



Digital Payment and Financial Inclusion: Transmission Mechanisms, Global Evidence and Policy Pathways

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Abstract: Digital payment systems have become the principal channel through which formal financial services reach previously excluded populations. This paper examines the relationship between digital payment adoption and financial inclusion using secondary evidence from the Global Findex Database 2025, GSMA mobile money statistics and transaction data from India's Unified Payments Interface (UPI), combined with a structured synthesis of twenty peer-reviewed studies. A conceptual framework links digital payment infrastructure to inclusion outcomes through four transmission mechanisms: reduction of transaction and travel costs, creation of digital transaction trails that substitute for collateral, digitisation of government-to-person and wage payments, and network-driven merchant acceptance. The evidence shows that global account ownership rose from 51 per cent of adults in 2011 to 79 per cent in 2024, that mobile money is now the dominant driver of ownership growth in low- and middle-income economies, and that UPI scaled from 0.9 billion to roughly 242 billion annual transactions between FY2017-18 and FY2025-26. The analysis nevertheless finds that access has outpaced use: dormant accounts, a residual gender gap, rising fraud exposure and connectivity deficits continue to separate nominal ownership from meaningful financial participation. Digital payments are therefore a necessary but insufficient condition for inclusion, and second-generation policy must shift from account opening to usage depth, consumer protection and interoperable public payment infrastructure.

Keywords: digital payments, financial inclusion, mobile money, Unified Payments Interface, digital public infrastructure, fintech, usage gap

1. INTRODUCTION

1.1 Background

Financial inclusion — the availability, affordability and actual use of appropriate formal financial services — has moved from a peripheral welfare concern to a central instrument of development policy, and is referenced as an enabler across most of the Sustainable Development Goals [1], [2]. For much of the twentieth century inclusion was pursued through physical expansion: branch licensing, directed lending and rural banking mandates. That model was limited by the unit economics of servicing low-value, high-frequency transactions through brick-and-mortar infrastructure, which made small accounts commercially unattractive [3]. Digital payment systems relax precisely this

constraint. By relocating the transaction from a branch counter to a mobile handset, they push the marginal cost of a payment towards zero, dissolve the distance penalty faced by rural households, and make no-frills accounts commercially viable [4], [5].

The resulting shift has been rapid. Worldwide account ownership reached 79 per cent of adults in 2024, up from 51 per cent in 2011, and 75 per cent of adults in low- and middle-income economies now hold an account at a bank, another regulated institution or a mobile money provider [1]. Mobile money alone recorded 2.3 billion registered accounts and approximately US\$2.1 trillion in annual transaction value in 2025, having taken two decades to reach its first trillion dollars and only four years to reach its second [6]. In India, the Unified Payments Interface



(UPI) processed roughly 242 billion transactions worth about ₹314 lakh crore in FY2025-26, compared with 0.9 billion transactions in FY2017-18 [7].

1.2 Statement of the problem

Aggregate adoption figures conceal a persistent divergence between access and use. About 1.3 billion adults still hold no account, and half of them live in only eight economies [1]. Among those who do hold accounts, a substantial share transact rarely, or use the account solely as a conduit for a single government transfer, so that ownership registers in the statistics without altering financial behaviour. The relevant research question has therefore shifted from whether digital payments widen access to whether they generate meaningful financial participation — formal saving, access to credit and resilience to shocks — and for which population segments. The existing literature remains divided between country-specific impact evaluations, predominantly of East African mobile money, and cross-country correlational work; comparatively few studies integrate the two with recent evidence from publicly operated fast-payment systems in Asia.

1.3 Research objectives

The paper pursues four objectives: (i) to specify the mechanisms through which digital payment infrastructure is transmitted into financial inclusion outcomes; (ii) to document adoption and inclusion trends using the most recent global and national secondary data; (iii) to assess the extent to which gains in access have converted into depth of use, with attention to gender and income segmentation; and (iv) to derive a policy agenda consistent with the evidence.

1.4 Scope and organisation

The study is global in scope, with India treated as an illustrative case of state-led digital public infrastructure and sub-Saharan Africa as the reference case for provider-led mobile money. Section 2 reviews the literature, Section 3 develops the framework, Section 4 the methodology, Section 5 the results, Section 6 the policy implications, and Section 7 concludes.

2. LITERATURE REVIEW

2.1 Conceptualising financial inclusion

Early formulations treated inclusion as a binary access condition — whether a household holds a bank account. Multidimensional measures subsequently combined banking penetration, availability of services and usage, showing that economies with similar ownership rates can differ sharply in depth of use and

that access alone is a weak proxy for inclusion [3]. Allen et al. [5], analysing pooled micro data across 123 economies, established that the cost of maintaining an account, physical proximity to a provider and documentation requirements are the dominant correlates of both ownership and usage, reframing inclusion as a function of transaction frictions rather than of income alone and supplying the warrant for treating payment technology as an inclusion instrument. Subsequent reviews note, however, that definitions and indices remain fragmented, which complicates cross-study comparison [8].

2.2 Digital payments as an access technology

Gomber et al. [9] locate digital payments within a wider fintech taxonomy and identify the payment layer as the entry point through which credit, insurance and investment are subsequently distributed. Ozili [4] argues that digital finance lowers the cost of intermediation while introducing risks of instability and of exclusion by design where services presuppose smartphones or literacy. Beck et al. [10] model a payment technology that dominates cash because it eliminates theft risk, and show through a calibration to Kenyan firm-level data that adoption raises entrepreneurial investment and output. Lashitew et al. [11] find that regulatory accommodation and mobile network infrastructure explain diffusion better than income levels, implying that inclusion outcomes are policy-contingent rather than income-determined.

2.3 Evidence on inclusion and welfare outcomes

The most credible causal evidence comes from mobile money. Jack and Suri [12] exploit the geographic roll-out of M-PESA agents in Kenya and show that users were able to absorb negative income shocks without reducing consumption, because remittance networks became cheaper and faster to access. Extending the panel to five rounds, Suri and Jack [13] estimate that agent expansion lifted about 194,000 households, roughly 2 per cent of Kenyan households, out of poverty, with the largest effects among female-headed households. Aker et al. [14] find in a randomised cash-transfer experiment in Niger that mobile-money delivery reduced recipient travel and programme administration costs while improving diet diversity, and Ouma et al. [15] report that mobile financial services raise both the probability and the level of formal saving, consistent with field-experimental evidence that savings constraints among the poor are transactional and behavioural rather than purely preference-based [16], [17]. Breza et al. [18] add a



qualification: in an experiment with Indian payroll accounts, usage rose only after workers accumulated direct experience, indicating substantial learning costs. At the macro level, Demir et al. [19] find that fintech reduces inequality mainly indirectly, through inclusion, while Shen et al. [20] show for China that internet access affects inclusion only through literacy and product use, not directly [21].

2.4 Barriers, risks and the usage gap

A parallel literature documents the limits of digital inclusion. Ghosh and Vinod [22], using Indian micro data, find that female-headed households face significantly lower access to and use of finance, with education and wage employment mattering more than household income, indicating that payment technology cannot by itself neutralise structural disadvantage. Dormancy, agent liquidity shortages, connectivity

gaps, privacy exposure and fraud are recurrent constraints, and fraud in particular scales with transaction volume [4], [7]. The inclusion function therefore appears concave in payment infrastructure: early investment yields large access gains, while later gains depend on complementary capability, protection and product design.

2.5 Research gap

Three gaps motivate this paper. The causal literature is heavily weighted towards provider-led mobile money in East Africa, whereas the largest contemporary systems are publicly specified interoperable rails in Asia; most cross-country studies predate the 2024 Findex round; and mechanisms are usually tested in isolation rather than as a single transmission structure. This paper integrates current secondary data with a mechanism-based framework.

Table 1. Synthesis of selected empirical studies on digital payments and financial inclusion

Study	Context and data	Method	Principal finding
Jack and Suri [12]	Kenya; household panel, M-PESA agent roll-out	Difference-in-differences	Users fully absorbed negative income shocks; non-users cut consumption by about 7 per cent
Suri and Jack [13]	Kenya; five-round panel, 2008–2014	Panel difference-in-differences	Agent expansion lifted roughly 194,000 households (2 per cent) out of poverty; effects concentrated among female-headed households
Aker et al. [14]	Niger; drought cash transfer programme	Randomised controlled trial	Mobile-money delivery cut recipient and administrative costs and improved diet diversity
Allen et al. [5]	123 economies; Findex micro data	Probit on pooled micro data	Cost, proximity and documentation are the dominant determinants of ownership and use
Breza et al. [18]	India; garment-worker payroll accounts	Randomised controlled trial	Account use rises with direct experience, evidencing significant learning costs
Ghosh and Vinod [22]	India; household micro data	Tobit and decomposition	Female-headed households face lower access and use; education and employment dominate income

Source: compiled by the author from the cited studies.

3. CONCEPTUAL FRAMEWORK

3.1 Structure of the framework

Fig. 1 organises the literature into a single transmission structure. Digital payment infrastructure — interoperable fast-payment rails, QR acceptance, mobile money wallets, cash-in/cash-out agent networks and electronic identity verification —

operates on inclusion outcomes through four mechanisms. First, it lowers the transaction and travel cost of moving money, which raises the net return on holding a formal account [5], [12]. Second, it generates digital transaction trails that function as a substitute for collateral and formal credit history, extending the payment relationship into credit [9], [10]. Third, it allows governments and employers to digitise transfers



and wages, which opens accounts at scale and, where accompanied by learning, converts them into active accounts [14], [18]. Fourth, merchant acceptance produces network effects: each additional accepting merchant raises the value of holding an account, which in turn attracts further merchants [6], [7].

These mechanisms operate conditionally. Mobile and internet access, digital and financial literacy, interoperability mandates, consumer protection and gender norms all moderate the strength of transmission [11], [22], [20]. A parallel set of risk channels — fraud and mule accounts, dormancy, privacy and algorithmic exclusion, over-indebtedness and infrastructure gaps — can attenuate or reverse inclusion gains [4]. Outcomes feed back through scale economies, which is why adoption trajectories tend to be S-shaped rather than linear.

3.2 Propositions

P1: Digital payment adoption is positively associated with account ownership, but the association weakens as ownership approaches saturation. P2: The effect of payment infrastructure on usage depth is conditional on connectivity and literacy. P3: Digitised government and wage payments increase ownership faster than usage, producing a measurable dormancy gap. P4: Inclusion gains are larger for women where infrastructure is combined with identity, handset ownership and agent access, and negligible where it is not.



Fig. 1. Conceptual framework linking digital payment infrastructure to financial inclusion and development outcomes.

4. RESEARCH METHODOLOGY

4.1 Research design

The study adopts a descriptive-analytical design based entirely on secondary data, combining three components: (i) trend analysis of harmonised cross-country indicators of access and use; (ii) a national case analysis of India's UPI as an instance of publicly specified payment infrastructure; and (iii) a structured synthesis of published effect estimates in which studies are classified by context, identification strategy and reported outcome. No primary survey was conducted and no causal claims are advanced from the descriptive component.

4.2 Data sources

Table 2 summarises the sources. Demand-side indicators are drawn from the Global Findex Database, which is the only globally comparable survey of financial behaviour; the 2025 edition is based on nationally representative surveys of approximately 145,000 adults across 141 economies conducted during calendar 2024 [1]. Supply-side mobile money data come from the GSMA annual industry survey [6], and Indian transaction data from the National Payments Corporation of India as reported by the Government of India [7].

Table 2. Data sources, indicators and coverage

Source	Indicators used	Unit and coverage	Period
Global Findex Database 2025 and 2021 [1], [2]	Account ownership; digital payment use; mobile money ownership; formal saving; gender gap	141 economies; ~145,000 adults	2011–2024 (survey waves)
GSMA State of the Industry Report 2026 [6]	Registered and 30-day active mobile money accounts; transaction value	Supply-side, global	2021–2025
NPCI / Government of India [7]	UPI transaction volume and value; person-to-merchant share	India, national	FY2018–FY2026



4.3 Variables and measurement

Financial inclusion is measured on two dimensions. Access is proxied by the share of adults aged 15 and above holding an account at a bank, another regulated institution or a mobile money provider. Use is proxied by the share making or receiving a digital payment in the previous year, the share saving formally, and mobile money activity rates. Digital payment adoption is proxied by mobile money ownership, per-capita transaction volume and merchant payment incidence. Equity is captured by the gender gap in ownership, in percentage points.

4.4 Analytical procedure

The analysis proceeds in three steps. Indicator series are assembled for the five survey waves and differenced to isolate period-on-period gains; access and usage series are then compared to estimate the residual usage gap, defined as the difference between the share of adults owning an account and the share transacting digitally; and published effect estimates are tabulated by mechanism to test consistency with the descriptive pattern. For subsequent hypothesis testing on panel data, the framework implies the specification

$$FI_{it} = \beta_0 + \beta_1 DPU_{it} + \beta_2 MOB_{it} + \beta_3 \ln GDP_{pcit} + \beta_4 REG_{it} + \beta_5 LIT_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where FI is a financial inclusion indicator for economy i in wave t , DPU is digital payment use, MOB is mobile money penetration, REG is a regulatory-quality index, LIT is a literacy proxy, and μ and λ are economy and wave fixed effects. Equation (1) is presented as the specification

implied by the framework and as an agenda for estimation, not as a model estimated here.

4.5 Limitations

Four limitations should be noted. Index indicators are self-reported and collected at three- to four-year intervals, so short-run dynamics are not observable. Supply-side registration counts overstate unique users. Definitional revisions between editions make some earlier values only approximately comparable. Finally, the Indian case reflects a specific configuration of digital identity, state mandate and zero merchant-discount pricing, which limits direct generalisation.

5. RESULTS AND DISCUSSION

5.1 Trends in account ownership

Fig. 2 shows the trajectory of account ownership. The global share rose by 28 percentage points between 2011 and 2024, from 51 to 79 per cent, while low- and middle-income economies advanced from 42 to 75 per cent [1], [2]. Convergence is evident: the gap between the global and developing-economy figures narrowed from nine to four percentage points. Growth has not, however, been uniform across waves. The 2011–2014 and 2014–2017 intervals delivered gains of eight to twelve percentage points in developing economies, whereas 2021–2024 delivered six — consistent with Proposition P1 and with saturation among the more advanced adopters. The residual unbanked population of about 1.3 billion adults is now geographically concentrated, with half in eight economies [1].

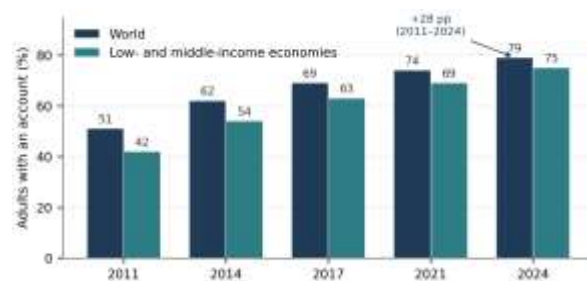


Fig. 2. Account ownership among adults, world and low- and middle-income economies, 2011–2024.

Source: constructed from [1], [2].

5.2 From ownership to use: the residual usage gap

Table 3 assembles the principal indicators. The share of adults in low- and middle-income economies making or receiving a digital payment rose from 35 per cent in 2014 to 57 per cent in 2021 and about 61 per cent in 2024, equivalent to roughly 82 per cent of account holders in those economies [1], [2]. Formal saving in an account rose from 24 to 40 per cent of adults between 2021 and 2024, the fastest increase in more than a decade [1], indicating that the payment layer is pulling other services behind it as the framework predicts. Yet a gap of roughly fourteen percentage points persists between the share owning an account and the share transacting digitally. Interpreted through Proposition P3, this gap is the footprint of supply-driven account opening — transfer, wage and subsidy accounts opened but not subsequently used — and it is the quantity that second-generation policy must compress.



Table 3. Key indicators of digital payment adoption and financial inclusion, 2011–2024

Indicator	2011	2014	2017	2021	2024
Account ownership, world (%)	51	62	69	74	79
Account ownership, low- and middle-income economies (%)	42	54	63	69	75
Adults making or receiving digital payments, LMICs (%)	—	35	—	57	61
Mobile money account ownership, world (%)	—	—	—	10	15
Gender gap in account ownership, LMICs (percentage points)	9	9	9	6	5
Adults saving formally in an account, LMICs (%)	—	—	—	24	40
Adults without an account, world (billion)	2.5	2.0	1.7	1.4	1.3

Source: compiled from [1], [2]. Dashes denote indicators not published on a comparable basis for that wave.

5.3 Evidence from India's Unified Payments Interface

Fig. 3 traces UPI volumes and values across nine financial years. Volume grew from 0.9 billion transactions in FY2017-18 to approximately 242 billion in FY2025-26, while value rose from about ₹1 lakh crore to roughly ₹314 lakh crore [7]. Three features of this trajectory are analytically relevant. First, person-to-merchant transactions now account for about 63 per cent of volume, indicating that the system has moved beyond peer-to-peer remittance into everyday retail acceptance — the network-effect mechanism of Fig. 1 operating at scale. Second, average ticket size has fallen as volume has

risen, the signature of small-value, high-frequency inclusion rather than of substitution among affluent users. Third, growth was achieved on a publicly specified, interoperable rail layered on a national digital identity system, supporting the finding of Lashitew et al. [11] that regulatory design rather than income level governs diffusion. Reported fraud cases have, however, risen alongside volume [7], illustrating the risk channel in the framework.

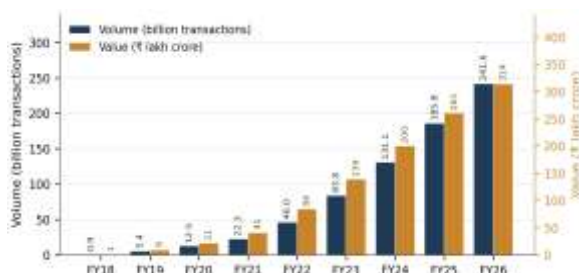


Fig. 3. UPI annual transaction volume and value, FY2017-18 to FY2025-26. Source: constructed from [7].

5.4 Gender gap and the mobile money channel

Fig. 4(a) shows that the gender gap in account ownership in low- and middle-income economies remained at nine percentage points for a decade before falling to six points in 2021 and five points in 2024; the global gap is now four points, with 77 per cent of women holding an account [1], [2]. Fig. 4(b) sets this against the growth of the mobile money channel, which reached 2.3 billion registered accounts and about US\$2.1 trillion in annual value in 2025, with 593 million accounts active in a given thirty-day window [6]. The activity rate of roughly one quarter of registered accounts is itself evidence of the dormancy problem. Consistent with Proposition P4, the gender gap has narrowed fastest where mobile money expansion was accompanied by identity documentation and handset access, and negligible where women's phone ownership lags, which corroborates the structural reading of Ghosh and Vinod [22]. Nearly 190 million adults in low- and middle-income economies now rely on mobile money as their only formal account [6].

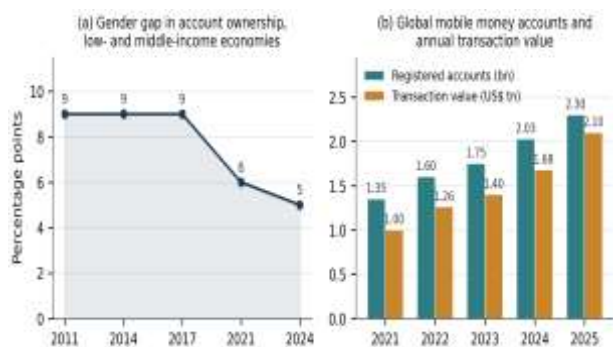


Fig. 4. (a) Gender gap in account ownership in low- and middle-income economies; (b) global mobile money registered accounts and annual transaction value. Sources: constructed from [1], [2], [6].

5.5 Discussion

Read together, the descriptive and experimental evidence supports a qualified conclusion. Digital payments have been decisive for access: the cross-country record shows no case of rapid inclusion gains in the past decade that did not run through a digital payment channel. The evidence on depth is weaker and

more conditional. Experimental findings that mobile money improves risk sharing [12], reduces long-run poverty [13] and lowers transfer costs [14] are robust but were obtained where usage was already established; where usage is imposed through a payroll or subsidy credit, effects appear only after a learning period [18]. The marginal return to further account-opening campaigns is therefore low relative to the return to interventions that raise usage intensity, protect users and close residual gender and connectivity gaps — a reallocation of effort within the digital payment agenda rather than a retreat from it.

6. POLICY IMPLICATIONS

Table 4 translates the findings into five priorities, each paired with the instrument that delivers it, the outcome expected and the principal risk to manage. Sequencing matters: interoperability and merchant acceptance are prerequisites for the network effect, while capability building and consumer protection determine whether the resulting accounts remain active.

Table 4. Policy priorities, instruments, expected outcomes and risks

Priority	Instrument	Expected inclusion outcome	Principal risk to manage
Interoperable public payment rails	Interoperability mandates, low merchant discount rates for small merchants, open APIs	Merchant acceptance and self-reinforcing network effects	Provider revenue sustainability
Usage-first account design	Digitised government and wage credits, no-frills accounts with overdrafts, vernacular interfaces	Lower dormancy and greater usage intensity	Forced adoption without effective recourse
Closing the gender gap	Women agent networks, identity and handset-ownership programmes, gender-disaggregated reporting	Narrowed gaps in both ownership and use	Gender-blind design defaults
Consumer protection and fraud control	Real-time fraud monitoring, tiered limits, clear liability allocation, grievance redress	Sustained trust and repeat use	Over-restriction that reintroduces transaction friction
Digital and financial capability	Curricula, just-in-time nudges at the point of transaction, agent-assisted onboarding	Informed use and lower fraud losses	Capability effort substituting for product redesign

7. CONCLUSION

7.1 Summary of findings

This paper examined how digital payment systems shape financial inclusion. Four conclusions follow.



First, digital payments have been the dominant channel of access expansion over the past decade, taking global account ownership from 51 to 79 per cent of adults and developing-economy ownership from 42 to 75 per cent. Second, the mechanism is identifiable and consistent across contexts: lower transaction costs, digital transaction trails, digitised government and wage payments, and merchant network effects. Third, transmission from access to use is conditional on connectivity, literacy, identity and gender-sensitive design, and a usage gap of roughly fourteen percentage points persists. Fourth, the risk channel is no longer secondary: fraud, dormancy and privacy exposure scale with volume

and require regulatory capacity that grows with the system.

7.2 Contribution and future research

The contribution is integrative rather than estimative: the paper places provider-led mobile money and state-led fast-payment infrastructure within a single mechanism framework and evaluates both against the 2024 evidence base. Three extensions follow. Equation (1) should be estimated on the five-wave Findex panel with regulatory and connectivity controls to test whether the association weakens at high ownership levels. Quasi-experimental evaluation of fast-payment roll-outs in Asia and Latin America would supply causal evidence for a model that currently rests on descriptive data. Finally, dormancy deserves treatment as a dependent variable in its own right, since it is the margin on which the next decade of financial inclusion will be decided.

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