



The Impact of Digital Payment Systems on Financial Inclusion: Evidence from Small and Medium Enterprises in Developing Economies

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Abstract

The rapid proliferation of digital payment systems has fundamentally altered the financial landscape of developing economies, offering novel pathways to financial inclusion for previously underserved populations. This study examines the relationship between digital payment adoption among small and medium enterprises (SMEs) and their access to formal financial services in India, Kenya, and Vietnam. Employing a mixed-methods research design, the study gathered quantitative data from 432 SME owners through structured questionnaires and qualitative insights from 24 in-depth interviews. Structural equation modeling (SEM) and thematic analysis were used to analyze the data. Findings reveal that digital payment adoption significantly improves SMEs' credit access ($\beta = 0.61$, $p < 0.001$), banking relationships ($\beta = 0.47$, $p < 0.01$), and overall financial resilience. Regulatory environment and digital literacy were found to be significant moderating variables. The study contributes to financial inclusion discourse by providing cross-country empirical evidence and practical recommendations for policymakers, fintech providers, and financial institutions.

Keywords: - Digital Payments, Financial Inclusion, Smes, Developing Economies, Fintech, Structural Equation Modeling

I. INTRODUCTION

Financial inclusion, defined as the availability and equality of opportunities to access financial services, has been a central concern for economists, policymakers, and development practitioners for several decades (World Bank, 2022). Despite significant progress, approximately 1.4 billion adults globally remain unbanked, with a disproportionate concentration in developing economies of Sub-Saharan Africa, South Asia, and Southeast Asia (Demircuc-Kunt et al., 2022). Small and medium enterprises operating in these contexts frequently encounter what Stiglitz and Weiss (1981) described as credit rationing, a systemic inability to access formal credit regardless of willingness to pay prevailing interest rates.

The emergence of mobile money platforms, digital wallets, and payment gateways has catalyzed a transformation in the financial services sector. Mobile-based payment systems such as M-Pesa in Kenya, PhonePe in India, and MoMo in Vietnam have dramatically expanded the financial frontier for populations historically excluded from conventional banking (Jack & Suri, 2011; Thakur & Srivastava, 2015). These platforms generate rich transactional data that serve as proxy indicators of creditworthiness, enabling formal financial institutions and fintech lenders to extend services to previously opaque borrowers.

However, the scholarly literature presents an incomplete picture. While macro-level studies confirm a positive association between digital financial infrastructure and national-level inclusion metrics, micro-level evidence on how individual SME-level digital payment adoption translates into tangible improvements in financial access remains scarce (Ozili, 2018). Furthermore, most existing studies focus on a single country, limiting the generalizability of findings. Cross-country comparative analyses that account for heterogeneous regulatory environments and cultural contexts are notably absent from the literature.

This study addresses these gaps by investigating the following research questions:

- To what extent does digital payment adoption influence credit access among SMEs in India, Kenya, and Vietnam?

- What role do digital literacy and regulatory environment play in moderating this relationship?
- How do SME operators perceive the benefits and barriers associated with transitioning from cash-based to digital payment systems?

The remainder of this paper is structured as follows. Section 2 presents a comprehensive review of the relevant literature. Section 3 outlines the research methodology. Section 4 reports the empirical findings. Section 5 discusses the implications of the findings, and Section 6 concludes with policy recommendations and directions for future research.

II. LITERATURE REVIEW

2.1. Financial Inclusion and SME Development

The nexus between financial inclusion and economic development has been extensively explored in the literature. Beck et al. (2007) demonstrated that financial deepening is positively associated with firm-level investment and employment growth, particularly for small enterprises. Building on this, Levine (2005) provided a comprehensive review establishing that financial intermediation accelerates productivity growth by facilitating risk diversification and capital allocation. These foundational contributions established the theoretical basis for prioritizing financial inclusion as a development objective.

SMEs constitute between 90 and 95 percent of all registered businesses in most developing economies and account for a substantial proportion of GDP and formal employment (IFC, 2020). Nevertheless, the SME financing gap in developing countries is estimated at approximately USD 5.2 trillion annually, representing a persistent structural impediment to growth (IFC, 2020). Ayyagari et al. (2021) attributed this gap to information asymmetries, weak collateral frameworks, and high transaction costs that characterize lending to small firms.

2.2. Digital Payment Systems and Financial Access

The theoretical underpinning for linking digital payments to financial inclusion draws primarily from information economics. Digital transactional footprints reduce information asymmetries between lenders and borrowers by enabling the creation of alternative credit scores based on payment frequency, volume, and consistency (Claessens et al., 2018). This mechanism has been empirically validated in several contexts. Jack and Suri (2011) found that mobile money adoption in Kenya was associated with significant improvements in household risk management and consumption smoothing, while Munyegera and Matsumoto (2016) documented similar effects in Uganda.

More recent scholarship has focused specifically on SME-level outcomes. Gutierrez-Nieto et al. (2023) analyzed panel data from 28 emerging market economies and found that fintech credit penetration was inversely correlated with SME financing gaps, after controlling for macroeconomic fundamentals. Ozili (2020) provided a nuanced critique, cautioning that digital financial inclusion does not automatically translate into better financial outcomes in the absence of appropriate regulatory safeguards and consumer protection mechanisms.

2.3. Moderating Factors: Digital Literacy and Regulatory Environment

Digital literacy, broadly defined as the ability to find, evaluate, and communicate information through digital technologies, has emerged as a critical determinant of the extent to which digital financial services generate inclusive outcomes (Lusardi & Mitchell, 2014). Van Dijk (2020) conceptualized digital inequality as a multi-layered phenomenon encompassing motivational, physical, skills-based, and usage access gaps. Applied to financial services, this framework suggests that even when digital payment infrastructure is available, usage barriers rooted in limited financial or digital literacy may prevent SMEs from fully leveraging available tools.

The regulatory environment represents another important contingency. Consistent with the enabling environment hypothesis advanced by Claessens et al. (2018), regulatory frameworks that balance innovation with consumer protection tend to foster more robust and equitable fintech ecosystems. Comparative studies by Sahay et al. (2020) confirmed that countries with proportionate, risk-based regulation achieved higher rates of digital financial inclusion without a commensurate increase in systemic risk.

2.4. Research Gaps

Despite this growing body of literature, several important gaps remain. First, most empirical studies rely on household-level or aggregate country-level data, neglecting enterprise-level dynamics. Second, cross-country studies employing consistent methodological frameworks and comparable samples are rare. Third, qualitative perspectives that illuminate the mechanisms and contextual factors shaping digital payment adoption decisions among SME operators have received limited attention. This study directly addresses these gaps.

III. RESEARCH METHODOLOGY

3.1. Research Design

This study adopted an explanatory sequential mixed-methods design, integrating quantitative survey data with qualitative interview data (Creswell & Creswell, 2018). The quantitative component was prioritized to test hypothesized structural relationships, while the qualitative component provided contextual depth and illuminated mechanisms that numerical data cannot adequately capture. This triangulation strategy enhances both the internal validity and the transferability of findings (Bryman, 2016).

3.2. Research Objectives

The specific objectives of this study are as follows:

Objective 1: To assess the level of digital payment adoption among SMEs in India, Kenya, and Vietnam.

Objective 2: To examine the effect of digital payment adoption on SME access to credit, banking relationships, and financial resilience.

Objective 3: To determine the moderating role of digital literacy and regulatory environment in the adoption-inclusion relationship.

Objective 4: To explore qualitative perceptions of benefits and barriers associated with digital payment adoption.

3.3. Hypotheses

Based on the theoretical framework and the extant literature, the following hypotheses are proposed:

- H1: Digital payment adoption has a significant positive effect on SME credit access.
- H2: Digital payment adoption has a significant positive effect on SME banking relationships.
- H3: Digital payment adoption has a significant positive effect on SME financial resilience.
- H4: Digital literacy moderates the relationship between digital payment adoption and financial inclusion.
- H5: Regulatory environment moderates the relationship between digital payment adoption and financial inclusion.

3.4. Sampling and Data Collection

The target population consisted of owner-managers of formal and semi-formal SMEs operating in three countries: India, Kenya, and Vietnam. These countries were selected purposively to represent distinct fintech development trajectories, regulatory regimes, and geographic regions, while sharing common characteristics of emerging market economies with substantial unbanked populations (Sahay et al., 2020). A stratified random sampling technique was employed, with strata defined by country, industry sector (retail, manufacturing, and services), and firm size (micro: 1 to 9 employees; small: 10 to 49 employees; medium: 50 to 249 employees). A total of 432 valid questionnaires were collected between March and August 2024, distributed as 148 from India, 141 from Kenya, and 143 from Vietnam.

For the qualitative component, 24 in-depth interviews were conducted with purposively selected SME owners who had adopted digital payment systems for at least 12 months. Participants represented diverse industry sectors and firm sizes. Interviews were conducted in local languages where necessary, professionally transcribed, and translated into English by certified translators. Each interview lasted between 45 and 75 minutes.

3.5. Measures and Instruments

The structured questionnaire comprised four sections. The first section collected demographic and firm-level data including age, gender, education, industry, firm size, and years of operation. The second section measured digital payment adoption using a validated six-item scale adapted from Davis's (1989) Technology Acceptance Model, modified for the digital payment context following Thakur and Srivastava (2015). Response options were anchored on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The third section assessed financial inclusion outcomes across three dimensions: credit access (five items), banking relationships (four items), and financial resilience (five items), drawing on scales developed by Demircuc-Kunt et al. (2022). The fourth section measured the moderating variables of digital literacy (six items, adapted from Van Dijk, 2020) and regulatory environment (four items, adapted from Claessens et al., 2018).

Content validity was established through review by five academic experts in finance, information systems, and development economics. A pilot study involving 45 SME operators confirmed satisfactory Cronbach's alpha values for all constructs (ranging from 0.74 to 0.89), indicating acceptable internal consistency (Nunnally, 1978).

3.6. Analytical Strategy

Quantitative data were analyzed using IBM SPSS Statistics 29 and AMOS 29. Descriptive statistics summarized respondent profiles and construct means. Confirmatory factor analysis (CFA) was performed to assess the measurement model, evaluating construct validity through convergent validity (average variance extracted, AVE > 0.50) and discriminant validity (Fornell-Larcker criterion). Structural equation modeling (SEM) was employed to test the hypothesized relationships, with maximum likelihood estimation. Interaction terms were created using mean-centered variables to test moderation hypotheses, following the procedures recommended by Hair et al. (2019).

Qualitative data were analyzed using NVivo 14 software. An inductive-deductive hybrid approach to thematic analysis was employed, following Braun and Clarke (2006). Initial codes were generated inductively from interview transcripts, subsequently organized into themes and sub-themes, and then interpreted against the deductive framework derived from the theoretical review. Member checking and peer debriefing were undertaken to enhance trustworthiness.

VI. RESULTS

4.1. Respondent Profile

Of the 432 respondents, 61.3% were male and 38.7% were female, reflecting the gender composition of formal SME ownership documented in the IFC Enterprise Finance Gap database (IFC, 2020). The majority of respondents (54.2%) fell in the 30 to 45 age bracket. In terms of firm size, micro-enterprises accounted for 42.1% of the sample, small enterprises for 38.4%, and medium enterprises for 19.5%. The retail sector constituted the largest industry group (38.7%), followed by services (33.1%) and manufacturing (28.2%). Approximately 68% of respondents reported having adopted at least one digital payment platform at the time of the survey.

4.2. Measurement Model Assessment

CFA results confirmed adequate fit for the overall measurement model: chi-square/df = 2.38, CFI = 0.94, TLI = 0.93,

RMSEA = 0.057 (90% CI: 0.048 to 0.066), and SRMR = 0.062. All standardized factor loadings exceeded the recommended threshold of 0.60, with a range from 0.63 to 0.84. AVE values ranged from 0.51 to 0.67, satisfying the convergent validity criterion. Discriminant validity was established as the square root of AVE for each construct exceeded the inter-construct correlations (Fornell & Larcker, 1981). Common method bias was assessed using Harman's single-factor test, which yielded a single-factor variance of 22.3%, well below the threshold of 50%, suggesting that common method bias was not a serious concern (Podsakoff et al., 2003).

4.3. Structural Model and Hypothesis Testing

The structural model demonstrated acceptable fit: chi-square/df = 2.51, CFI = 0.93, TLI = 0.92, RMSEA = 0.061, SRMR = 0.068. Table 1 presents the standardized path coefficients and significance levels.

H1 posited a positive effect of digital payment adoption on credit access. The standardized path coefficient was 0.61 (SE = 0.08, $t = 7.63$, $p < 0.001$), providing strong support for H1. H2 examined the effect on banking relationships. The coefficient was 0.47 (SE = 0.07, $t = 6.71$, $p < 0.01$), supporting H2. H3 assessed the effect on financial resilience, yielding a path coefficient of 0.53 (SE = 0.09, $t = 5.89$, $p < 0.001$), thus supporting H3. Together, the three endogenous constructs explained variance levels of 43%, 37%, and 51% respectively.

H4 proposed that digital literacy moderates the adoption-inclusion relationship. The interaction term was significant for credit access ($\beta = 0.22$, $p < 0.05$) and financial resilience ($\beta = 0.19$, $p < 0.05$), but non-significant for banking relationships ($\beta = 0.11$, $p = 0.18$). H4 was thus partially supported. H5 examined regulatory environment as a moderator. Significant interaction effects were found for all three financial inclusion outcomes (credit access: $\beta = 0.31$, $p < 0.001$; banking relationships: $\beta = 0.26$, $p < 0.01$; financial resilience: $\beta = 0.28$, $p < 0.001$), providing full support for H5.

Country-level subgroup analysis using multi-group SEM revealed that path coefficients were largest in Kenya (credit access: $\beta = 0.69$) and smallest in Vietnam ($\beta = 0.54$), with India occupying an intermediate position ($\beta = 0.62$). Chi-square difference tests confirmed that these cross-country variations were statistically significant ($\Delta \chi^2 = 14.37$, $df = 4$, $p < 0.01$), suggesting meaningful contextual heterogeneity.

4.4. Qualitative Findings

Thematic analysis of interview data generated three primary themes:

- Perceived economic benefits of digital payments,
- Digital and financial literacy as a double-edged factor, and
- Navigating the regulatory and trust landscape.

4.4.1. Theme 1: Perceived Economic Benefits

Participants consistently described digital payment adoption as transformative for their business operations. Enhanced record-keeping, reduced cash-handling risks, and improved access to working capital financing emerged as the most frequently cited benefits. Several participants noted that fintech lenders had contacted them proactively to offer credit products based on their transactional history, confirming the information asymmetry reduction mechanism hypothesized in the literature (Jack & Suri, 2011). One retail trader from Nairobi stated that within eight months of using a mobile payment platform, a microfinance institution offered a business loan without requiring any physical collateral, a possibility that had not existed previously.

4.4.2. Theme 2: Digital and Financial Literacy as a Double-Edged Factor

Participants with higher levels of education and prior banking experience reported a smoother transition to digital payments and greater ability to leverage associated credit products. Conversely, several participants with limited formal education expressed anxiety about data privacy, erroneous transactions, and their inability to resolve disputes through digital channels. This finding aligns with Van Dijk's (2020) argument that skills gaps can perpetuate rather than reduce digital inequalities if not addressed through targeted capacity-building interventions.

4.4.3. Theme 3: Navigating the Regulatory and Trust Landscape

The regulatory theme revealed considerable variation across the three study countries. Kenyan respondents expressed relatively high confidence in the regulatory framework governing mobile money, attributing this to the long-standing role of the Central Bank of Kenya in overseeing mobile financial services. Indian participants displayed a more mixed perception, citing the 2016 demonetization experience as having both accelerated digital adoption and generated residual distrust in government-mandated financial changes. Vietnamese participants noted that evolving regulations had created uncertainty, with some platforms adjusting service offerings in response to policy changes.

V. DISCUSSION

The findings of this study make several important contributions to the financial inclusion and SME finance literatures. The strong positive effect of digital payment adoption on credit access (H1 supported, $\beta = 0.61$) corroborates and extends the prior work of Gutierrez-Nieto et al. (2023) and Munyegera and Matsumoto (2016) to a multi-country enterprise-level context. The mechanism appears to operate through transactional data transparency, as the qualitative evidence suggests that fintech lenders proactively identify and target SMEs exhibiting consistent digital payment behavior.

The significant moderation by regulatory environment (H5 fully supported) has important practical implications. It indicates that the benefits of digital payment adoption for financial inclusion are not automatic but are conditioned by the quality and proportionality of the surrounding regulatory ecosystem. This is consistent with Claessens et al. (2018) and Sahay et al. (2020), who argued that regulatory frameworks must balance innovation incentives with stability and consumer

protection objectives. The cross-country variation in effect sizes, with Kenya outperforming India and Vietnam, further underscores the relevance of country-specific regulatory maturity.

The partial support for the digital literacy moderation hypothesis (H4) is noteworthy. The non-significant moderation of the banking relationships pathway suggests that basic platform usage, even without high digital literacy, may be sufficient to establish institutional banking connections, perhaps because formal financial institutions have invested in simplifying onboarding processes. However, the significant moderation of credit access and financial resilience pathways indicates that higher literacy is required to translate digital engagement into more sophisticated financial outcomes. This nuance has been underappreciated in prior research.

From a theoretical standpoint, the findings affirm the relevance of information economics (Stiglitz & Weiss, 1981) as an explanatory framework and extend it by demonstrating that digital payment systems serve as endogenous mechanisms for overcoming information asymmetries at the firm level. The Technology Acceptance Model, originally developed by Davis (1989) in a North American organizational context, demonstrates adequate cross-cultural validity in predicting adoption behavior among SMEs in diverse developing economy settings, albeit with contextual modifications.

The qualitative findings add depth by illuminating the heterogeneous experiences of SME operators and the role of trust, prior financial experiences, and institutional confidence in shaping adoption trajectories. These dimensions are not fully captured by quantitative constructs and point to the value of mixed-methods approaches in financial inclusion research.

VI. CONCLUSION

This study provides robust multi-country evidence that digital payment adoption significantly enhances financial inclusion among SMEs in developing economies, operating through mechanisms of information transparency, institutional trust-building, and improved creditworthiness signaling. The findings confirm that digital payments are not merely transactional conveniences but serve as foundational financial infrastructure with far-reaching implications for enterprise development and economic inclusion.

For policymakers, the findings underscore the importance of cultivating enabling regulatory environments that provide clarity, proportionality, and consumer protection without stifling innovation. Particular attention should be given to cross-border regulatory harmonization, given the increasingly transnational nature of fintech service provision.

For financial institutions and fintech providers, the study highlights the commercial opportunity in developing credit and savings products specifically tailored to SMEs with established digital payment histories. Investing in digital literacy programs as part of customer onboarding will enhance the ability of SMEs to leverage the full suite of financial services available through digital channels.

For development organizations, the study's evidence on digital literacy as a moderator of financial outcomes validates ongoing investments in financial and digital education programs targeting SME operators, particularly women and operators with lower formal education.

This study has several limitations that should be acknowledged. The cross-sectional design precludes causal inference, and longitudinal research is needed to establish temporal precedence in the adoption-inclusion relationship. The sample, while cross-country, is confined to urban and peri-urban areas, and findings may not generalize to deeply rural contexts. Future research should examine the role of specific platform types, peer networks, and sectoral differences in shaping adoption and financial outcomes.

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