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Fintech Adoption and Inclusive Economic Development in India: Research Trends, Evidence and Future Directions

Sidharth Singh
Assistant Professor, Department of Economics, PIET NCR College, Panipat, Hayana, India

***Abstract*—**Fintech has become an important instrument for achieving inclusive development outcomes in emerging markets by advancing financial inclusion through technologies such as the Unified Payments Interface (UPI), the Pradhan Mantri Jan Dhan Yojana (PMJDY), the India Stack, and the National Strategy for Financial Inclusion 2019-2024. Despite the rapid spread of fintech solutions, with UPI processing 172 billion transactions worth INR 247 trillion in 2024 alone, uneven adoption, persistent digital divides, and emerging risks raise the question of whether fintech genuinely promotes inclusive economic development or merely extends the reach of existing financial services. This paper provides a comprehensive review of scholarly work on fintech adoption and financial inclusion in India between 2010 and early 2026. It develops a conceptual framework linking digital public infrastructure, fintech adoption, financial inclusion, and inclusive development; examines Indian and cross-country empirical evidence; analyses bibliometric and thematic trends in the literature; and proposes a forward-looking research and policy agenda. The Financial Inclusion Index of the Reserve Bank of India rose from 43.4 in March 2017 to 67.0 in March 2025, yet these gains conceal significant heterogeneity across regions, genders, and enterprise sizes. Future research should establish causal links between fintech initiatives and inclusive development, address risks such as over-indebtedness, algorithmic bias, and data privacy, and pursue comparative South-South studies.

Keywords*—Fintech; Financial Inclusion; Inclusive Economic Development; UPI; India Stack; Digital Public Infrastructure; PMJDY*

I. INTRODUCTION

The advent of financial technology (fintech) in emerging economies has transformed the financial services system faster than any preceding innovation. In the literature, the term fintech denotes technological innovations in financial services covering areas such as payments, digital lending, neo-banking, insurtech, and wealth management [1]. Two main drivers lie behind this rapid growth: the existence of large unbanked populations and the development of digital infrastructure capable of supporting fintech services [2]. India is an excellent illustration of both, having achieved a high rate of financial inclusion by 2025. The Financial Inclusion Index (FI-Index) of the Reserve Bank of India (RBI) increased from 43.4 in March 2017 to 64.2 in March 2024 and to 67.0 in March 2025 [3]. In 2024 alone, the number of transactions conducted through the Unified Payments Interface (UPI) rose to 172 billion, worth INR 247 trillion, representing a 46 percent increase over the previous year [4].

These aggregate numbers place India at the centre of worldwide discussions on the potential of fintech to deliver development outcomes previously unachievable through conventional banking. The India Stack, encompassing the Aadhaar biometric identity, the Jan Dhan-Aadhaar-Mobile (JAM) trinity, UPI, and the Data Empowerment and Protection Architecture (DEPA), has been emulated by more than fifty countries and is regarded as a model of inclusive financial infrastructure [5], [6]. Launched in August 2014, the flagship Pradhan Mantri Jan Dhan Yojana (PMJDY) scheme has opened no fewer than 559 million accounts, more than fifty-five percent of them owned by women [7].

The choice of India as the focus of this review is not coincidental. The country offers an exceptional setting for researching the effects of fintech adoption because it combines factors rarely found together elsewhere: a large, demographically diverse population with varying levels of technological readiness, a public payment infrastructure, a proactive regulatory body that tracks developments, and rich policy variation, including the staggered rollout of UPI, the demonetization of November 2016, the pandemic-related cash transaction shock of 2020, and successive RBI digital lending guidelines. India has thus become the subject of intensive study by the international academic and policymaking community seeking answers about the developmental power of fintech.

A. Problem Statement and Research Questions

Behind the aggregate indicators, however, lies significant heterogeneity in adoption. While ownership of financial accounts has risen sharply, dormant accounts, limited utilization, gender gaps, and weak penetration of credit and insurance products persist [8], [9]. At the cross-country level, there is a significant association between fintech adoption and growth, although the strength of the association, its channels of transmission, and its distributional effects are not fully understood [10]. Moreover, risks accompanying fintech growth, such as over-indebtedness driven by smartphone-based lending, data privacy and cybersecurity threats, and algorithmic bias in credit decision-making, require close examination [11], [12].

At least three additional tensions merit consideration. First, the relationship between fintech and financial intermediaries remains unclear: while fintech can extend conventional banking services to thin-file applicants, it can also crowd out brick-and-mortar branches, reducing the quality of relational banking and the supply of credit to small and medium enterprises. Second, the same digital infrastructure that delivers welfare services can also be used to monitor citizens, creating a tension between inclusion and surveillance. Third, the literature tends to overlook heterogeneity across Indian states, where fintech adoption approaches saturation in the south and west but lags in the east and northeast despite sustained policy effort.

This review therefore poses three questions. First, how do scholars define and measure fintech adoption and inclusive economic development? Second, what do empirical estimates

reveal about the contribution of fintech to financial inclusion and growth in India, and how does this contribution compare with cross-country estimates? Third, what are the major themes and methodological trends in the relevant literature, and where are the gaps?

B. Scope, Sources and Review Method

The paper constructs a conceptual framework connecting digital public infrastructure, fintech adoption, financial inclusion, and inclusive economic development; reviews Indian and cross-country empirical evidence; synthesises thematic and bibliometric trends; and articulates a forward-looking research and policy agenda. The review focuses primarily on India but selectively includes cross-country comparative evidence. It draws on academic journals, regulatory reports, government papers, multilateral working papers, and select grey literature produced between 2010 and early 2026.

The review combines the insights of a structured systematic literature review with bibliometric analysis. Source materials were located through Scopus, Web of Science, EconLit, Google Scholar, the Social Science Research Network, and the websites of the RBI, the Ministry of Finance, the Bank for International Settlements, the International Monetary Fund, and the World Bank. Search strings included keywords and synonyms for fintech, digital finance, financial inclusion, UPI, India Stack, the JAM trinity, PMJDY, and inclusive development. Inclusion criteria required peer-reviewed publication or institutional authorship, India-focused content or a substantial India component, and a primary or secondary focus on adoption or development indicators. Synthesis paid particular attention to evidence quality and methodological design, distinguishing descriptive accounts, correlation-based research, quasi-experimental approaches, and randomised controlled trials.

II. CONCEPTUAL FOUNDATIONS AND FRAMEWORK

A. Fintech and Fintech Adoption

By fintech, this review means digital innovations leading to new business models, applications, processes, or products in the financial sector. The most common classification divides fintech innovations into six major categories: payments, digital lending, deposits and savings, insurtech, capital raising and investments, and infrastructure layers such as identity, data sharing, and regtech solutions [1], [10]. Fintech adoption operates at three levels. At the household level, adoption refers to the extent to which individuals use digital financial products, for example whether a PMJDY account holder is a regular user of UPI, keeps savings, or accesses credit digitally. At the enterprise level, adoption captures the extent to which micro, small, and medium enterprises (MSMEs) use digital payments, accounting systems, and credit facilities. At the systemic level, it refers to aggregate indicators such as the share of digital payments in total payments or the share of digital credit in formal lending [13], [3]. Treating adoption as a multilevel construct matters because mere possession of a bank account, the most commonly used metric, is not a sufficient measure.

Adoption also has a dynamic dimension and an intensity dimension that the literature has been slow to consider. Researchers studying mobile money in Kenya and East Africa made decisive progress by moving from binary adoption measures to intensity metrics, such as the number of transactions per month or monthly digital money flows, and to functional depth, such as whether a user transacts with a single merchant type or with several counterparties including employers, governments, financial institutions, and merchants [14]. Indian studies are now beginning to follow. Analyses of UPI distinguish active from registered users and find that the share of active users varies greatly by age, income, and education. Registered-user counts can therefore significantly overstate coverage and effectiveness, since the developmental impact of fintech flows from actual use rather than the mere existence of services. Inactive Jan Dhan accounts, for instance, contribute little to financial stability or MSME formalization.

B. Financial Inclusion and Inclusive Economic Development

Following the Rangarajan Committee, financial inclusion in India means access for vulnerable and low-income groups to appropriate, affordable, and timely financial services [9]. As a multidimensional construct, financial inclusion is measured along access, usage, and quality dimensions, an approach pioneered by composite indices of financial inclusion [15]. Within this framework, the RBI FI-Index evaluates the degree of financial inclusion in India using 97 indicators, with relative weights of 35 percent for access, 45 percent for usage, and 20 percent for quality, the last covering financial literacy and consumer protection [3].

Inclusive economic development is a broader concept, encompassing growth that raises living standards, lowers poverty and inequality, expands opportunities for productive employment, and strengthens resilience to adverse shocks for the bottom half of the income distribution [16]. Financial inclusion is viewed as an important determinant of inclusive development, but the latter concept is much wider. A household may hold a bank account and transact actively through digital channels while still facing income uncertainty, a lack of insurance against health shocks, and poor employment prospects. The task for empirical research is to establish whether and how the impact of fintech adoption extends beyond financial inclusion to the development outcomes articulated in the United Nations Sustainable Development Goals and India's vision of Viksit Bharat [17], [9].

C. Linking Fintech, Financial Inclusion and Inclusive Growth

Theory suggests several channels through which fintech enables financial inclusion and, subsequently, inclusive economic growth. First, fintech lowers transaction costs, especially the fixed costs of serving end users; historically, high costs excluded many poor and geographically remote people from financial services altogether [5]. Second, fintech reduces information asymmetries through the digital footprints generated by transactions and identification processes, expanding formal credit to thin-file borrowers and small businesses. Third, instantaneous, low-cost payment systems and direct benefit transfer (DBT) schemes reduce inefficiencies in social protection programmes and reach more beneficiaries [6]. Fourth, mobile and biometric authentication empowers disadvantaged groups, including women, migrants, and informal workers, to manage savings and remittances independently.

Cross-country studies offer ample support for these theoretical links. Meta-analyses and bibliometric studies find that indicators such as digital payment volumes and mobile phone penetration correlate positively with financial inclusion and economic development [1], [18]. The impacts, however, differ with a country's economic status, regulatory quality, and infrastructure depth, and the relationships are rarely linear. Fintech complements the conventional banking system up to a threshold, beyond which substitution effects emerge and rural branch density declines [19]. Risks associated with rapid digital finance include over-indebtedness driven by algorithmic credit scoring, new monopolies arising from platform consolidation, and the replication of bias by algorithms [12].

D. A Conceptual Framework

Fig. 1 presents the overarching conceptual framework used in this review to organize the relationships between fintech, financial inclusion, and inclusive economic growth in India. The lowest layer consists of digital public infrastructure and the accompanying regulatory architecture. These enablers allow households and firms to adopt fintech solutions. Fintech adoption then advances the access, usage, and quality goals of financial inclusion, which in turn supports inclusive economic development through several channels: financial inclusion can raise productivity by expanding access to credit, while risk sharing, savings mobilization, and labour market participation can drive growth. Feedback loops run from inclusive development back to fintech adoption and to regulation. The remainder of the paper examines the empirical evidence along these mappings.

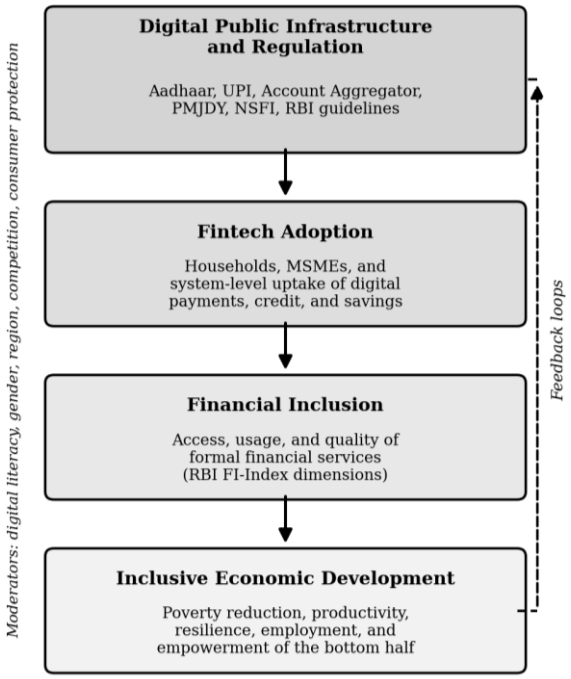

Fig. 1. Conceptual framework linking digital public infrastructure, fintech adoption, financial inclusion, and inclusive economic development.

The framework carries two boundary conditions. First, complementary factors are required to translate fintech adoption into financial inclusion and, ultimately, inclusive growth: adequate digital and financial literacy, effective grievance redressal mechanisms, and competitive product markets. In their absence, fintech may deepen only the access dimension of inclusion, leaving usage and quality unchanged and producing merely superficial inclusion. Second, the theoretical channels describe average effects, whereas heterogeneous impacts are equally crucial for inclusiveness; the benefits of fintech use must be examined across income, gender, caste, age, and geography.

III. POLICY AND DIGITAL INFRASTRUCTURE LANDSCAPE IN INDIA

A. Evolution of Financial Inclusion Policy

Financial inclusion policy in India has evolved through three overlapping phases: a bank-driven wave, a digital infrastructure phase, and a fintech regulation phase. The bank nationalizations of 1969 and 1980 marked the beginning of the bank-driven phase, supported by branch expansion mandates and priority sector lending [9]. The RBI subsequently implemented financial inclusion plans through the Basic Savings Bank Deposit Account (BSBDA), the business correspondent model, and priority sector lending targets. The PMJDY, launched in 2014, created the platform for universal account ownership; by August 2025 it had reached 559.8 million beneficiaries, of whom 55 percent are women and 66 percent live in rural and semi-urban areas [7].

In 2020 the RBI formulated the National Strategy for Financial Inclusion (NSFI) with six strategic pillars: universal access to financial services, provision of a basic bouquet of financial services to every adult, access to livelihoods and skills development, financial literacy and education, customer protection and grievance redressal, and effective coordination among stakeholders [9]. By March 2024, banking outlets were available within a 5 km radius of 99.99 percent of identified villages and hamlets across 27 states and 8 union territories. The successor strategy, NSFI 2025-2030, with its Panch-Jyoti approach of five themes covering last-mile access, usage, financial safety, gender-sensitive design, and consumer protection, together with 47 action points, was rolled out in December 2025 [20]. The FI-Index has grown steadily, rising from 53.9 in March 2021 to 67.0 in March 2025, an increase of 24.3 percent since its launch [3], [21]. Table I summarizes the headline indicators that frame this review.

TABLE I. KEY INDICATORS OF FINTECH-ENABLED FINANCIAL INCLUSION IN INDIA

Indicator	Status / Trend
RBI Financial Inclusion Index	43.4 (Mar 2017) to 67.0 (Mar 2025)
UPI transactions, CY 2024	172 billion transactions worth INR 247 trillion
UPI share in digital payment volume	About 34 percent (2019) to 83 percent (2024)
RBI Digital Payments Index	100 (Mar 2018) to 493.22 (Mar 2025)
PMJDY beneficiaries (Aug 2025)	559.8 million; 55 percent women; 66 percent rural and semi-urban
Villages with a banking outlet within 5 km (Mar 2024)	99.99 percent
Cumulative DBT savings (to 2024-25)	Over INR 3.48 lakh crore

[a] Source: Compiled from [3], [4], [7], [22], [21].

B. Digital Public Infrastructure and the India Stack

The decisive change came with the India Stack, a set of open application programming interface (API) layers for identity (Aadhaar), payments (UPI), data exchange (Account Aggregator and DEPA), and related government services. More than 1.3 billion residents hold a biometric identity under Aadhaar, enabling electronic know-your-customer verification at negligible marginal cost and reducing onboarding time to minutes [5]. The JAM trinity of Jan Dhan accounts, Aadhaar, and mobile connectivity created the basis for direct benefit transfers that significantly cut leakage in social protection programmes, according to International Monetary Fund estimates [6].

Launched in 2016, UPI has expanded extremely rapidly: its share of digital payment volume rose from approximately 34 percent in 2019 to 83 percent in 2024 [22]. UPI distinguishes itself from comparable innovations such as M-Pesa in Kenya and Alipay in China through an open architecture in which many banks, third-party applications, and merchant networks interact at zero or near-zero cost [23]. The RBI Digital Payments Index, which assesses payment digitization through supply-side and demand-side indicators, reached 493.22 in March 2025 from a base of 100 in March 2018 [22].

C. Regulatory Stance on Fintech and Inclusion

The RBI's overall approach to fintech regulation can be characterized as innovation-friendly within prudential parameters. The Regulatory Sandbox, the Account Aggregator framework, the Payment Aggregator and Payment Gateway guidelines, and the Digital Lending Guidelines of September 2022 all pursue this balance [12]. The Digital Lending Guidelines stipulate that loan disbursements and repayments must flow directly between borrowers and regulated entities' bank accounts, without pass-through accounts of intermediary lending service providers. The RBI has also set up the Digital Payment Intelligence Platform and tightened cybersecurity standards for payment system operators.

Challenges persist. The layering of third parties complicates accountability when failures occur. Enforcement of data privacy under the Digital Personal Data Protection (DPDP) Act 2023 is still taking shape, and largely unregulated algorithmic credit scoring remains a concern. Finally, digital divides based on age, gender, language, and disability continue to obstruct the actual use of digital financial products even where access has improved [13], [24].

IV. EMPIRICAL EVIDENCE

A. Fintech Adoption and Inclusion Outcomes in India

A growing number of studies evaluate whether fintech uptake enhances financial inclusion in India. Mishra and Kumar [22] analyze the expansion of UPI between FY 2017-18 and FY 2024-25 using National Payments Corporation of India (NPCI) data and estimate state-level relationships between UPI penetration and the FI-Index. They find that an increase in UPI transaction density positively affects multidimensional financial inclusion, with larger marginal effects in states with lower initial inclusion and among underrepresented populations. Studies based on the World Bank Global Findex data and the RBI's own statistics show that between 2014 and 2021 India narrowed the gender gap in account ownership from roughly 20 percentage points to practically zero among adults aged 15 and above [8].

State-level analysis uncovers mixed results. Decompositions of the FI-Index by state reveal a catch-up effect in the access dimension: historically lagging states such as Bihar, Jharkhand, Madhya Pradesh, and Odisha converged toward the leaders between 2017 and 2025, mainly through PMJDY and business correspondent outlets. Convergence in usage and quality is much more limited, with per-capita transaction volumes still far higher in Karnataka, Tamil Nadu, Maharashtra, and Delhi than in the eastern states, and gender and other disparities more pronounced in the northern states. The FI-Index is thus a highly aggregated measure that glosses over the heterogeneity of inclusion.

Survey research provides disaggregated evidence at the individual level. Sahu [25] conducts a primary survey in rural Uttar Pradesh and uses binary logistic regression to model UPI usage among PMJDY account holders, finding that smartphone ownership, perceived usability, and social network diffusion are the main drivers of adoption, with gender, age, and education acting as moderators. Modwel and Trivedi [26] document the heterogeneity of UPI penetration across districts and its correlation with local infrastructure. Using staggered UPI adoption by banks as an identification device, Dubey and Purnanandam [27] conduct a quasi-experimental analysis of UPI's impact on credit market inclusion, concluding that individuals in regions served by early-adopting banks experienced greater gains in financial inclusion than those in late-adopting regions. The identification exploits the fact that full UPI use requires a bank account, making depositors of early-adopting banks early UPI users; positive network externalities generate additional spillovers in early-adoption areas [28].

Evidence on the behavioural side and on consumer impacts is also accumulating. Survey-based quasi-experimental work treating the COVID-19 lockdown as a natural experiment shows that UPI adoption accelerated sharply in 2020-21, especially among older adults and small merchants who had previously relied on cash. In a 2024 survey of Indian UPI adopters, about three-quarters of respondents reported increased consumption as a consequence of using UPI, citing greater convenience in small-value payments and reduced need to handle cash.

B. Fintech and Inclusive Development Outcomes in India

Robust links between fintech-enabled inclusion and development outcomes are fewer, but research is beginning to fill the gap. Most extensively documented is the effectiveness of DBT. Alonso et al. [6] find that DBT through the JAM trinity has reduced corruption and administrative leakage in India's largest welfare programmes, including PAHAL (the LPG subsidy) and MGNREGA wage payments, while increasing the speed of delivery. Government estimates place cumulative savings from DBT at over INR 3.48 lakh crore from the scheme's launch to 2024-25, achieved by removing ghost beneficiaries and duplicates [7].

The impact of digital payments and credit on MSMEs is increasingly studied. Researchers show that integrating digital payments with credit has raised revenues and made accounting and formal finance more accessible through Account Aggregator based lending. According to Aggarwal [13], UPI adoption by small merchants has increased customer footfall and reduced cash-handling costs. A current strand examines how QR-code acceptance helps firms formalize through digital transaction trails, which make it easier for banks and non-banking financial companies (NBFCs) to extend working capital to MSMEs and thereby relax the collateral constraint that previously limited MSME credit. Evidence on firm-level outcomes nevertheless remains thin, because much of the work relies on cross-sectional surveys rather than panel data.

Positive outcomes for women have been observed, but gaps persist. As per government statistics, 55 percent of PMJDY beneficiaries are women, and women who receive welfare payments directly demonstrate greater household decision-making power [7]. Nevertheless, gender gaps remain in mobile phone ownership, internet usage, and digital financial literacy. Fieldwork shows that in patriarchal households women often route digital payments through the accounts of male relatives, reducing fintech's empowerment potential. Findings on DBT under MGNREGA are mixed and context-dependent: some studies find that crediting wages directly into women's accounts increases female control over household resources, whereas others find that intra-household bargaining neutralizes the effect. Such findings underline the importance of accompanying measures to raise women's digital literacy.

Evidence on the effects of fintech on poverty reduction, structural transformation, and labour market outcomes in India remains scarce. Theory suggests that fintech could influence labour markets by lowering search costs through digital matching platforms, mitigating agricultural risk through parametric crop insurance, and strengthening migration networks through digital remittances. Empirical validation of these mechanisms in the Indian context is still pending, although the administrative data ecosystem built around Aadhaar makes it feasible. The Centre for Monitoring Indian Economy produces the Consumer Pyramids Household Survey, and the Ministry of Statistics and Programme Implementation conducts the annual Periodic Labour Force

Survey; linking payment transaction data with such surveys, however, raises serious privacy concerns.

C. Cross-Country Evidence from Emerging Economies

Cross-country studies confirm that fintech lowers geographic and cost barriers to financial services but emphasize that its impact is conditional. Khera et al. [18] construct a digital financial inclusion index for 52 developing economies and show that digital financial inclusion has grown rapidly since 2014, outpacing traditional inclusion, with the fastest gains in Sub-Saharan Africa and South Asia. Digital financial inclusion correlates positively with economic growth over and above the correlation with traditional inclusion. Lendra, Pulungan and Maherza [10] provide a systematic review for developing countries, documenting broad consensus that fintech facilitates inclusion by improving access for women, MSMEs, and rural populations, while identifying persistent challenges: cybersecurity, fraud, data protection, digital divides, and consumer protection.

The bibliometric analysis of Del Sarto and Ozili [1], covering 695 Scopus-indexed papers on fintech and financial inclusion in emerging markets between 2010 and 2023, identifies China, the United States, the United Kingdom, and India as the leading nations in the field and highlights mobile banking, peer-to-peer lending, and blockchain as dominant research themes. The authors note that a major gap concerns the long-run implications of fintech for financial stability and for the needs of marginalized groups. Sharma and Choubey [29] focus on financial inclusion and literacy bibliometrics, noting growing convergence between the digital payments and financial literacy literatures, with India ranking as the third most productive nation in the field.

Comparative case studies illuminate design-driven differences in outcomes. Kenya's M-Pesa mobile money system greatly increased access to finance and yielded large welfare gains; researchers estimate that M-Pesa lifted nearly two percent of Kenyan households out of extreme poverty, largely by enabling female-headed households to smooth consumption [30]. China's private duopoly of Alipay and WeChat Pay scaled digital finance rapidly, albeit without interoperability between applications. India's open-loop system has matched and even exceeded China's adoption rate while imposing minimal cost on end users, whereas China's system charges merchant commissions. India's inclusion-to-development relationship, however, is less precisely estimated than Kenya's because the Indian innovation is younger and lacks a decade of household survey outcome data [23].

D. Synthesis: Established Findings and Open Questions

Three clear findings stand out. First, the relationship between fintech adoption and measures of financial inclusion, such as account penetration, digital payment usage, and transaction frequency, is strongly positive and substantively large. Second, India's digital public infrastructure approach, which is open, interoperable, and publicly governed, appears more conducive to inclusivity than walled-garden models, though robust counterfactuals are few [23]. Third, the chain linking inclusion to development is less well established than the chain linking adoption to inclusion: positive associations between fintech and growth, MSME revenues, and welfare delivery have been demonstrated, but few papers establish causal effects of fintech on poverty alleviation, productivity, or labour market improvement.

Several uncertainties persist. The distributional incidence of digital credit is not yet understood; over-indebtedness has been reported among low-income borrowers using app-based lenders [12]. More research is needed on the gender, caste, and disability dynamics of digital exclusion. The distinction between inequality of access and inequality of use is unresolved: while access has evened out, differences in the quality and depth of use may be widening. Evidence on the impact of digital payments on household resilience, a quality dimension critical for inclusive development, requires panel data that has only recently become accessible through Aadhaar linkage.

A major unanswered question concerns the political economy of public-good payment systems. UPI has been offered without fees to merchants, allowing it to scale rapidly and inclusively even among small traders, but India has periodically subsidized the system to cover the cost of processing low-value transactions for banks and payment service providers. Whether this subsidy structure is financially sustainable, who bears the burden, and how the system should be financed over time remain open questions. Brazil's PIX system, likewise implemented as a public good, offers limited international precedent and suggests that the choice between user-pay and taxpayer-pay architectures has distributional implications. With a decade of UPI experience and data, India-based researchers are ideally positioned to make foundational contributions to the political economy of public payment systems.

V. RESEARCH TRENDS IN THE LITERATURE

A. Bibliometric Patterns

Bibliometric analysis offers the clearest view of the evolution of the field. Del Sarto and Ozili [1] document an inflection point in 2017-2018, after which annual publications on fintech and financial inclusion grew at a compound rate exceeding 30 percent. Sharma and Choubey [29] find a similar trend in the financial inclusion and financial literacy literature and identify the conceptual framework for digital financial inclusion proposed by Ozili [31] as the most influential paper in the field. The geographical distribution highlights the dominance of China, the United States, the United Kingdom, and India, with Indian institutions, including the Indian Institutes of Management, the Indian Institute of Technology Delhi, and public research bodies such as NIPFP, accounting for a rising share of output.

The topical distribution reveals four shifts. First, work on digital payments has evolved from descriptive case studies of mobile money systems toward causal evaluation of an entire platform, UPI. Second, research on digital lending and credit scoring has gained traction since 2020, driven by the emergence of buy-now-pay-later (BNPL) platforms and app-based lending products. Third, an emerging body of literature examines blockchain technologies and central bank digital currency (CBDC), stimulated by the digital rupee pilot projects. Fourth, while early studies were primarily access-oriented, research on the developmental benefits of fintech has grown steadily, linking fintech to MSME productivity, household resilience, and gender outcomes; outcome-focused research nevertheless still constitutes a minority of the literature.

B. Thematic Clusters

Four thematic clusters stand out. The first, fintech and financial inclusion, covers the measurement of access and usage, the role of digital payments, and fintech's contribution to narrowing demographic gaps; it is the largest cluster and the one in which Indian studies are concentrated. The second, financial literacy and consumer protection, includes digital fraud, financial education interventions, and grievance redressal mechanisms; Indian contributions to this theme have grown since the RBI Digital Lending Guidelines but remain methodologically weak. The third concerns fintech, MSME finance, and entrepreneurship, covering the effects of digital

payments and the Account Aggregator on small enterprise growth, formalization, and survival. The fourth covers regtech, digital public infrastructure, and inclusive fintech policymaking.

Across the four themes, Indian research is heavily skewed toward the first and the fourth. There has been extensive work on UPI adoption, the role of the RBI, account penetration, and the design of digital public infrastructure. Indian research on the second and third themes is comparatively underdeveloped, and studies of long-term poverty impacts, structural transformation, and intergenerational mobility through digital finance remain rare, largely because they require panel data that is only now becoming available through Aadhaar linkage.

The institutional distribution of Indian research is also instructive. Researchers affiliated with the public sector and the central bank, including the RBI, NIPFP, and NCAER, contribute disproportionately to fintech policy evaluation, while business schools dominate survey-based adoption research. University-based academic economists have contributed relatively little to the empirical literature on Indian fintech compared with the corresponding literatures on Kenya, Bangladesh, or the Philippines. This imbalance shapes the questions asked: policy-oriented work focuses on programme metrics suited to policymaking, whereas academic researchers are more inclined to test mechanisms and establish causality. Stronger connections among academic, central-bank, and multilateral researchers could generate new classes of research questions.

C. Methodological Approaches and Their Limits

Descriptive work predominates in the literature, followed by survey-based research. The most frequent designs include descriptive analysis of NPCI and RBI aggregates, logistic or probit models of fintech adoption estimated on primary surveys, and regressions of FI-Index components on policy and infrastructure variables. Quasi-experimental work has emerged but remains marginal; examples include difference-in-differences designs based on staggered UPI adoption, instrumental variable strategies exploiting neighbourhood network externalities, and regression discontinuity designs built around eligibility rules such as PMJDY enrolment criteria.

Three main limits constrain fintech adoption research in India. First, measures of adoption are highly heterogeneous: one study relies on account penetration, another on transaction volumes, and a third on self-reported survey responses, which complicates meta-analysis across the research base. Second, endogeneity has rarely been addressed adequately; districts and households that adopt fintech early differ from late adopters both observably and unobservably. Third, experimental designs, let alone randomised controlled trials of fintech adoption, are scarce in India relative to other developing countries, partly because the national scale of the digital infrastructure resists local randomisation. Mixed-method designs combining quantitative analysis with qualitative fieldwork also remain rare.

VI. FUTURE RESEARCH AGENDA

A. Improving Measurement

Several directions promise better measurement of fintech adoption. The focus should move from the binary access margin, such as whether a household has a UPI-enabled bank account, to adoption intensity, capturing how many transactions a household makes, with which counterparties, and with what effects on household finances. Fintech should also be studied in relation to substantive inclusive development outcomes, such as household resilience to shocks, intergenerational mobility, and labour force participation, rather than account penetration and transaction volumes alone [18]. Combining FI-Index data with micro surveys, including the Periodic Labour Force Survey, the Consumer Pyramids Household Survey, and the National Family Health Survey, would enable the multilevel analysis needed to understand the fintech-to-development chain.

The quality dimension of fintech, assigned only a 20 percent weight in the FI-Index, should be measured more precisely. User experience, including waiting times, dispute resolution, and the incidence of fraud; cost transparency, including effective annual percentage rates and foreign exchange margins in cross-border remittances; and behavioural appropriateness, that is, whether financial products match users' needs and risk tolerance, should all be captured. User surveys modelled on the World Bank Findex methodology can serve this purpose [8]. It is also worth examining whether over-reporting of financial activity in surveys is a distinctive feature of the Indian case and how well administrative records corroborate self-reported data.

B. Toward Causal Designs

Research designs will need to become increasingly causal in the coming years. Difference-in-differences designs based on the gradual rollout of India Stack features and regulations are promising sources of policy-relevant findings; examples include the introduction of UPI Lite and UPI 123Pay, the Digital Lending Guidelines, the DPDP Act, and reforms in welfare delivery. Firm-level randomisation can be applied to the rollout of digital accounting products among MSME merchants, while digital financial literacy training can be randomised in household experiments. Eligibility rules for schemes such as Stand-Up India or MUDRA refinance can be exploited in regression discontinuity designs. Aadhaar-linked administrative records can support the construction of household-level panels, and combining these causal designs with field studies would illuminate the mechanisms behind heterogeneous treatment effects.

C. Emerging Themes

Five relatively under-researched topics merit concentrated attention. First, risks to data privacy and the surveillance potential inherent in digital identity infrastructure need investigation, particularly after recent data breaches in the Aadhaar ecosystem [11]. Second, possible algorithmic bias in credit scoring should be explored, including audits comparing English and vernacular language versions of scoring models. Third, household over-indebtedness induced by app-based digital lending, including informal BNPL arrangements, requires diagnostic study. Fourth, the market structure in which a handful of third-party applications account for the vast majority of UPI transactions raises competition and financial resilience questions requiring further theoretical development. Fifth, the intersection of fintech with climate resilience and green finance, for instance through digital weather-based crop insurance, is an emerging topic in Indian fintech research.

A further understudied area is the application of fintech in informal labour markets, especially for platform and gig economy workers. Over eighty percent of India's non-agricultural workforce is informally employed, and a growing share works through digital platforms. An open empirical question is whether digital wage payments to platform workers reduce vulnerability and create new channels for formalisation, or whether digitalisation merely transfers the risks of precarious work to the worker under the guise of flexibility. Related questions concerning the portability of social protection, digital pensions for informal workers, and the

eShram platform as a channel for formal welfare provision are precisely those in which Indian research could lead the world.

D. Comparative and South-South Research

The literature on Indian fintech is ripe for comparative research exploring how the digital public infrastructure model interacts with different institutional environments. Useful comparators include Kenya, whose M-Pesa system is supported by a rich body of micro-evidence on welfare impacts [30], and China, whose walled-garden model rests on Alipay and WeChat Pay. It would be especially valuable to study how variation in the adoption of India Stack components in other countries translates into financial inclusion and inclusive development. Collaborative projects involving Indian and African research organisations could become an engine for such comparative work.

VII. POLICY IMPLICATIONS: TOWARD AN INCLUSIVE FINTECH ECOSYSTEM

First, the public-good character of India's digital financial infrastructure should be deepened and reinforced. The triad of a zero merchant discount rate on UPI, an open API architecture, and publicly governed payments and identity infrastructure has enabled large citizen gains at no personal expense; reversing any of these elements would set the inclusion clock back by years. The task is to find sustainable funding while preserving the public-good architecture, for example through subsidies for small-value transactions and innovation grants for products demanded by poor citizens. Investments in interoperability toward insurance, pensions, and government-to-person payments would extend the same gains to those domains.

Second, greater cooperation between the public and private sectors is needed for responsible digital credit. With some early problems of app-based lending addressed by the Digital Lending Guidelines [12], room for improvement remains in the disclosure of effective annual percentage rates, responsible-lending tests for poor borrowers, and grievance redress. An inclusion-oriented regulatory sandbox for innovations in digital credit to thin-file customers is one promising option.

Third, concrete actions should address India's remaining digital divides. The most affected groups include women, rural seniors, persons with disabilities, and informal economy workers who face difficulty accessing smartphones, navigating interfaces, and learning digital skills. Solutions include vernacular voice-based interfaces, implemented through initiatives such as UPI 123Pay for feature phones, targeted device-financing schemes for vulnerable populations, and financial literacy programmes in partnership with the National Rural Livelihoods Mission and adult education schemes. The National Centre for Financial Education and the Banking Ombudsman should receive additional resources to strengthen consumer protection, particularly complaint handling and recovery rates for low-income consumers.

Fourth, urgent improvements are needed in cybersecurity and data governance. Although the legal framework of the DPDP Act 2023 is in place, the rules for the Data Protection Board and associated capacity-building require further work. Sector-specific codes for the financial industry, algorithmic impact assessments for credit scoring models, and audit requirements for high-risk fintech applications would address existing gaps. RBI payment system operator guidelines should be extended to fintech platforms with appropriate compliance requirements [24].

Fifth, digital fraud demands intervention. RBI annual reports show that both the frequency and the value of fraud in digital and card payments are rising rapidly, most frequently affecting newly digitally included individuals [24]. The regulator has responded with two-factor authentication, transaction limits on new accounts, and the Digital Payment Intelligence Platform, but enforcement capacity must be strengthened. Additional investment in vernacular fraud awareness programmes, fast-track recovery mechanisms for low-value fraud, and shared liability models that push platforms and banks toward prevention would shift responsibility away from inexperienced users. The guiding principle is that the costs of fraud should be borne by the party best placed to prevent it.

Sixth, fintech and digital financial inclusion initiatives should be aligned with the Viksit Bharat 2047 vision and the Sustainable Development Goals [17]: in social protection through direct benefit transfers, in MSME growth through Account Aggregators, and in regional development by filling the state-level gaps exposed by the FI-Index. The 47 actions listed under the NSFI 2025-2030 Panch-Jyoti initiative provide a useful framework; implementing them with explicit targets and publicly available progress reports would enhance accountability [20].

Finally, India's leadership in digital public infrastructure should be leveraged for South-South development cooperation. The 2023 G20 New Delhi Declaration highlighted digital public infrastructure as a development tool, and NPCI International is signing contracts to deliver UPI-like systems abroad. Pursuing these opportunities in collaboration with the Ministry of External Affairs, the Export-Import Bank of India, and multilateral institutions would support Indian exports while generating evidence on the transferability of the model. Three further matters deserve attention: the nexus between climate change and digital finance, through UPI-linked parametric insurance payouts and green credit channelled via Account Aggregators to businesses in climate-vulnerable sectors; the urban transition, which will require portability of customer identifiers, account balances, and credit histories for migrant labourers, gig workers, and informal renters; and the pairing of public-good fintech with investment in vernacular digital literacy delivered by trusted intermediaries such as anganwadi workers, self-help groups, and Common Service Centres.

CONCLUSION

Supported by robust digital public infrastructure and successive National Strategies for Financial Inclusion, fintech innovations have greatly increased financial inclusion and financial activity in India over the last decade. The RBI FI-Index rose from 43.4 in 2017 to 67.0 in 2025, banking access now covers more than 99.9 percent of identified villages, and UPI has become the largest fast payment system in the world. More than 559 million people have joined PMJDY, the majority of them women. India has thus become one of the best available examples of how digital technologies can enhance financial inclusiveness in developing countries.

These achievements should not, however, be mistaken for inclusive development itself. The headline indicators measure the inputs to inclusive growth rather than its outputs. The literature demonstrates that the relationship between fintech and inclusion is robust, but the links between technological adoption and reductions in poverty, gains in productivity, empowerment, and resilience require far more attention. The risks that accompany fintech, including data exposure, algorithmic discrimination, over-indebtedness, and market concentration, must be taken seriously, and the regional, gender, and disability dimensions of digital exclusion need better empirical treatment.

The research priorities set out above imply measuring intensity of use rather than access alone, deploying causal

designs that exploit policy variation and natural experiments, and linking administrative microdata with surveys. On the policy side, it is critical to preserve the public-good character of the India Stack, to develop regulatory practice for responsible digital credit, to close residual divides, and to make fintech initiatives compatible with social programmes, MSME development, and climate adaptation. In the coming years, the hallmark of India's digital finance progress will no longer be the number of transactions processed through UPI; what must be measured instead is how fintech improves the resilience, livelihoods, and opportunities of the lower-income half of the population.

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