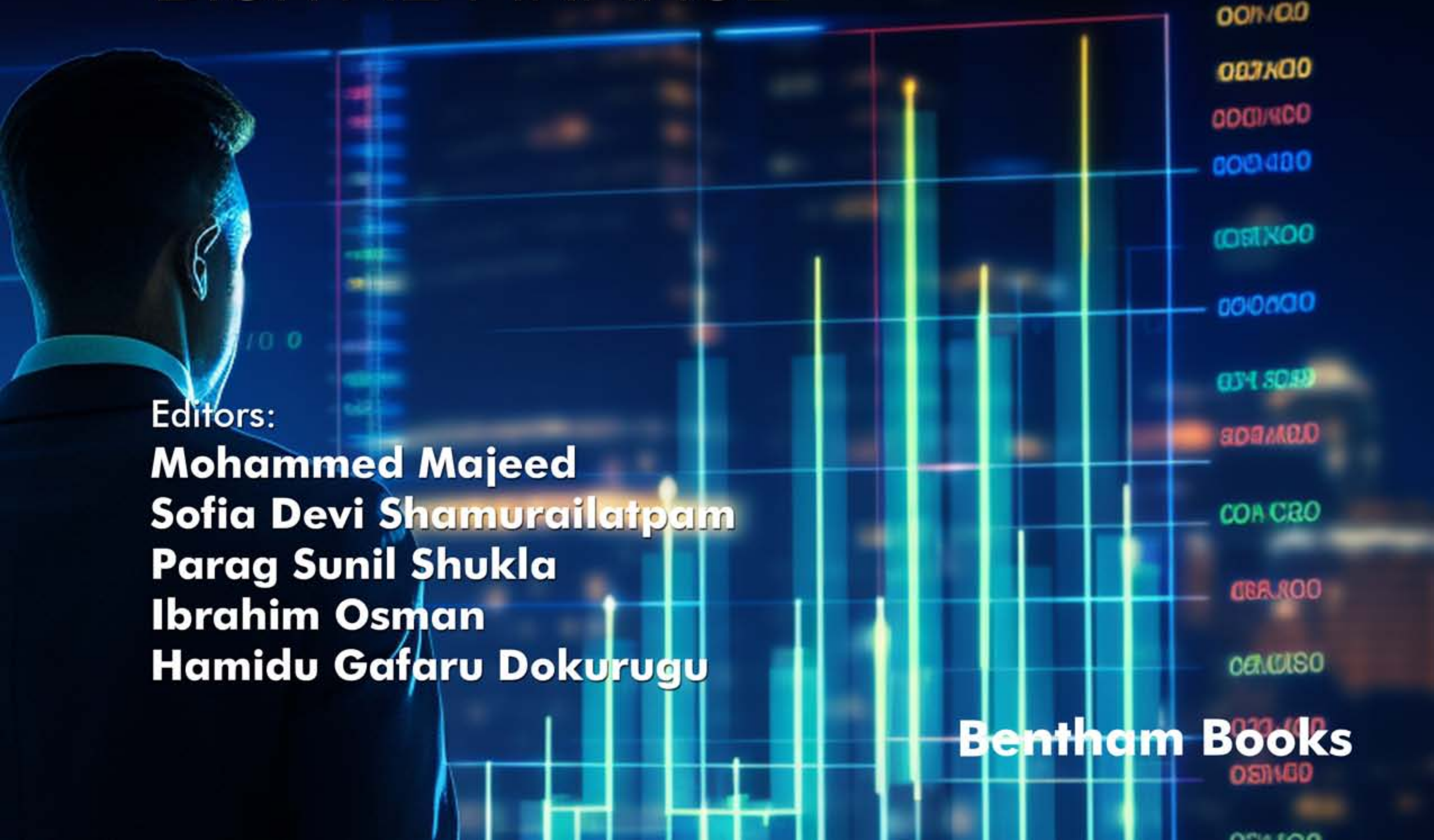
FINTECH REVOLUTION AND FINANCIAL INCLUSION IN EMERGING MARKETS

SHAPING SUSTAINABLE DIGITAL FINANCE



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FOREWORD

In an era where financial exclusion remains a noteworthy universal task, the arrival of Financial Technology (FinTech) has started a transformative crusade. FinTech not only aims to reform access to financial services but also seeks to fundamentally alter the architecture of financial systems, especially in developing economies. The book, Fintech Revolution and Financial Inclusion, offers a comprehensive examination of how FinTech is narrowing the divide between the unbanked population and conventional financial institutions. While financial inclusion has long been recognized as a crucial factor in fostering economic development and societal welfare, millions worldwide, particularly in less developed regions, still lack access to basic financial services. Conventional banking systems often struggle to reach these underserved communities due to infrastructure constraints, elevated operational costs, and insufficient financial education. However, the proliferation of digital technologies is now creating unparalleled opportunities to address this issue. The uniqueness of this book lies in its holistic approach to investigating the impact of FinTech on promoting financial inclusion in emerging markets. The book's chapters explore how various technologies, ranging from artificial intelligence and machine learning to blockchain and mobile-based solutions, can create new avenues for individuals previously excluded from the financial landscape. This book explores not just the potential of FinTech but also the hurdles encountered during its deployment. The chapter authors meticulously demonstrate that the path from innovation to real-world impact is riddled with challenges, including complex regulations, gaps in digital literacy, and constraints in financial infrastructure. Nevertheless, by tackling these issues directly and emphasizing inclusive, sustainable approaches, we can ensure that digital finance's advantages reach those most in need. By consolidating diverse viewpoints on the convergence of technology, finance, and social progress, this book provides a timely and crucial analysis of FinTech's capacity to effect enduring change in developing markets. The knowledge shared here will prove essential for policymakers, entrepreneurs, academics, and anyone committed to molding the future of sustainable digital finance. The significance of this dialogue cannot be overemphasized. In an ever-evolving world, financial inclusion through innovative FinTech solutions may be the catalyst for economic empowerment, social equity, and environmental sustainability. As we chart the course for finance's future, we must strive to leave no one behind.

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PREFACE

Of late, the financial sector has experienced a momentous change, pushed by the rapid development of Financial Technology (FinTech) and a wide-reaching effort to enhance financial accessibility. The potential of digital finance is particularly impactful in developing economies, where many still struggle to access conventional banking services. FinTech has created novel possibilities, delivering innovative solutions to underserved communities, enhancing access to credit, savings, and insurance products, and revolutionizing economies that have historically been excluded from mainstream financial systems. This book aims to examine the dynamic convergence of technology, finance, and social inclusion, with a focus on emerging markets. It compiles insights from industry experts, practitioners, and thought leaders, shedding light on FinTech's transformative role in fostering sustainable development, economic empowerment, and financial accessibility. As we explore the future of digital finance, we seek to comprehend how FinTech innovations, such as Artificial Intelligence (AI), blockchain, and mobile banking, can tackle the urgent issues of financial exclusion. Each chapter offers an in-depth analysis of current and future trends shaping the financial inclusion agenda, ranging from empowering ever-married women in India to incorporating Environmental, Social, and Governance (ESG) factors into fintech investments. The path from innovation to real-world impact is fraught with obstacles. Numerous challenges—whether they be technical, legal, or cultural—must be surmounted to ensure digital financial services reach every corner of the world. This volume provides a critical analysis of these hurdles and potential solutions that could lead to a more inclusive and sustainable financial system. We anticipate that this book will motivate scholars, government officials, innovators, and financial sector experts to further investigate FinTech's potential as a positive force in developing economies. The FinTech revolution is only in its early stages, and its ability to transform the financial landscape knows no bounds.

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CHAPTER 1

Financial Inclusion in Emerging Market Economies: A Macroeconomic Perspective

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Abstract: This chapter reviews recent trends in financial inclusion and its progress from a macroeconomic perspective, focusing on Emerging Market Economies (EMEs). The importance of EMEs in the global economy is evident in their dynamic and adaptive economic characteristics, especially given the structural challenges they face in integrating with the world economy. Understanding the extent of financial inclusion is crucial, as finance drives economic growth and ensures resource sustainability, in line with the socio-economic policy goals set by regulatory bodies and policymakers in these economies. We have analyzed financial inclusion in 20 selected EMEs based on the World Bank database and various macroeconomic development indicators, shedding light on the fundamental nature of their financial systems. While significant progress has been made in terms of access to finance, as evidenced by the growing number of people with formal bank accounts, there has also been progress in the use of financial services, such as savings, borrowing, and payments. However, concerns remain regarding the quality of services and the affordability of financial products.

Keywords: Accessibility to finance, Emerging market economies, Financial inclusion, Finance-led-growth.

INTRODUCTION

Dominated by dynamic and adaptive economies, Emerging Market Economies (EMEs) are characterized by rapid economic growth, industrialization, and increasing integration into global trade and finance. Understanding the strength of financial capacity and absorption in these economies is crucial from a global economic perspective. The concept is rooted in finance-led growth hypotheses,

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whether demand-following or supply-leading, which highlight the importance of finance as a key driver of development (Ranis & Fei, 1961; Schumpeter, 1912). For emerging and developing market economies, finance is instrumental in achieving major economic goals and visions (Beck, Demirgüç-Kunt, & Levine, 2007).

In this context, it is essential to understand the state of financial inclusion and the extent to which finance reaches different segments of society, particularly in emerging market economies. Additionally, recognizing the sustainability of finance is critical for meeting sustainable development goals (UNDP, 2015). This chapter provides an overview of financial inclusion and sustainable finance in EMEs. While there is no universally accepted definition of EMEs, they are generally identified based on factors such as nominal GDP, demographic characteristics, contributions to global trade and finance, and relationships with international institutional investors, such as Foreign Institutional Investors (FII) or Foreign Direct Investment (FDI) (IMF, 2020). According to research by Duttagupta and Pazarbasioglu (2021), we have selected 20 emerging market countries that account for 34% of the world's GDP in nominal terms and 46% in purchasing power parity terms. These countries include: Argentina, Brazil, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Iran, Malaysia, Mexico, the Philippines, Poland, Russia, Saudi Arabia, South Africa, Thailand, Turkey, and the United Arab Emirates. These countries' structural changes present new challenges and opportunities for global integration and development strategies (World Bank, 2022).

One of the key sources of financial inclusion data is the World Bank's Global Findex database, which surveys around 150,000 households across 140 countries, providing insights into account holdings, credit and savings accounts, and methods of transferring funds for services or receiving government benefits (Demirgüç-Kunt *et al.*, 2018). This chapter draws on data from the World Bank's Global Findex, the IMF's Financial Access Survey, and macroeconomic indicators from the World Development Indicators (World Bank, 2022) to analyze financial inclusion in selected EMEs. The chapter is structured into six sections. Section II provides a brief review of the literature on financial inclusion in EMEs. Section III offers an overview of the state of financial inclusion in EMEs, based on World Bank and IMF data. The following section presents debates and discussions on the topic, while Section VI concludes the chapter.

A BRIEF REVIEW OF LITERATURE

Extensive literature exists regarding the issues of financial inclusion in Emerging Market Economies (EMEs), as financial inclusion is considered one of the major policy development goals nations aim to incorporate into achieving Sustainable Development Goals (SDGs). Over time, countries have made notable progress in financial inclusion and financial literacy programs, as evidenced by World Bank Surveys, the IMF Financial Access database, and various local, regional, and global surveys. Theoretically, there is a direct and positive linkage between financial inclusion and economic development (Beck *et al.*, 2007).

A study by Ozili (2022) found that financial inclusion is positively correlated with sustainable development, which was measured in terms of various economic, social, and environmental variables. The role of technology is also indispensable when considering growth models for countries. Khera *et al.* (2022) examined the role of technology in financial inclusion across 52 developing and emerging market economies. Their study revealed that the adoption of digital financial services has been a key driver of financial inclusion, with significant variations across countries and regions. African and Asian countries, in particular, have shown the greatest progress in financial inclusion. Innovations in financial services, such as mobile banking, have helped overcome infrastructural barriers and improved financial accessibility (Allen *et al.*, 2014). Allen and colleagues conducted a cross-country study of financial development and the financial inclusion gaps between African nations and other developing countries with similar levels of economic development, emphasizing how these innovations aid financial inclusion.

However, structural and institutional factors within economies may hinder financial inclusion in developing nations, leading to differences across countries, regions, and income levels (Barajas *et al.*, 2020). These findings support the conventional finance-led growth hypotheses, which suggest that a supply-leading or demand-following strategy should be implemented based on a region's structural and fundamental systems to stimulate economic growth (Levine, 2005). Hussain *et al.* (2024) found a significant positive long-term impact of financial inclusion on economic growth in Asia, with results being more pronounced in developing countries compared to developed countries. This highlights the positive association between economic progress and financial inclusion as a driving force behind shaping sustainable growth (Kapoor, 2014; Mushtaq & Bruneau, 2019; Abdul Karim *et al.*, 2022). These findings offer comprehensive policy insights for designing efficient and inclusive policies aimed at fostering sustainable economic growth in the region.

However, some studies argue that financial inclusion may negatively contribute to financial stability by accelerating credit growth, leading to an increase in non-performing loans, transaction costs, and exposure to risks associated with poor credit lines (Abubakari *et al.*, 2025; Igan & Pinheiro, 2011; Sahay *et al.*, 2015;

CHAPTER 2

The FinTech Journey: Bridging the Gaps in Financial Inclusion Through Artificial Intelligence

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Abstract: This chapter begins with a historical overview of Artificial Intelligence (AI), tracing its conceptual origins and examining its evolution as a transformative force in the financial sector. AI has emerged as a powerful tool in enhancing financial inclusion, particularly in improving accessibility to financial services for marginalized and underserved communities. Financial inclusion, defined as universal access to affordable financial services, is critical for poverty reduction and overall economic development. However, despite significant progress, billions of people worldwide remain unbanked or underbanked. The chapter explores how Artificial Intelligence and Financial Technology (FinTech) are addressing these challenges by creating new opportunities for financial access through innovative digital solutions. Key FinTech innovations such as mobile banking, Peer-to-Peer (P2P) lending, blockchain technology, and digital wallets are helping to break down traditional barriers to financial services by offering affordable, accessible, and user-centric alternatives to conventional banking systems. AI plays a pivotal role in enhancing these innovations by automating critical processes such as Know Your Customer (KYC) and Anti-Money Laundering (AML) procedures, thereby simplifying compliance and reducing costs. Additionally, AI improves fraud detection and contributes to the creation of personalized financial experiences through data-driven insights, tailoring services to meet the unique needs of individual users. The chapter concludes by exploring the potential of FinTech and AI to foster a more equitable financial landscape. By adopting responsible and inclusive approaches to these technologies, there is significant potential to achieve greater financial inclusion, particularly in emerging markets. When

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deployed thoughtfully, these technologies can not only address the challenges of financial access but also catalyze sustainable economic growth and development.

Keywords: Artificial super intelligence, Artificial intelligence, Financial inclusion, FinTech.

INTRODUCTION

The evolution of Financial Technology (FinTech) is closely linked to the advancement of Artificial Intelligence (AI), a discipline initiated by trailblazers such as Alan Turing, Marvin Minsky, and John McCarthy. The following passage beautifully highlights the transformative role AI is playing in the FinTech sector, especially in terms of improving financial inclusion. The application of AI in FinTech is indeed opening up new possibilities, particularly for the unbanked and underbanked populations who have historically faced barriers to accessing essential financial services.

The idea that AI can tackle financial inclusion gaps by enabling mobile banking, peer-to-peer lending, and blockchain technology is critical. These innovations create a more accessible and efficient ecosystem, allowing individuals in rural or remote areas to bypass traditional financial infrastructure and engage in the global economy. AI also supports these services by improving security, providing predictive analytics, and creating personalized financial experiences for users, which is especially important for fostering trust in new technologies.

Additionally, the ability of AI to assist in fraud prevention and regulatory compliance is particularly relevant. AI algorithms can monitor transactions in real-time, detect anomalies, and ensure that financial institutions remain in compliance with evolving regulations. This proactive approach helps prevent financial crime while promoting a safer environment for users to engage with financial systems.

By focusing on these points, the chapter provides an insightful look into the convergence of AI and FinTech, which is reshaping the financial landscape and offering opportunities for economic empowerment. It will be interesting to explore specific case studies of how AI has already made an impact in financial inclusion efforts and the lessons learned from these early applications. This chapter elucidates the connections between AI and FinTech in the continuous pursuit of financial inclusion.

THEORETICAL BACKGROUND

Artificial Intelligence

This passage provides a rich historical overview of the development and various definitions of Artificial Intelligence (AI), tracing its origins from Turing's groundbreaking work to contemporary perspectives. The inclusion of Turing's questions about whether machines can think and whether they could perform well in the imitation game sets the stage for the evolution of AI. The idea of a machine mimicking human-like intelligence, central to Turing's concept, still resonates with modern AI approaches, where the focus is often on creating systems that can simulate cognitive functions. The Turing Test, introduced in 1950, remains one of the most iconic benchmarks for AI to this day.

Marvin Minsky's development of the SNARC neural network in 1951 is another pivotal moment, as it marks the first attempt to model a machine after the human brain's structure, introducing the concept of artificial neural networks. Minsky's work laid the groundwork for the field of machine learning, which has seen a resurgence in recent decades.

John McCarthy's coining of the term "Artificial Intelligence" at the Dartmouth Conference in 1956 is also a milestone in AI history. His definition, alongside others like those of Marvin Minsky and Nils J. Nilsson, reflects a broad understanding of AI that focuses on simulating human-like intelligence and behaviors. These definitions underscore AI's goal of making machines act intelligently, often in a way that mirrors human cognitive abilities such as reasoning, learning, and problem-solving. The definitions provided by Castro and New (2016) and Rao (2017) emphasize the wide range of capabilities that AI can possess, from interacting with humans and machines to perceiving and responding to its environment. These functions highlight AI's role as not just a tool for computational tasks, but a versatile technology with the potential to perform complex tasks that would otherwise require human intelligence.

The quote from Jean-Paul Simon (2019) points out the diversity of opinions in the AI community, which is not surprising given the complexity of defining intelligence itself. There is no single, universally accepted definition of AI, which can vary depending on the perspective or application, reflecting the interdisciplinary nature of the field. This historical context provides an understanding of the evolution of AI from its conceptual beginnings to its current state as a powerful tool impacting many aspects of modern life. The development of AI continues to be shaped by ongoing debates around its definitions, goals, and ethical implications.

CHAPTER 3

Investigating the linkages of HRM Practices and Financial Inclusion: Challenges and Opportunities with reference to Emerging Market Economies (EMEs)

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Abstract: The growth and development of an economy largely depend upon its human resources and their contribution to different sectors of the economy. In this case, it is quite interesting to see existing linkages, possible relationships, and key imperatives associated with Human resource management practices with financial inclusion. The present chapter explores and offers a relevant discussion on the interrelated linkages of human resource management practices and their linkages to financial inclusion, with special focus on emerging market economies like India, China, Brazil, and others, which are not only growing faster but setting a distinct image in their efforts of financial inclusion for their citizens and other stakeholders. In this chapter, researchers try to conceptualise the relevant dimensions of HRM with emphasis on financial inclusion in emerging market economies.

Keywords: Emerging market, Economies, Financial, HRM practices, Inclusion.

INTRODUCTION

In the management of organisations and large economic systems, the role of human resources (employees or workforce) cannot be denied. The growth and development of an economy cannot be achieved until its human resources are

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properly aligned. Its emphasis is on the role of Human Resource Management (HRM), which can boost the productivity, performance, and profitability of any organisation or the core, secondary, and tertiary sectors of the economy as well. Human Resource Development (HRD) is known as a crucial component of HRM, which also emphasises training and development initiatives for employees who can better contribute to financial inclusion programs and initiatives in emerging economies. In a review work by Wilson & Briscoe (2004), it is concluded that education and training investment boost national economic growth. It shows that HRM has existing as well as potential linkages with the economic and financial growth of a country.

Exploring the Meaning And Significance of EMEs

In general, the meaning of ***Emerging markets Economies (EMEs)*** can be taken as a developing nation's economy that's growing into global marketplaces is an emerging market economy. Emerging market economies share several traits with developed markets. Strong economic growth, high per capita income, liquid equities and debt markets, foreign investor accessibility, and reliable regulation are some of the characteristics of developed markets (Team & Scott, 2024). Even, it is a general perception that an emerging economy is closer to the transition and race to achieve the status of a developed economy.

State of Financial Inclusion and its policy framework in EMEs

As of the middle of 2018, the Reserve Bank of India (RBI) observed that more than 35 nations, including China, Brazil, and Indonesia (All are emerging market economies), had implemented a national strategy for financial inclusion. The following are some of the common themes that are present in these countries: (i) adhering to a target-based approach (by focusing on particular industries), (ii) enhancing the necessary infrastructure of payment mechanisms, (iii) establishing a robust regulatory framework, (iv) putting an emphasis on last-mile delivery and financial literacy, (v) utilizing innovation and technology, and (vi) periodically monitoring and evaluating the progress that has been made in the realm of financial inclusion (Committee Reports, 2024).

In India, the Jandhan scheme was launched in 2014. It has been a remarkable scheme that has added many people to mainstream financial inclusion. India is widely recognised for its safe and robust digital payment infrastructure. The data in Fig. (**1**) highlights the insights related to robustness in digital transactions:

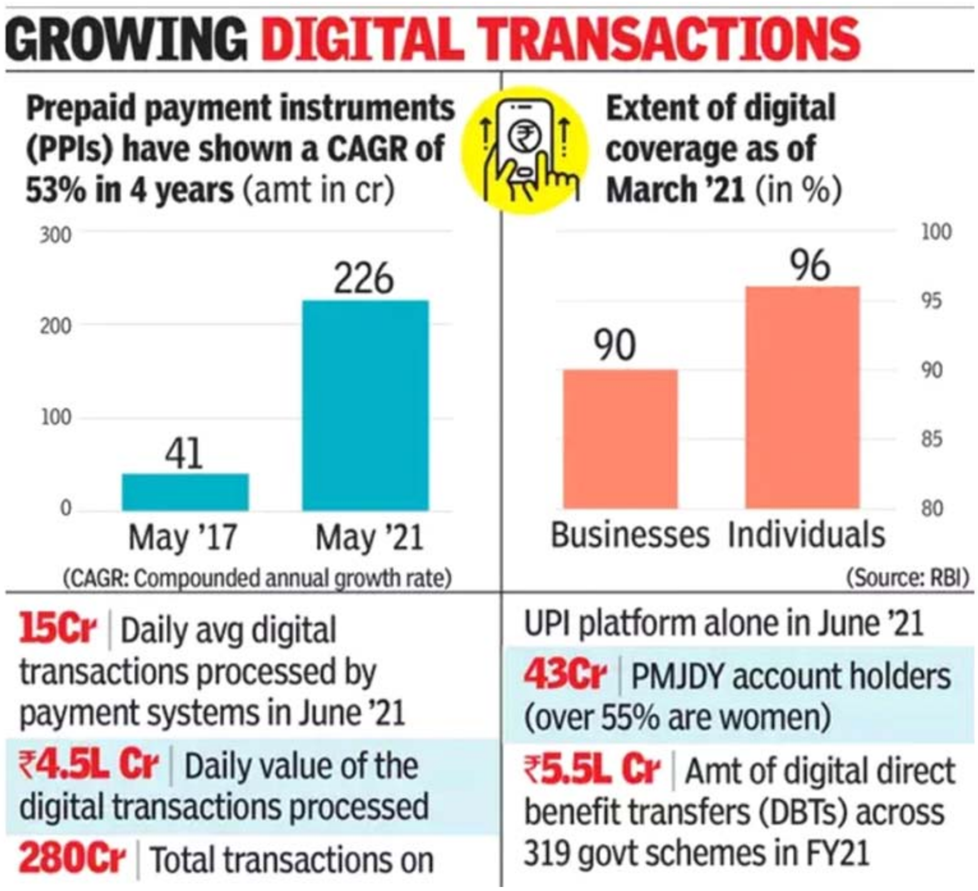

Fig. (1). Growing digital traction.
Source: Times of India (18 August 2021).

A web article states that eighty-four percent of adults in Brazil currently have access to a formal financial account (Findex 2021), which is an increase from seventy percent in 2017 and fifty-six percent in 2011. Brazil has made significant progress in the area of financial inclusion over the past eleven years. Furthermore, Brazil's continued pro-competition attitude to establishing an inclusive digital finance ecosystem and infrastructure, such as the interoperable payments like Pix, has been essential. Additionally, Brazil's evolving open finance laws, which can assist in the flourishing of private sector innovation, have been a significant factor. The ability to contact underprivileged groups has been significantly facilitated by this (*Building Resilience and Financial Health Through Inclusive Finance in Brazil*, 2023).

CHAPTER 4

Barriers and Progress in Financial Inclusion for Ever-married Women in India

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Abstract: This chapter investigates the determinants of account-holding status among ever-married women in India, utilizing data from the National Family Health Survey (NFHS-5) for the period 2019-21. It explores three key aspects of financial inclusion: access to bank or financial institution accounts, mobile phone ownership, and the use of mobile phones for financial transactions. The study examines the relationship between account-holding status and various socio-economic parameters, offering insights into how factors such as place of residence, religion, economic status, education, age, personal occupation, and the husband's education and occupation influence financial inclusion. Methodologically, the analysis combines descriptive statistics and econometric tools to provide a comprehensive understanding of financial accessibility for ever-married women in India. The findings highlight the significant role of these socio-economic factors in shaping women's financial inclusion.

Keywords: Account holding status, Ever-married women, Financial inclusion, NFHS-5.

INTRODUCTION AND BACKGROUND

Financial inclusion plays a critical role in building resilience to economic shocks, particularly for the poorer sections of society. It is a key driver of inclusive development, which developing countries must prioritize to achieve equitable growth. The significance of financial inclusion lies in its ability to empower individuals and communities by providing access to formal financial systems. Currently, around 65 per cent of adults in the poorest developing economies lack

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access to financial services, and only about 20 per cent use formal financial institutions for borrowing and lending (Pazarbasiogl, *et al.*, 2020). Studies have shown that in rural areas of developing countries, many people lack access to formal financing due to barriers such as inconvenience and high transaction costs (Beck & Demirgüç-Kunt, 2008; Karlan *et al.*, 2016; Soumaré *et al.*, 2016). However, recent advancements in mobile technology and network availability have enabled rural populations to access digital financial services through formal institutions, bridging the gap caused by the absence of traditional banking infrastructure (Andrianaivo & Kpodar, 2011; Pazarbasioglu *et al.*, 2020; Chatterjee, 2020; Chatterjee & Anand, 2017).

For women, financial inclusion remains a significant challenge due to various socio-economic barriers. Despite these challenges, studies suggest that when women have access to financial services, they are better able to manage and prioritize their budgets independently (Aker *et al.*, 2016; Field *et al.*, 2016). Women's financial inclusion has been shown to improve household consumption levels, particularly for necessities, more effectively than their male counterparts. This not only benefits individual households but also strengthens communities and societies at large (Islam *et al.*, 2014; Ashraf *et al.*, 2010; ILO, 2020). Moreover, financial inclusion empowers women by giving them greater freedom to make employment choices, decisions about marriage and family planning, and even the ability to leave abusive relationships (Aker *et al.*, 2016; Holloway *et al.*, 2017; Suri and Jack, 2016; Garikipati, 2008; Panda, 2014).

According to a 2015 United Nations report, women are particularly vulnerable to poverty due to the unequal distribution of labor and lack of control over economic resources. The report revealed that one in ten women globally is not consulted about how her own earnings should be spent. Additionally, only 58 per cent of women worldwide have formal financial accounts, compared to 65 per cent of men. This gap is even more pronounced in South Asia (Demirgüç-Kunt *et al.*, 2015).

Despite the critical role of financial inclusion in women's empowerment, there is a paucity of academic literature on this subject, particularly in India. Even more limited are studies focusing on the financial inclusion of ever-married women. In order to bridge this research gap, the present study seeks to fill this gap by analyzing the factors that determine the account-holding status of ever-married women in India, using data from the National Family Health Survey-5 (NFHS-5). Through this analysis, the study aims to provide deeper insights into the economic empowerment of women in India and the role of financial inclusion in fostering this empowerment.

METHODS

The study utilizes data from the NFHS-5 to analyse the account-holding status of ever-married women in India. A binary logistic regression model is employed to predict the determinants of the account-holding status, where the dependent variable has a binary outcome. The NFHS data classifies women into six marital status categories: never married, currently married, married but '*gauna*' not performed, widowed, separated, and deserted. For the binary logistic regression, a dummy variable was created, assigning a value of '0' to women who were never married and '1' to women in any of the other categories—termed “ever-married women” for the purposes of this analysis.

The independent variables include: place of residence (rural or urban); religion (Hindu, Muslim, Christian, and others); total number of children ever born; economic status (poorest, poorer, middle, richer, and richest); highest year of education of the respondent; age (15-49 years); use of mobile phones for financial transactions; social group (Scheduled Caste, Scheduled Tribe, or no caste/no tribe); occupation of the respondent (formal workers, not working, informal workers, agricultural workers, and others); total years of the husband’s education; and husband’s occupation (formal workers, informal workers, agricultural workers, and others). Empirically, when there is only one predictor variable X_1, the probability of Y is predicated as follows:

$$P(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_{1i})}}$$

Where P(Y) is the probability of Y occurring, ‘e’ is the base of natural logarithms, b_0 is a constant, X_1 is a predictor variable .

Similarly, when there are more than one predictor variables, the equation becomes:

$$(Y) = \frac{1}{1 + e^{-(b_0 + b_1 X_{1i} + b_2 X_{2i} + \cdots + b_n X_{ni})}}$$

The resulting values from the logistic regression equation vary between 0 and 1. A value close to 0 indicates that Y is unlikely to have occurred, and a value close to 1 indicates that Y is likely to have occurred.

CHAPTER 5

From Innovation to Impact: The New Era of Sustainable Finance

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Abstract: This chapter examines how regulatory laws, investor demand for ethical investments, and corporate accountability drive sustainable finance's transformation. It highlights how innovation, through financial instruments like green bonds and digital platforms, is shaping the future of sustainable finance and influencing industries and economies worldwide. The chapter also examines how sustainable finance affects economic development, social well-being, and environmental sustainability, as well as regulatory inconsistencies and market volatility. It identifies opportunities for further integration of sustainable finance and examines how emerging technologies like artificial intelligence and blockchain are expected to drive future trends, creating a more sustainable global financial system.

Keywords: Digital finance, Fintech, Financial instruments, Innovation, Sustainable finance.

INTRODUCTION

The current focus on shareholder wealth maximization and short-term results has led to externalizing social and environmental costs, producing sustainable outcomes. Markets often fail to account for the long-term value of these impacts. To address future challenges, a paradigm shift is needed, proposing a sustainable value creation framework that fully considers the costs of environmental and social (Fatemi & Fooladi, 2013). Sustainable Finance (SF) is a developing domain that incorporates Environmental, Social, and Governance (ESG) considerations into financial decision-making (Edmans & Kacperczyk, 2022). It seeks to direct funds towards projects and activities that provide a beneficial societal effect while guaranteeing sustained financial returns. The integration of ESG issues has compelled financial institutions, investors, and governments to embrace SF as a

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remedy for global crises, including climate change, resource depletion, and social inequality (Ionescu, 2021).

Financial markets, which formerly prioritised profits, increasingly value sustainability for long-term development and stability. This transformation relies on innovation to create new financial instruments, business models, and technologies that solve sustainability issues and boost economic development. However, the path to SF is not without its challenges. Lack of standardised frameworks and indicators for ESG performance makes it difficult for stakeholders to measure the genuine effect of their investments. Integrating sustainability into mainstream financial products demands major changes in risk assessment, regulatory compliance, and stakeholder involvement. Smaller companies without the means to invest in sustainability may find this difficult. Despite these challenges, SF offers vast opportunities. The growing demand for green bonds, social impact investing, and ESG-focused funds reflects a broader recognition that sustainability can be a driver of long-term financial performance. Furthermore, advancements in fintech, such as AI and blockchain, offer tools to enhance transparency, efficiency, and traceability in SF practices. Due to governmental pressure, technological advances, and changing customer expectations, SF may change. As global awareness of climate change and social inequality continues to rise, financial institutions will be expected to play a more proactive role in addressing these issues. SF, therefore, will not only be a trend but a necessity, influencing how businesses operate, investments are made, and long-term value is created.

This chapter explores the various innovations that are driving SF and how they are making a tangible impact on the global economy. The study also examines the opportunities and challenges that lie ahead in this dynamic field.

LITERATURE REVIEW

SF has gained momentum globally as a response to increasing environmental and social challenges. Several studies have identified key drivers that push the agenda of SF. Ziolo *et al.* (2020) have examined that the World Bank and International Monetary Fund emphasize the need for increased development finance to achieve the 17 Sustainable Development Goals (SDGs). The connection between SF and the SDGs among OECD countries in the European Union (EU), excluding SDG 6 and SDG 14, is limited due to data limitations. The findings indicate that a more SF model correlates with better progress towards various SDGs, particularly in social, environmental, and economic sustainability. Edmans and Kacperczyk (2022) studied how SF has become a core focus for companies and investors, integrating ESG issues into key financial decisions. Its rise is driven by financial relevance, nonfinancial contributions, and evolving investor preferences, as explored in the Special Issue articles.

Innovation is a major force shaping the evolution of SF. Technologies such as blockchain, AI, and big data are enhancing transparency, reducing transaction costs, and enabling the traceability of sustainable investments. Musleh Al-Sartawi *et al.* (2022) explored SD, ESG investment, and how AI might help creditors, investors, and company managers make long-term financial choices. AI's sustainability difficulties and prospects are highlighted. This editorial also sheds light on AI applications and models in sustainable investing, going beyond problem-solving. A rigorous examination of SF and blockchain integration has been limited despite their popularity. Ren *et al.* (2023) employed a comprehensive bibliometric approach to explore how blockchain impacts SF, revealing its widespread application across various industries, its long-term influence on smart cities and the sharing economy, and its potential for integration with other technologies to enhance SF development.

SF has shaped worldwide economies and businesses. The study by Alshehhi *et al.* (2018), which examined the impact of corporate sustainability on financial performance, reached a conclusion similar to the earlier review by Friede *et al.* (2015): there is growing interest but a lack of consensus among researchersWhile 78% of the 132 papers report a positive relationship, research methods and a focus on corporate social responsibility (CSR) over sustainability concepts hinder conclusions, and limited studies from developing countries suggest further research.

RESEARCH GAP

Since the drivers, innovations, and impacts of science fiction have been extensively examined in the existing literature, there are still numerous voids. There is a scarcity of research that has investigated the potential of SF to be implemented in emerging nations, as the majority of studies have concentrated on established markets and significant institutional investors. Additionally, there is a dearth of exhaustive studies that evaluate the long-term economic advantages and hazards of incorporating sustainability into financial strategies. Furthermore, although the significance of technology in the advancement of science fiction is acknowledged, additional research is required to comprehend the practical implications and obstacles associated with the integration of emergent technologies, including Artificial Intelligence (AI), blockchain, and big data, into the financial sector. Finally, there is an opportunity to investigate the potential for

CHAPTER 6

Financial Development and Environmental sustainability: An Empirical Analysis of Major Asian Economies

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Abstract: The rapid economic growth in Asia, driven by technological advancements, manufacturing, and a significant population, has profound implications for environmental quality. This study investigates how financial development impacts environmental quality in major Asian economies—China, Japan, India, South Korea, and Indonesia—controlling for economic growth, human capital, and urbanization from 1990 to 2019. Utilizing the ARDL bounds testing approach, the analysis explores both short- and long-term relationships among these variables. Results indicate that financial development and urbanization contribute to increased CO_2 emissions in the long run, while rising GDP per capita tends to reduce emissions, likely due to cleaner technology adoption in advanced economies. However, human capital shows a positive association with emissions, underscoring the need for education focused on environmental sustainability. These findings emphasize the importance of policies promoting sustainable finance, green skill development, and clean technology adoption, supporting economic growth without compromising environmental health in Asia's rapidly developing economies.

Keywords: Asian economies, Clean technology adoption, Environmental sustainability, Financial development, Green skill development, Sustainable finance.

INTRODUCTION

Asia, with 59.05% of the global population, stands as a pivotal force in the global economy, with several of its economies ranking among the world's most significant in GDP. These Asian economies, especially the top five—China,

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Japan, India, South Korea, and Indonesia—are integral to global economic dynamics due to their advancements in manufacturing, technology, and innovation. According to the 2024 World Population Review, China leads with an impressive GDP of $18.53 trillion, followed by Japan at $4.11 trillion, India at $3.94 trillion, South Korea at $1.76 trillion, and Indonesia at $1.48 trillion, as highlighted in the IMF's 2024 report. Asia’s economic strength is further underscored by its financial development, marked by extensive market depth, access to financial services, and operational efficiency, which has facilitated this rapid growth trajectory.

However, the economic expansion of these nations has come at an environmental cost. The International Energy Agency’s 2023 report indicates that global CO_2 emissions from energy use increased by 1.1%, reaching a record high of 37.4 billion tons, with China and India as leading contributors. This scenario underscores the critical importance of examining the relationship between economic growth and environmental sustainability in Asia, with a particular focus on the impact of financial development.

Historically, the financial sector’s influence on economic growth has been extensively studied. Bagehot (1873) first recognized the crucial role of organized capital markets in promoting productive investments. Subsequently, scholars such as Schumpeter (1911), Hicks (1969), and Goldsmith (1969) emphasized that financial systems—particularly banking and capital markets—are instrumental in mobilizing savings and advancing technological innovation, which propel economic growth. The McKinnon-Shaw hypothesis (1973) further argued that financial liberalization is essential for economic growth, as restrictive policies such as high interest rates and credit controls, known as financial repression, limit financial development by discouraging savings and investments. In recent years, studies incorporating endogenous growth theory have demonstrated that financial systems play a key role in overcoming informational asymmetries between lenders and borrowers. Scholars such as Diamond (1984), Gale and Hellwig (1985), and King and Levine (1993) showed that financial institutions not only mobilize savings but also enhance resource allocation and investment monitoring, reducing risks and promoting sustained growth, especially in developing economies.

Nonetheless, the positive impacts of financial development are counterbalanced by its environmental implications. Financial expansion fuels industrial and manufacturing growth, often driven by high-emission energy sources, which aggravates environmental degradation. Research findings on this relationship are mixed: some studies indicate that financial growth and globalization exacerbate environmental harm (Zafar *et al.*, 2019), while others, such as Ahmad *et al.*

(2021), suggest that financial development can contribute to environmental sustainability. This study aims to analyze whether financial development in Asia's leading economies has not only propelled economic growth but also intensified energy demands and environmental challenges, shedding light on the complex dynamics between financial development, economic expansion, and environmental sustainability.

LITERATURE REVIEW

Exploring the nexus between Financial Development (FD) and Environmental Degradation (ED), existing literature reveals two primary linkages: the causative impact of financial development, which potentially worsens environmental conditions, and the deterrent role financial development may play in promoting sustainability. Scholars have examined this relationship from diverse perspectives, offering empirical evidence for both positive and negative impacts of FD on the environment. The first perspective sees financial development as a catalyst for environmental degradation. Many studies identify a direct link between increased financial development and worsening environmental conditions. Nawaz *et al.* (2020) and Alabi *et al.* (2021) argue that FD fuels economic activities leading to environmental harm, while Shahbaz *et al.* (2020a), Ali *et al.* (2019), and Hundie (2018) highlight that credit availability facilitates industrial growth, increasing non-renewable energy consumption and emissions. Alam (2022) and Rjoub *et al.* (2021) add that as financial markets develop, more capital becomes available for short-term economic investments, often at the cost of long-term environmental sustainability. Several regional studies reinforce this view: De Qiang *et al.* (2022) found that while financial inclusion boosts economic growth, it worsens environmental quality through increased carbon emissions in emerging economies from 2004 to 2019. Zu B. (2022) also links credit access to rising emissions. Ali *et al.* (2023) analyzed the E-7 countries, finding that high FD, rapid economic growth, and non-renewable energy use detract from environmental sustainability, recommending policies aligned with the UN's Sustainable Development Goals (SDGs). Similarly, Sethi *et al.* (2020), studying India (1980-2015), found that globalization and financial development degrade environmental quality, advocating for stringent regulations and green technology investments. Kirikkaleli *et al.* (2020) showed that while FD supports renewable energy use in the long term, economic growth often compromises environmental quality.

Conversely, a second body of literature presents financial development as potentially beneficial for environmental quality. This perspective suggests that FD can mitigate degradation if well-regulated. Creane *et al.* (2004) and Claessens and Feijen (2007) argue that financial development can channel investments toward sustainable initiatives, while Salahuddin *et al.* (2015) and Charfeddine and Kahia

CHAPTER 7

Financial Technology (FinTech) as a Game Changer for Financial Inclusion

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Abstract: Financial technology (FinTech) has materialized as a transformative force in improving financial inclusion, particularly in emerging markets. By leveraging improvements such as mobile banking, MoMo, digital payment platforms, and data analytics, Fintech has expanded access to financial services for underserved populations. This paper examines the role of Fintech in promoting financial inclusion, highlighting its impact on economic development and poverty reduction. It also addresses the challenges and risks associated with Fintech implementation, including cybersecurity concerns, regulatory hurdles, and the potential for amplified disparity. The study underscores the need for a balanced style that fosters innovation while guaranteeing buyer protection and financial stability.

Keywords: Financial inclusion, Fintech, Financial, Innovation, Technology.

INTRODUCTION

In recent years, financial technology (Fintech) has emerged as a key player in the realm of financial inclusion. Over the past two decades, financial inclusion has become a primary objective for developing nations' financial sectors (Lensink *et al.*, 2022). This shift from focusing on financial development, which measures the overall size of the financial sector, to financial inclusion, which emphasizes broader access to and use of financial services, represents a significant move towards more socially nuanced indicators. Many experts believe that affordable, widespread digital solutions are crucial for reaching the 1.7 billion individuals

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worldwide who remain excluded from formal financial services (Triodos Investment Management, 2019). The growth of fintech initiatives and related investments has been substantial.

Currently, financial inclusion is recognized as a crucial factor in achieving seven of the seventeen Sustainable Development Goals (World Bank, 2018) and has long been considered essential for optimal societal participation in economic and social spheres (Anderloni *et al.*, 2008). Notably, research has established clear causal connections between women's financial inclusion and their economic empowerment (Duvendack & Mader, 2020). Fintech refers to new technologies that enhance and streamline the delivery and utilization of financial services. At its core, fintech employs specialized software and algorithms on computers and smartphones to help businesses, entrepreneurs, and consumers better manage their financial operations and lives.

Fintech is revolutionizing how individuals handle their finances, enabling them to conduct transactions anytime and anywhere through various platforms (Yang and Zhang 2022). By leveraging technology, fintech companies are creating innovative and user-friendly channels for financial services. This technological advancement is particularly impactful in areas with limited traditional banking infrastructure, allowing people to perform financial transactions using their smartphones (Asif *et al.* 2023). Fintech services are generally more cost-effective than traditional financial services (Shaikh *et al.* 2023), making them more accessible and affordable to a broader population and significantly impacting financial inclusion. In developing nations like India, promoting digital financial literacy is crucial to ensure widespread access to financial services.

There is a growing possibility that fintech-driven entities may emerge as viable alternatives to traditional financial intermediaries, markets, and infrastructures. While the widespread adoption of modern technologies offers numerous benefits, it also presents certain risks. Fintech has the potential to increase efficiency in the financial sector, provide more targeted and improved products and services, and expand financial inclusion in developing regions. However, it may also pose risks if its implementation undermines competition, trust, monetary policy transmission, and financial stability. Financial inclusion is essential for the well-being of households, the growth of businesses, and the advancement of national economies. Recent research has mainly focused on three areas: developing measures for financial inclusion, investigating the determinants that affect it, and assessing its impacts. However, the role of financial technology (fintech) in enhancing financial inclusion is a relatively new yet significant area that warrants further exploration. This chapter aims to provide an introductory overview of how fintech is transforming financial inclusion in the financial industry and enhancing the efficiency of the broader economy. This chapter holds particular importance for developing and emerging markets by examining the challenges and issues surrounding fintech's role in enhancing financial inclusion within complex institutional environments. Additionally, it seeks to expand the current knowledge base regarding FinTech usage and financial inclusion while providing actionable recommendations for industry stakeholders and policymakers alike.

LITERATURE REVIEW

FinTech

FinTech, a fusion of the words “financial” and “technology,” emerged during the 2007-2008 financial crisis and has since transformed the financial services industry with new technological advancements. Modern banking growth is largely built on two core elements: technology-driven banking systems and innovations. In India, the expansion of mobile networks in previously underserved regions over the past decade has been instrumental in this evolution (Abubakari *et al.*, 2025). Payment banks have also emerged as an alternative to online and mobile banking, enhancing operational efficiency and lowering customer service costs in rural and semi-urban areas.

FinTech refers to the innovations designed to compete with traditional financial methods and improve the delivery of financial services. FinTech companies aim to reach a broader audience more efficiently, affordably, and in a customer-centric manner compared to traditional financial institutions (Triodos Investment Management, 2019). These innovations have greatly enhanced financial service accessibility. Services like M-Pesa have given millions access to previously unavailable financial services (Demirgüç-Kunt *et al.*, 2018; Central Bank of Kenya, 2020). Additionally, FinTech has reduced transaction costs, making services more affordable for low-income users by eliminating the need for physical infrastructure (Gabor & Brooks, 2016; Ozili, 2018). Today, FinTech services encompass savings, loans, and insurance products, leading to increased financial inclusion rates in Kenya (FSD Kenya, 2019; Cook & McKay, 2015).

Financial Inclusion

Financial inclusion, which refers to ensuring that financial services are accessible and affordable for everyone, is vital for economic development. The World Bank (2022) estimates that about 1.4 billion adults worldwide are unbanked, with most of them residing in low-income nations and rural areas. Traditional banking systems often struggle to serve these populations due to high operational costs and logistical difficulties. Financial inclusion ensures that individuals and businesses have access to essential financial services—such as payments, savings, credit, and

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