, countries such as Afghanistan and Bhutan are at a relatively nascent stage of mobile financial services development, and they still have problems like tiny amounts of smartphone use and an inadequate state of financial literacy.

The developments of the SAARC region's mobile financial services have been precipitated by the following factors. First, the extensive use of mobile phones has created a vast user base that can be tapped into for the provision of monetary assistance. The advanced utilization of mobile devices, even in rural regions, is another opportunity for financial institutions, in that they can now access a much broader market than in the past. Second, mobile financial services came as cheaper solutions compared to traditional banking services, which were preferred by both sides – consumers and providers. Mobile financial services do not require physical infrastructure, thereby minimizing the expenses likely to be incurred in putting up banking branches and ATMs. This, in turn, helps extend a range of financial services to be more competitive and, hence, affordable to low-income individuals.

There is also an increasing and effective regulation aspect, which is also a prominent driver of MFS in the SAARC region. Authorities from every nation in the region have appreciated the ability of MFS to promote financial inclusion and have put in place measures that would support their deployment. For instance, the Reserve Bank of India (RBI) set standard procedures that have to be complied with to provide mobile

payment systems and facilitate such services. Likewise, Khan et al. explained that the Bangladesh Bank has introduced important regulations on mobile financial services, which have helped increase mobile money service providers [28]. Nevertheless, the level of regulation differs between countries in the region: some of them are more active in facilitating the use of MFSs.

To what degree MFS has impacted the flow of financial inclusion in the SAARC region is quite enormous. Saxena and Mokashi Punekar stated that being readily available and affordable, the services may be a way of closing the gap between the banked and the unbanked [34]. This has many implications encompassing the economy, whereby there is enhanced economic participation and development, which is realized through enhanced financial inclusion. Jacolin et al. examined that MFS provides a way out of some of the barriers that may be inherent in bank-based financial services, including the requirements for bricks and mortar and the costs of providing services [25]. Furthermore, since mobile financial services enhance people's ability to save, borrow, and invest relative to other forms of financial services, the utilization of mobile financial services, controlling for other factors, reduces poverty and enhances living standards.

This research mainly aims to compare mobile finance markets as a proportion of the total economy among SAARC countries, focusing on factors affecting financial inclusion. Therefore, this study has provided an understanding of how MFS can grow financial services in SAARC countries, improving financial access and economic well-being. Although there are various issues to consider, such as the slow spread of mobile use and various regional regulations, the potential benefits of mobile financial services are clear. With heightened consciousness and coverage of these offerings, the future of the SAARC region is more inclusive in the sense that the barriers to financial inclusion will not be a reality in the future.

Thus, this study suggests significant practical ramifications on business practices, the telecommunication and innovation infrastructure, the mobile finance network service providers, the official setting of the country, literature, academia, various international organizations, and policymakers. This research paper will be useful in extending the knowledge about mobile

and internet services in SAARC countries by offering up-to-date empirical data regarding the penetration, usage, and service quality of digital services. Biswanath Behera et al. anticipated that the findings of the studies should aid initiatives meant to address the digital divide and foster a regional developmental agenda [8]. Also, it will pave the way for future investigation on the implications of new technologies in addition to PPPs and digitization in the SAARC region, as the findings of this investigation will act as a source of current and prospective comparative research in digital infrastructure. Considering this, Donner and Tellez ascertained that mobile money transactions and mobile cellular subscriptions are the main forces behind financial inclusion. Here is how the rest of the paper is structured: the "Current Status of Mobile and Internet Services in SAARC Countries" and the "Literature Review Section" derive the hypotheses, and the "Data and Methodology" outline the data collection procedure and research method [16]. The "Results and Discussion" part exhibits the output of the collected data. The 'Theoretical and Managerial Implications of the Study' section outlines practice and theory recommendations, while the 'Limitations and Future Scope of Research' section outlines the areas to explore in the future field, and the 'Section on Conclusion and Policy Proposals' provides a summary and proposals for policies.

Current Status of Mobile and Network Experience Across SAARC Countries

For each SAARC nation, we have compiled a table that highlights their mobile and internet penetration, 4G availability, and 5G deployment. There will be extensive 4G and 5G services in India beginning in 2022, and the country already has 1.17 billion mobile customers, an 84% penetration rate, and 850 million internet users, a 60% penetration rate. With 4G accessible to 90% of the population and limited 5G starting in 2021, Bangladesh has 182 million mobile users, or 110% penetration, and 130 million internet users, or 78%. With 4G coverage at 85% and 5G trials continuing, Pakistan has 195 million mobile subscribers (89% penetration) and 125 million internet users (54%). There is a wide range of 4G coverage and 5G deployment phases in other nations, such as the Maldives, Sri Lanka, Nepal, Afghanistan, and Bhutan.

Table 1. *Current Status of Mobile and Internet Services in SAARC Countries.*

Country	Mobile Penetration	Internet Users	4G Availability	5G Rollout
India	As of 2023, India has around 1.17 billion mobile subscribers, and mobile penetration is estimated to be around 84%.	India has over 850 million internet users, out of which the internet penetration stands at around 60%, making the country the second-largest internet market globally.	Chawla and Joshi found that 4G services are widely available and the coverage is about 98% of the population [10].	In mid-2022, India started 5G services, and it will roll out further in the country.
Bangladesh	Bangladesh has 182+ million mobile users with a mobile penetration rate of 110%, im-	Hasan stated that it boasts about 130 million internet users and an internet usage rate of	There is a total availability of 4G services to approximately 90% of	Bangladesh launched limited 5G services in late 2021, with plans for

Country	Mobile Penetration	Internet Users	4G Availability	5G Rollout
	plying multiple SIM card usage.	78% [21].	the population.	broader expansion.
Pakistan	According to Kemal, Pakistan has approximately 195 million mobile subscribers, representing roughly 89% of the total population [27].	Currently, there is internet user of 125 million and the Internet is accessible to 54% of the population.	Recently, it has been noted that the 4G services provide coverage for over 85% of the population.	5G has not been launched in Pakistan yet and the country is in the initial phase of trial, though it is going to launch soon commercially.
Sri-Lanka	Sri Lanka has approximately 30 million mobile users, with an estimated usage rate of 140%, a factor indicating multiple subscriptions.	It has about 11 million internet users, which is half of its population which making the internet penetration rate about 50%.	4G services are also available, and it is said that they cover more than 95% of the population of the country.	di Castri marked that 5G is at the trial stage currently in Sri Lanka, with a commercial rollout soon [14].
Nepal	Currently, there are around 42 million users of mobile phones among the total population of Nepalese people, and the average Mobile phone penetration in Nepal is more than 140%, which shows that there is a high tendency of multiple SIM connections.	Pradhan and Dahal stated that it is shocking to learn that the internet users of Nepal are over 18 million and internet usage is at 60% of the population [41].	Coverage of 4G services is some 85 per cent of the population.	Currently, Nepal has not started 5G services, but it has ventured into the trials of 5G.
Afghanistan	As per Rahman et al., there are about 23 million mobile subscribers with a 60% mobile phone penetration [42].	The country has about 10 million people with internet access, with internet usage being approximately 27%.	4G services have been deployed mostly in large cities, and the penetration is estimated to be 50%.	Afghanistan has not started the 5G trial yet because of infrastructure and political problems.
Bhutan	Bhutan has a total mobile user of approximately 800 million and it shows that the mobile penetration is around 108%.	It is estimated that there are about 700000 internet users, giving internet connectivity of roughly 90%.	The 4G services are widely spread, especially in the urban areas hence touching on the majority of the population.	Currently, Bhutan has not widely embraced 5G but has plans to in future, depending on its development.
Maldives	Currently, there are approximately 900,000 mobile subscribers, and the mobile subscribers' penetration is more than 200% in the Maldives, and which refers to multiple SIM usage.	Currently, an easily accessible internet is available in the country as it has nearly about 600000 internet users and the internet is highly penetrated to the extent of 120%.	Song et al. explained that 4G is offered in all the regions and even on the remote islands of the country [46].	The Maldives introduced 5G services in 2020, with a wide coverage requirement being one of the first countries in the region to do so.

The following figure presents the download and upload speed experiences in megabits per second (Mbps) for various countries. Among the nations tested, India has the fastest download speed—just over 40 Mbps—and the worst upload speed—about 10 Mbps. Moderate download rates of 10–20 Mbps and upload speeds of 5–10 Mbps are seen in Sri Lanka, Pakistan, and Bangladesh. The performance is inferior in Afghanistan and Nepal, with download and upload rates be-

low 10 Mbps. Bhutan and the Maldives are notable for their remarkable mobile network performance when compared to other SAARC countries. The Maldives, in particular, stand out with download speeds approaching 45 Mbps and upload speeds approaching 20 Mbps. The graphic clearly shows how these nations' mobile network quality varies greatly from one another.

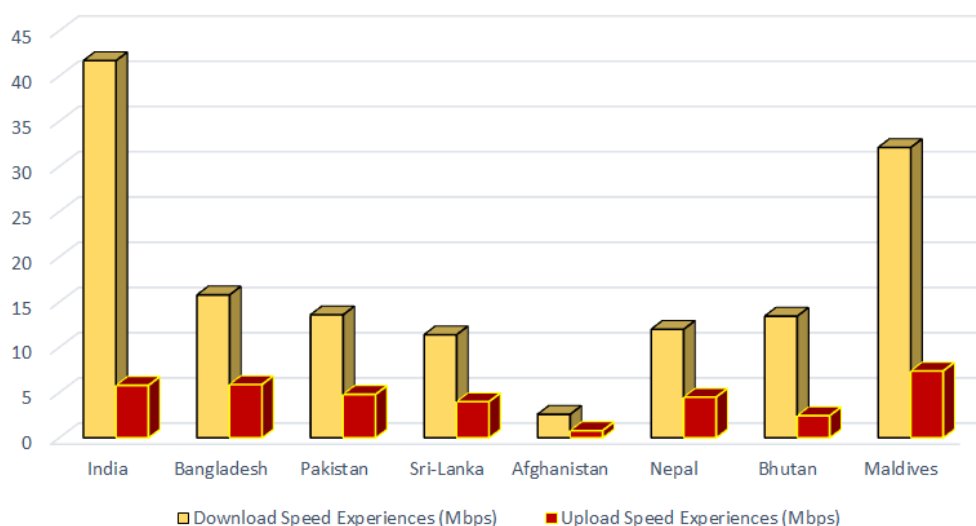


Figure 1. Mobile Network Experience Across SAARC Countries.

The bar chart displays the proportion of tests where the mobile internet quality was constant across different SAARC nations. With a consistency rate of over 80% in mobile internet quality, the Maldives has the most dependable mobile internet service. Following closely behind with around 70% consistency, Bhutan demonstrates both excellent and reliable service. While Nepal's performance is lower than Bhutan's, it is nevertheless commendable, showing consistency of over

60%. Internet consistency is modest, falling anywhere between 40% and 60% in countries like Bangladesh, Sri Lanka, Pakistan, and Afghanistan. Among the region's nations, India has the highest mobile and internet penetration rates, but its consistency rate is just over 30%, suggesting that the quality of service is uneven despite the extensive availability. The graphic below shows how the mobile internet dependability varies between SAARC countries.

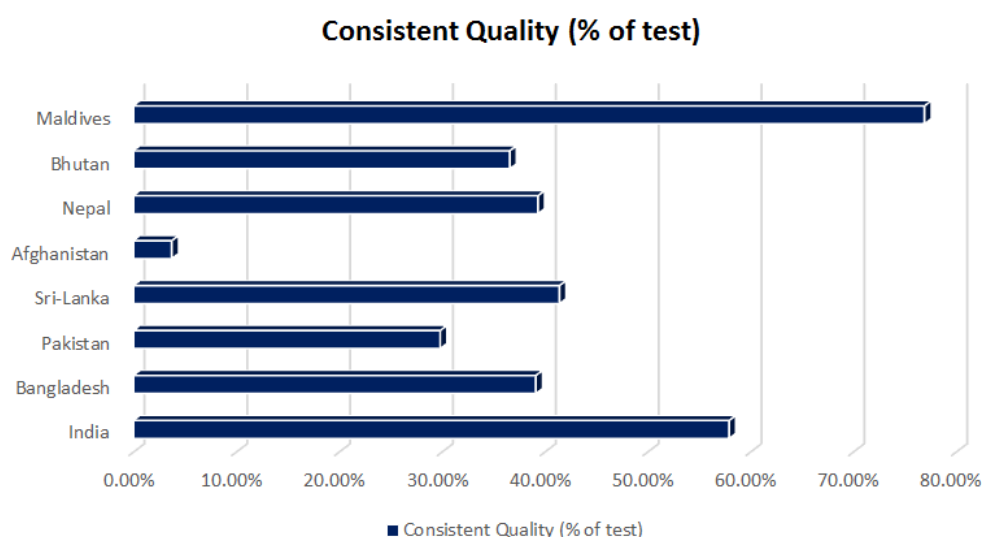


Figure 2. Consistency rate of Mobile Internet Across SAARC.

2. Literature Review

2.1. Overview of MFS in Financial Inclusion

Mobile financial services demonstrate a range of banking

operations that can be accomplished via mobile phone. Essentially, it illustrates a comprehensive range of services offered to consumers who access and utilize banking and payment services via mobile devices, both for personal and commercial purposes [47]. In 1997, Coca-Cola revolutionized mobile money by launching a beverage machine that enabled

consumers to purchase with text messages [20]. In the 2000s, the notion of mobile banking transitioned from the traditional banking paradigm to a non-banking approach in emerging economies. Consequently, the notion of "mobile money" emerged, denoting the cost-effective provision of fundamental banking operations using cell phones, mainly aimed at the population without access to the conventional banking system [38].

In Africa and Asia, a substantial population lacks the opportunity to access facilities from financial institutions, and these individuals are mostly found in developing nations. More precisely, South Asia (SA) is home to about 20% of the worldwide estimated population, with the bulk of its inhabitants facing financial isolation. Additionally, it is one of the rapidly developing areas globally. Hazra and Priyo have asserted that Mobile Financial Services (MFS) can influence emerging nations by enhancing the accessibility of financial services [22]. A thorough understanding of the reasons and methods by which individuals use these sophisticated applications to achieve their objectives is crucial to optimize their potential. Specifically, mobile finance services have been crucial in Bangladesh's socio-economic progress. The existence of this sector in sustaining the Bangladesh economy at a crucial period is evidence of the government's forward-thinking approach in implementing the 'Digital Bangladesh' initiative mentioned by Kumar [31].

Kim et al. revealed that M-PESA effectively fostered financial inclusion for previously deprived banking populations in developing nations by providing financial services via mobile devices [30]. Morduch and Haley stated that small and medium-sized businesses profit significantly from increased access to financing opportunities made possible by a well-developed national banking sector. Moreover, it has the potential to provide job prospects, promote financial and economic prosperity by minimising susceptibility, and aid in the alleviation of poverty [36]. The World Bank asserts that easier access to finance can diminish unemployment and enhance collective prosperity. Additionally, it can improve individuals' ability to conduct financial transactions with greater efficiency and security while broadening their investment and risk mitigation opportunities [53].

Cámara, N., and Tuesta assessed the extent of financial inclusion across eighty-two nations, both developed and less developed, at a national level [9]. They hypothesize that access to financial services is governed by three factors: utilization, obstacles, and availability of equitable finance. Furthermore, Sharma quantitatively assessed the level of financial inclusion among Asian nations [49]. A financial inclusion model that she devised is a methodical strategy to ensure that all individuals in a country have readily available to and can effectively use the official banking system [48]. The International Monetary Fund's (IMF) Financial Access Survey (FAS) database and the World Bank's World Development Indicators (WDI) dataset have been used in a substantial number of prior research to develop an updated integrated index that measures

financial inclusion [1, 15, 35, 45].

2.2. Hypothesis Development

2.2.1. The Influence of Mobile Money Transactions

Donovan emphasized that mobile money is the most crucial component in increasing the availability of traditional banking facilities in developing nations [17]. Since individuals and small businesses have little involvement in the conventional banking services of developing countries, mobile money systems have the potential to fulfill two roles: promoting financial inclusion and serving as an income stream for operators in emerging economies [40]. For this reason, some SAARC nations have implemented additional steps to expand mobile money transactions by introducing a program focused on financial literacy. This program aims to accelerate the progress towards achieving equitable financial access.

Hypothesis 1: *Mobile money transactions have a significant positive impact on financial inclusion.*

2.2.2. The Influence of GDP

Oruo conclusively showed a strong and favorable association between expansion in GDP and financial inclusion [39]. Available empirical data demonstrates that the banking industry fosters economic activity. The overall economic progress in Kenya has been aided by the banking industry's remarkable degree of development. Musau et al. looked at the influence of monetary inclusion on the risk of borrowing in Kenyan banks and how GDP moderates this relationship [37]. The study demonstrated that the GDP growth rate partly influenced the connection between monetary inclusion and borrowing risk. Therefore, per capita GDP can be considered one of the most essential factors when estimating financial accessibility.

Hypothesis 2: *GDP has a significant positive impact on financial inclusion.*

2.2.3. The Influence of Mobile Cellular Subscriptions

Lenka and Barik analyzed to examine the impact of the increase in mobile cellular users on the accessibility of banking services in SAARC nations from 2004 to 2014 [32]. Their statistical analysis revealed a significant and strong correlation between the increase in mobile cellular users and the expansion of economic empowerment. According to Ghosh, who conducted out in fourteen of India's most populous states, increased access to mobile phones significantly boosted economic development and democratization of finance [19]. Thus, it is certain that widespread cell phone usage promotes economic development by facilitating access to financial services.

Hypothesis 3: *Mobile cellular subscriptions have a significant positive impact on financial inclusion.*

3. Methodology

3.1. Data

The research is based on World Development Indicators (WDI) data. Given the expenses associated with gathering primary data for a comprehensive panel, the WDI is the most suitable source of macroeconomic data. Furthermore, the selection of WDI was based on its comprehensive coverage of the variables, surpassing the information available in the Global Financial Index database on financial inclusion explained by Evan [18]. The collected data covered relevant variables for this study from 2012 to 2022, focusing on SAARC countries. However, it has been found that most of the SAARC nation's data is not consistent throughout the years. Therefore, only the indicators from Bangladesh, India, and Pakistan have been retained to maintain the accuracy of the results derived from this study.

3.2. Model Specification

The six measures used in this research to build financial inclusion were derived from previous studies where these measures were shown to be both valid and reliable [5, 52]. The most relevant materials on financial inclusion were identified using Principal Component Analysis (PCA). Initially, five indicators, such as mobile money transactions, GDP growth rate, individuals using the internet, and the number of mobile cellular subscriptions, were adopted from earlier research to compare the MFS market and build a panel regression model [6, 7, 44]. However, after conducting a correlation matrix, individuals using the internet were eliminated from the panel regression model due to the multicollinearity problem. Hence, the following empirical model of this study expresses the effect of mobile money transactions, GDP growth rate, and the number of mobile cellular subscriptions on financial inclusion:

$$FI_{it} = a_0 + \beta_1 MM_{it} + \beta_2 GDP_{it} + \beta_3 MCS_{it} + \mu_{it}$$

This model's stated goal is to identify the interactions among FI and some substantial factors in three SAARC nations: Pakistan, India, and Bangladesh. This research selected the index of financial inclusion (FI) as the dependent variable, which denotes the degree to which people in society can use financial services for fundamental monetary necessities, including deposits, financing, and insurance coverage. Mobile money (MM) serves as a prime independent factor that quan-

tifies the degree of adoption of mobile financial services. It illustrates the use of mobile technologies to provide financial services to even those who have limited access to it. GDP is another predictor that indicates a country's broad progress in the economy, which is often linked to improved services in finance. Finally, mobile cellular subscriptions (MCS) are utilized to ascertain the quantity of mobile internet accessibility, since these devices significantly contribute to delivering financial services in regions lacking financial institutions. The presence of these indicators improves the model's ability to examine how factors like GDP, cellular technology, and other elements of digital payment systems through mobile influence financial accessibility across diverse SAARC nations.

4. Data Analysis and Findings

4.1. Principal Component Analysis

A Principal Component Analysis (PCA) was performed on six dimensions related to financial inclusion. These variables include the number of commercial bank branches per 100,000 adults, the number of ATMs per 100,000 adults, the number of borrowers from microfinance institutions per 1,000 adults, the number of microfinance institution branches per 1,000 km², the outstanding loans from commercial banks (specifically SME loans), and the number of deposit accounts with commercial banks per 1,000 adults. The PCA revealed significant insights into the underlying structure of the data [31].

The PCA analysis reveals that the first principal component had an eigenvalue of 4.382, accounting for 73.05% of the overall variance. This component is closely linked to variables about the infrastructure of commercial banking, such as the quantity of commercial bank branches. The second principal component, which has an eigenvalue of 1.528, explains an extra 25.47% of the variance. Component 2 is mostly shaped by the quantity of ATMs in certain demographics among SAARC countries.

Components three to six individually account for a small amount of the variation, together with contributing less than 1.4%. More precisely, component 3 explains 1.04% of the variation, whereas the last three components contribute 0.31%, 0.11%, and 0.02% correspondingly. The results emphasize that the first two primary components account for the majority (98.52%) of the variation in the data, making them crucial for comprehending financial inclusion. Therefore, to highlight the notion of financial inclusion, the first two components were retained.

Table 2. Principal Component Analysis of Financial Inclusion.

Component	Eigenvalue	Difference	Proportion	Cumulative
1	4.383	2.854	0.731	0.731

Component	Eigenvalue	Difference	Proportion	Cumulative
2	1.528	1.466	0.255	0.985
3	0.062	0.044	0.010	0.996
4	0.018	0.011	0.003	0.999
5	0.007	0.006	0.001	1
6	0.001		0.000	1

4.2. Comparison of MFS Markets Among SAARC Countries

Figure 1 displays the financial inclusion figures for Bangladesh, India, and Pakistan from 2013 to 2022. Throughout the past ten years, all three nations have exhibited a steady rise in financial inclusion, with India consistently displaying the highest levels. The financial inclusion rate in India in 2013 was 12.24, surpassing that of Bangladesh (6.66) by more than double and Pakistan's (7.39) by a significant margin. India's

financial inclusion value increased to 19.48 by 2022. The level of financial inclusion in Bangladesh increased from 6.66 in 2013 to 10.70 in 2022, demonstrating consistent advancement. Pakistan saw a favorable trajectory, increasing from 7.39 in 2013 to 10.98 in 2022. Although they began from distinct starting points, the increasing trends in all three nations demonstrate their focus on improving financial accessibility and inclusion. The ongoing enhancement highlights the efficacy of financial strategies and endeavors targeted at extending financial services to the wider citizens in the SAARC area.

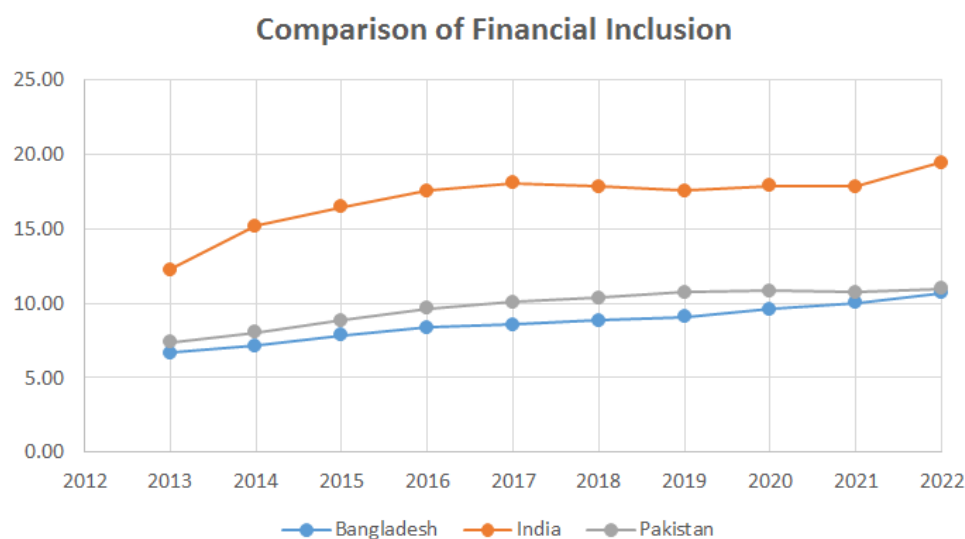


Figure 3. Line Chart of Financial Inclusion.

The following table presents a comparative study of the number of mobile money transactions over the years 2013 through 2022 in the countries of Bangladesh, India, and Pakistan. During this time, all three nations had a significant increase in mobile money transactions, which indicates the growing acceptance of mobile financial services. From 2013 to 2022, the number of transactions in Bangladesh's mobile money sector climbed from 229 million to 4.26 billion. India had a remarkable development in its transaction volume, beginning from 32.7 million in 2013 and reaching an im-

pressive 5.3 billion by 2022. This significant increase can be credited to India's efforts to promote digitalization and financial inclusion. Pakistan had significant growth, as shown by the rise in transaction volume from 192 million in 2013 to 3.05 billion in 2022. The figure highlights the rapid expansion and growing reliance on mobile financial services in these SAARC countries, underscoring the essential function of mobile money in enhancing financial inclusivity and accessibility in the neighboring countries.

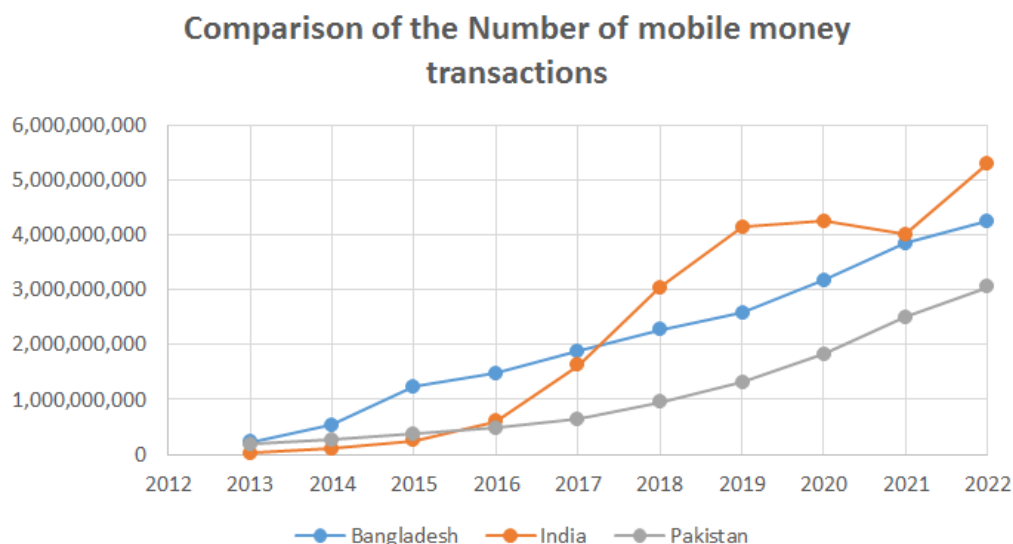


Figure 4. Line Chart of the number of mobile money transactions.

Figure 3 provides a comprehensive comparison of the GDP growth rates of Bangladesh, India, and Pakistan from 2013 to 2022. It highlights important economic trends and disturbances that occurred during these ten years. Bangladesh has constantly shown robust and steady economic expansion, reaching its highest point at 7.88% in 2019. However, the global epidemic drastically showed decreased to 3.45% in 2020. Fortunately, the nation saw a subsequent recovery, with a growth rate of 7.10% in 2022. India saw significant fluctuations in its economic performance, with a notable high of 8.26% growth in 2016, followed by a steep decrease to -5.83% in 2020, which

may be attributed to the severe economic disruptions caused by the pandemic. Nevertheless, India showed resilience by achieving a strong recovery rate of 9.05% in 2021. Pakistan saw very slow and fluctuating GDP growth, reaching a remarkable high of 6.57% in 2016, followed by swings and a large drop of -1.27% in 2020. The ensuing rebound to 6.51% in 2021 signifies a resumption of economic expansion, although at a level below that of the pre-pandemic period. These patterns highlight the different levels of economic resilience and recovery paths across the three nations, which are affected by both local policy and global economic factors.

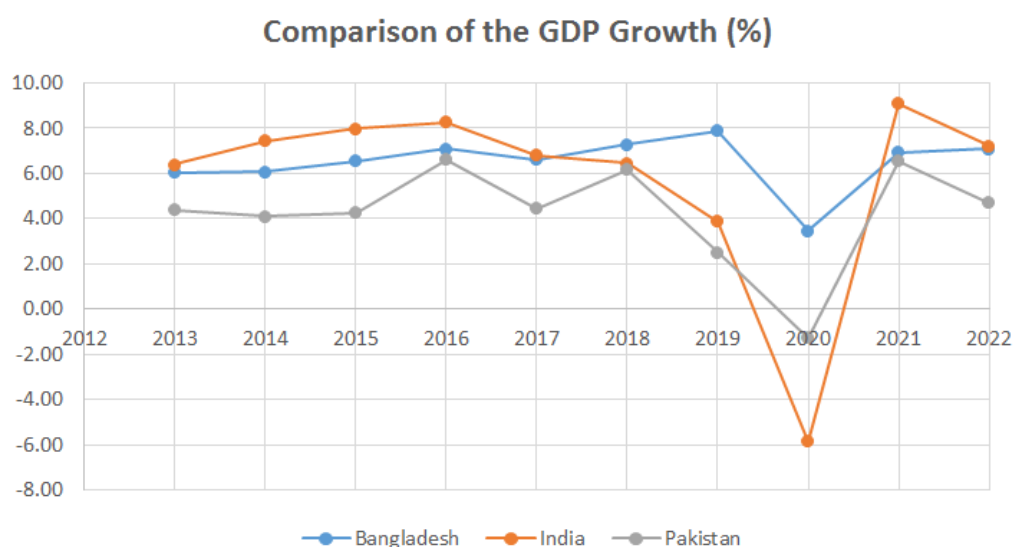


Figure 5. Line Chart of the GDP Growth (%).

In Bangladesh, India, and Pakistan, mobile cellular subscriptions have changed throughout ten years, from 2013 to

2022. The provided diagram depicts Bangladesh's consistent and uninterrupted growth, which has emerged from 116.6

million in 2013 to reach its highest point of 184.4 million in 2021, subsequently experiencing a small decline to 180.2 million in 2022. The consistent expansion demonstrates a rise in mobile connection and the extent it has spread across the nation. India, in contrast, has a vast level of mobile penetration, with a significant increase from 886.3 million subscribers in 2013 to a high of 1.17 billion in 2018. Nevertheless, the data indicates a slight decrease in the following years, reaching a final figure of 1.14 billion in 2022. This suggests

that the market may have reached its maximum capacity or might have possible effects from regulations. The number of mobile subscribers in Pakistan, like Bangladesh, has seen substantial development, increasing from 127.7 million in 2013 to 192.8 million in 2022. This rise is a result of the rising mobile market and improved accessibility. This research underscores the critical significance of mobile internet in fostering connectivity and online accessibility in different countries.

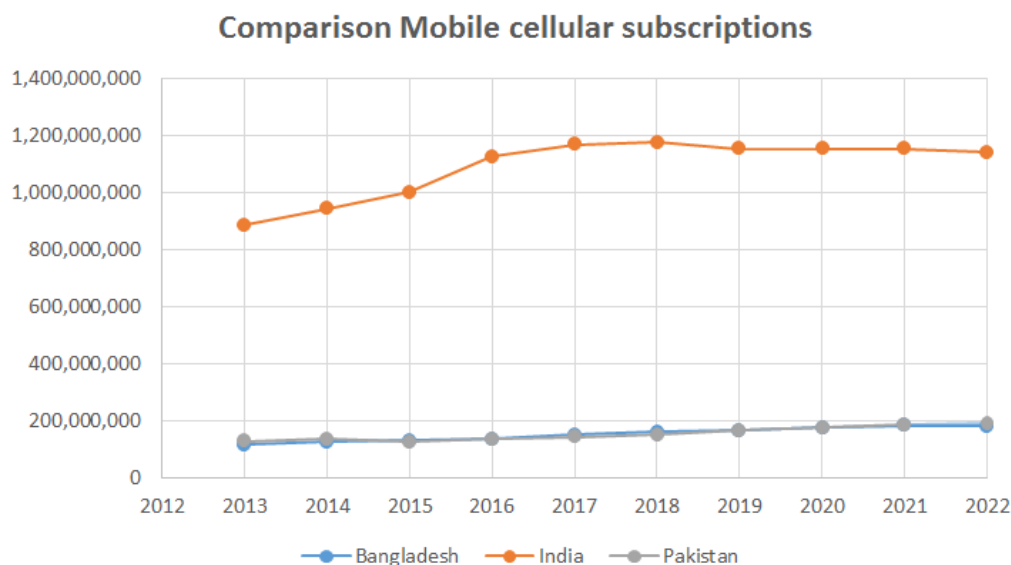


Figure 6. Line Chart of Mobile Cellular Subscriptions.

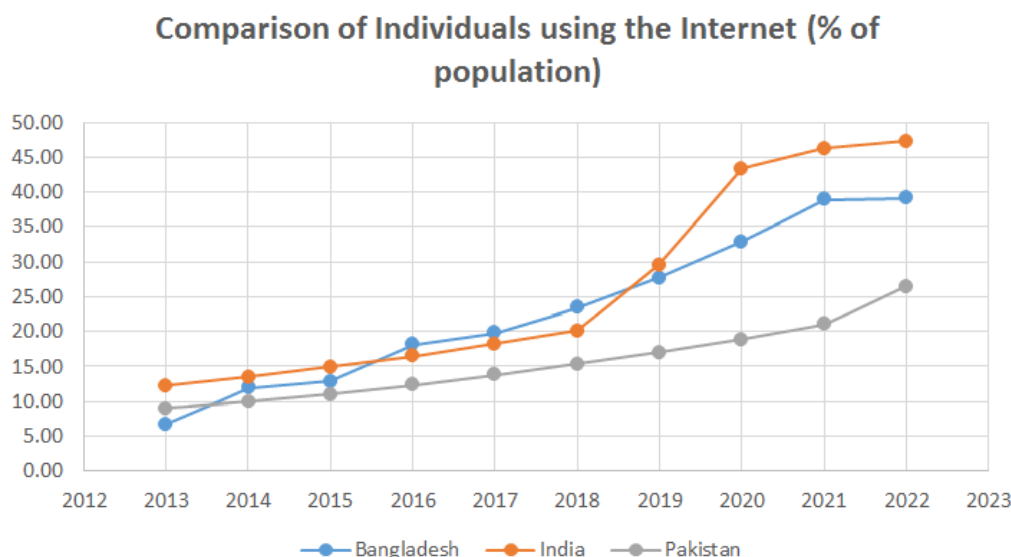


Figure 7. Line Chart of Individuals using the Internet (% of population).

Figure 5 illustrates the growth of internet use in Bangladesh, India, and Pakistan from 2013 to 2022, highlighting significant advancements in digital penetration in these nations. Internet

use in Bangladesh increased from 6.63% in 2013 to 39.18% in 2022, demonstrating a substantial growth in digital connection and affordability. India had a significant increase in its growth

rate, beginning at 12.30% in 2013 and reaching 47.24% by 2022. The significant surge in numbers highlights the country's strong expansion of technological capabilities and extensive acceptance of Internet services. Pakistan, although having a greater initial value of 9.00% in 2013 compared to Bangladesh, demonstrates a more gradual rise, reaching a peak of 26.50% in 2022. The consecutive growth represents the individual countries' efforts to improve internet penetration, with India taking the lead in terms of the highest growth rate. Various developments emphasize the crucial importance of internet accessibility in promoting digital inclusion and socio-economic development in various South Asian countries.

The summary statistics of the five primary variables in the research provide a comprehensive overview of the data's central tendency and dispersion. The average financial inclusion (FI) level is 11.827, with an SD of 4.042, indicating considerable variability within the average. With a mean of

1.78 billion and an SD of 1.58 billion, the mobile money transactions (MM) display substantial variability, indicating a broad range of values spanning from 4.706 million to 5.3 billion. The average GDP growth rate is 8.066%, but it has a significant level of variability, as seen by its standard deviation of 14.228. The numbers range from -5.831 to 81.747. The average level of Internet use among people (INT), expressed in a percentage of the total individuals, is 21.950, with an SD of 11.842. Figures ranging from 6.630% to 47.240% indicate varying degrees of internet penetration. Mobile cellular subscriptions (MCS) mean value is 466 million, with an SD of 453 million. The Mobile Subscriber Statistics (MCS) ranges from 117 million to 1.18 billion, indicating a wide range of mobile subscription rates in the last decade. The figures highlight the varied financial environments and technology acceptance in various locations, offering important insights for policy and economic plans.

Table 3. Summary Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
FI	30	11.827	4.042	6.663	19.479
MM	30	1780000000	1580000000	4.706	5300000000
GDP	30	8.066	14.228	-5.831	81.747
INT	30	21.950	11.842	6.630	47.240
MCS	30	466000000	453000000	117000000	1180000000.

Table 2 presents the correlation matrix that illustrates the associations among the variables included in this study. The results reveal that mobile money transactions, GDP growth rate, individuals using the internet, and mobile cellular subscriptions are positively associated with financial inclusion. However, individuals using the internet correlate strongly (.845) with mobile money transactions. If the correlation value between independent variables exceeds 0.70, it indicates the presence of multicollinearity, which hinders the estimation of the specific influence of individual predictors on the output variable [12, 24]. Therefore, the indicator named individuals using the internet has been removed to avoid multicollinearity problems in the panel regression model.

Table 4. Correlation matrix.

Variables	FI	MM	GDP	INT	MCS
FI	1				
MM	0.447	1			
GDP	0.041	-0.235	1		

Variables	FI	MM	GDP	INT	MCS
INT	0.465	0.845	0.206	1	
MCS	0.956	0.337	-0.105	0.331	1

Before conducting the regression for the panel in this study, the Hausman test was used to ascertain the suitability of the fixed effects (FE) model against the random effects (RE) model for analyzing panel data. Since the results failed to reject the null hypothesis, the Random-effects Generalised Least Squares (GLS) regression analysis was performed on 30 observations over 3 groups (countries).

The regression analysis reveals that the coefficient for the number of mobile money transactions ($\beta = 0.004$, $z = 3.07$, $p = 0.002$) directs a statistically significant positive impact. Thus, it can be inferred that increasing the volume of mobile money transactions leads to a proportional enhancement in financial inclusion. However, the correlation between GDP growth and financial inclusion is not statistically significant. Mobile Cellular Subscriptions (MCS) favorably influence Financial Inclusion ($\beta = 0.008$, $z = 17.72$, $p = 0.000$). This result implies

that increased mobile internet subscriptions are strongly linked to improved financial accessibility.

These results suggest that mobile money transactions and mobile cellular subscriptions are crucial in advancing financial integration. These elements have significant beneficial effects on financial inclusion, underscoring the vital importance of internet-based banking services and technological infrastructure in enhancing the accessibility of financial offerings. These results indicate that policies that promote the implementation of cellular technology and online banking solutions can greatly improve financial inclusion, particularly in emerging nations.

Table 5. Panel Data Regression Results.

Variables	Coefficient	Std. Err.	z-Statistic	Prob.
MM	0.004	0.001	3.070	0.002
GDP	0.003	0.014	1.850	0.065
MCS	0.008	0.005	17.720	0.000
_cons	7.093	0.365	19.430	0.000

5. Discussion

This paper examines the factors influencing financial inclusion in SAARC countries by comparing their mobile finance markets to their overall economies. Previous studies on mobile financial services, financial inclusion, internet usage, etc., were reviewed [3, 23]. The results of this research corroborate all of the hypotheses except for the one about the direct influence of GDP on financial inclusion. Hence, this study's findings corroborate those of previous investigations.

The results of this investigation suggest that mobile cellular subscriptions have a significant impact on access to financial services. The current results align with the analyses conducted by Bayar et al. and Donovan, which similarly identified mobile Internet subscriptions to determine financial inclusion [5, 17]. Given the comparable results, it is evident that SAARC countries have to prioritize the optimization of mobile payment systems' functions. The concept of mobile money underscores the potential benefit of ICT in facilitating the transition of poor nations to more efficient and contemporary economic systems, consequently enhancing financial inclusion [1, 4]. Furthermore, mobile money offers substantial efficiency enhancements compared to conventional money transmission methods by reducing travel time and improving safety and comfort.

The current findings of the research disclosed an insignificant Integration of GDP and financial inclusion. While results from this study contradict much prior research, a few studies also found that GDP growth is not an important determinant of financial inclusion. According to Dabla, the

variables contributing to GDP growth differ across different financial policies [11]. Hence, they confirmed that the financial inclusion measures and GDP results do not differ much in India. Rajesh stated that the increase in GDP by itself is inadequate for effective poverty reduction, which has been the primary objective of legislators for the past thirty years [43]. While high and sustained growth are essential prerequisites, the results of such progress must be distributed more effectively. The advantages associated with fast growth in GDP must reach the most vulnerable level of the population.

Considering these findings, mobile cellular subscriptions significantly influence the easy accessibility of financial amenities in SAARC nations. The findings derived from Berdibayev and Kwon also align with the present study [7]. They demonstrated that expanding access to financial services involves the provision of cost-effective mobile Internet rates, particularly in countries classified as emerging and developing. The proliferation of mobile phones, web browsing, and other online platforms caused the proposal of financial inclusion via the internet to alleviate economic hardship. In their study, Khowsehawat and Jantarakolica showed that mobile cellular subscriptions contribute to increased ownership of accounts at banking chains [29]. However, they do not significantly influence institutional deposits and legal loans. Furthermore, they provide convenience, connectivity, and safety assurance for usage and access to financial services. Hence, mobile cellular subscriptions are one of the significant factors in determining financial inclusion.

5.1. Implication of the Study

This paper has significant implications to governments, legislators, providers of mobile banking services and FinTech companies in the SAARC countries. The data corroborates the fact that MFS is an essential source of financial inclusion, and it can transform financial system access. To policy makers, the results indicate that there should be introduction of specific subsidies to increase the coverage of mobile networks in rural and underserved communities. To stimulate innovation in mobile money services aimed at low-income earners, governments can also offer tax incentives or establish regulatory sandboxes. On the same note, implementing digital literacy programs and consumer protection systems would assist in developing trust and safe use of mobile technologies. To service providers and FinTech companies, the findings indicate that there is an opportunity in creating low-cost data plans and streamlined mobile solutions to rural and low-education groups. Besides, further partnership between the business world and the international agencies would help fill in infrastructure gaps, including joint rural internet centers or mobile payment systems. Mobile money providers and telecom companies would be able not only to increase their presence in the country of operation but also play a significant role in closing the digital divide and ensuring inclusive growth in the region by aligning their activities with the peculiarities of the

socio-economic and regulatory environment that countries of the SAARC have to offer.

5.2. Limitations and Future Scope of the Study

There are some limitations regarding this study, though it is apparent that this study is a relatively comprehensive one. Firstly, the accessibility and consistency of data in different SAARC countries are differentiated, which may influence substantive quantitative estimations. Furthermore, given the scarcity of data, this research is mainly concerned with India, Bangladesh and Pakistan. Some countries may have detailed data regarding mobile and internet usage while others may have less consistent data at that. Secondly, it tends to work mainly with quantitative indicators such as penetration rates and coverage levels to characterize the experience of mobile and internet services, excluding certain qualitative characteristics, including client satisfaction and service reliability.

Future studies can overcome these limitations by including more quantitative data, such as surveys of users or online interviews with professionals in the technological field, to generate more accurate impressions of mobile and internet usage in SAARC countries. Consequently, more long-term examinations, which capture the trends and evolutions of mobiles and internet services, may provide important knowledge about intervention policies and market strategies. Further studies could also consider whether new technologies that are yet to emerge in the SAARC region and how they may affect other MFS markets in the future. In this way, scholars and practitioners can further advance these research directions to enhance the region's social connectedness and create new opportunities for economic growth and equitable development.

6. Conclusion

This research paper offers an exhaustive assessment of the comparison of MFS in advancing financial inclusion across SAARC countries, the proliferation of digital services, and the pervasiveness of mobile phones to reach the "bottom of the pyramid." Mobile financial services (MFS) has been widely recognized as a crucial catalyst for economic growth and the elimination of poverty. Furthermore, the research revealed that increasing the quantity of mobile money transactions and cellular subscriptions is crucial to improving financial inclusion in the SAARC region. While no apparent link could be established between fiscal expansion, as determined by GDP growth rates and financial inclusion. Therefore, the study concluded that economic growth alone is insufficient for addressing financial exclusion. The paper also emphasizes the availability of a friendly legal environment and the general network infrastructure where the Indian and Bangladeshi markets exhibit continued advancement in mobile financial services. Policy implications highlight the need for partnership between government and private entities to close infra-

structure gaps, including promoting a favorable regulatory environment to support the development and deployment of MFS, which in turn fosters the development of inclusive socio-economical infrastructure for greater involvement of individuals in the financial systems. The quantitative dynamics should be accompanied by research on qualitative characteristics such as consumer satisfaction and command over novel technologies capable of shifting MFS markets in the region. The study suggests that MFS will revolutionize financial inclusion and deep integration into the lives of the SAARC countries' economies and societies.

Abbreviations

CSR	Corporate Social Responsibility
FI	Financial Inclusion
MM	Mobile Money
MCS	Mobile Cellular Subscriptions
GDP	Gross Domestic Product
INT	Internet Users
PCA	Principal Component Analysis
KMO	Kaiser
Meyer	Olkin (Test for Sampling Adequacy)
RE	Random Effects
FE	Fixed Effects
GLS	Generalized Least Squares
SAARC	South Asian Association for Regional Cooperation
WDI	World Development Indicators
ICT	Information and Communication Technology
SDG	Sustainable Development Goals
WB	World Bank
UN	United Nations
ITU	International Telecommunication Union

Conflicts of Interest

The authors declare no conflicts of interest.

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