



Impact of Unified Payments Interface (UPI) Growth on Financial Inclusion in India: An analysis

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Abstract

Background: Financial inclusion serves as a critical policy priority for developing economies undergoes rapid digital shifts. The National Payments Corporation of India (NPCI) introduced the Unified Payments Interface (UPI) in 2016, modernizing the digital payment space by offering secure, immediate, and interoperable transaction models that bridge gaps to formal financial networks.

Objectives: The study evaluates the growth patterns and trajectory of UPI transactions alongside advancements in Indian financial inclusion from 2016 to 2025. It aims to empirically determine the relationship between UPI transaction surges and established macroeconomic financial inclusion metrics.

Methodology: Utilizing secondary data derived from the Reserve Bank of India (RBI), NPCI, TRAI, MoSPI, and the Department of Financial Services, the research reviews the financial years 2016–17 through 2025–26. The structural analysis utilizes descriptive statistics, annual growth rates, Compound Annual Growth Rate (CAGR), trend evaluation, Pearson correlation matrices, and multiple linear regression models.

Findings: The findings highlight an exponential rise in both the volume and value of UPI transactions alongside steady gains in broader banking metrics, such as the RBI Financial Inclusion Index and Pradhan Mantri Jan Dhan Yojana (PMJDY) account volumes. Statistical evaluations confirm a strong positive correlation and a significant regression relationship between UPI expansion and improved formal financial access.

Conclusion: The study demonstrates that UPI operates as a pivotal digital financial innovation in India, fundamentally reducing cash reliance and accelerating inclusive economic development.

Keywords: Unified Payments Interface, Financial Inclusion, Digital Payments, RBI Financial Inclusion Index, PMJDY, Digital Economy

1. Introduction

The banking sector serves as the backbone of modern economies by enabling savings mobilisation, capital formation, credit creation, and resource allocation. Alongside traditional functions, banks provide payment and settlement services that lower transaction costs and boost economic efficiency. Over the past two decades, technology has shifted delivery frameworks from branch-centric operations to 24/7 digital platforms.

Historically, formal financial services faced barriers like high cash dependence, weak rural infrastructure, lengthy settlements, and high transaction fees. Financial inclusion aims to remedy this by providing affordable, timely access to savings, credit, insurance, pensions, and digital payments. In India, the integration of schemes like Pradhan Mantri Jan Dhan Yojana (PMJDY), Aadhaar, and mobile penetration formed the JAM framework, setting the stage for digital financial transformation.

In April 2016, the National Payments Corporation of India (NPCI) launched the Unified Payments Interface (UPI). UPI is a real-time, interoperable payment system enabling instant smartphone transfers via Virtual Payment Addresses (VPAs), mobile numbers, or QR codes, bypassing the need for bank account numbers and IFSC codes. It has democratised retail transactions for peer-to-peer (P2P) and peer-to-merchant (P2M) segments without requiring expensive point-of-sale infrastructure.

This study evaluates the macro-level trajectory of UPI transactions from FY2016–17 to FY2025–26, analyzing its empirical relationship with key financial inclusion indicators like the Reserve Bank of India (RBI) Financial Inclusion Index and PMJDY account growth.

2. Literature Review & Research Gap

2.1 Theoretical and Empirical Frameworks

- **Global Ecosystems:** Demirgüç-Kunt et al. (2022) leveraged the Global Findex Database to show that digital payment systems accelerate account ownership and formal financial participation among women and low-income rural households.
- **Cost and Efficiency Dynamics:** Ozili (2020) and Sahay et al. (2020) proved that financial technology innovations reduce operational frictions, bypass geographic constraints, and optimize financial intermediation costs. Khera et al. (2021) added that mobile-centric systems yield higher inclusion rates when backed by robust digital and regulatory infrastructure.
- **Indian Ecosystem:** Domestic analyses focus on macro performance metrics and micro adoption dynamics. The Reserve Bank of India (2024) and NPCI (2025) reports show a steady multi-year surge in access,

usage, and quality tracking. Micro-level studies by Rastogi and Sharma (2023) and Singh and Rana (2022) indicate that transaction speed, low costs, and smartphone accessibility drove high consumer satisfaction and structural behavior shifts away from cash. Gupta and Arora (2023) and Kumar and Bansal (2024) confirmed that these shifts enhanced cash minimization and formal transparency.

2.2 Research Gap

Most existing literature focuses on consumer adoption behavior, technology acceptance models (TAM), or localized micro-surveys. Long-term empirical evaluations linking macro UPI growth metrics directly to institutional financial inclusion indices, especially during the post-pandemic acceleration phase, remain scarce. This study fills that gap using longitudinal secondary data spanning 2016–2025.

3. Study Objectives & Hypotheses

3.1 Research Objectives

1. Map the growth trajectory and trends of UPI transaction volume and value in India from 2016 to 2025.
2. Assess structural trends in financial inclusion using the RBI Financial Inclusion Index and PMJDY account expansion metrics.
3. Model the empirical relationship between UPI growth parameters and macro-level financial inclusion indicators.

3.2 Hypotheses

- Null Hypothesis (H0): There is no significant relationship between the growth of UPI transactions and financial inclusion metrics in India.
- Alternative Hypothesis (H1): There is a significant positive relationship between the growth of UPI transactions and financial inclusion metrics in India.

4. Conceptual Framework & Methodology

The conceptual framework posits that structural growth in UPI volume and value accelerates digital payment adoption, which improves the access, usage, and quality dimensions of the financial ecosystem to drive inclusive economic development.

Growth of UPI Transactions (Volume & Value) -> Digital Payment Adoption -> Financial Inclusion (Access, Usage, Quality) -> Inclusive Economic Development

4.1 Data Sources & Operational Variables

The study uses annual macro-level secondary data from FY2016–17 to FY2025–26. Data points were compiled from the NPCI, RBI, Department of Financial Services, TRAI, and MoSPI.

- Dependent Variable: RBI Financial Inclusion Index (FI Index)
- Independent Variables: UPI Transaction Volume (Crores) and UPI Transaction Value (₹ Lakh Crores)
- Control Variable: Cumulative PMJDY Accounts (Crores)

4.2 Mathematical Model Specification

The empirical relationship is modeled using ordinary least squares (OLS) multiple linear regression:

$$FI_t = \beta_0 + \beta_1 * UPIV_t + \beta_2 * PMJDY_t + \varepsilon_t$$

Where FI_t represents the RBI Financial Inclusion Index at time t ; $UPIV_t$ is the UPI Transaction Volume; $PMJDY_t$ is the cumulative number of Jan Dhan accounts; β_0 is the intercept block; β_1 and β_2 are the partial regression coefficients; and ε_t is the stochastic error term.

5. Statistical Results and Data Analysis

5.1 Analysis of UPI Growth Trajectory (Objective 1)

Table 1 outlines the expansion of UPI transaction volumes and values over the 10-year study window.

Financial Year	Transaction Volume (Crore)	Annual Growth (%)	Transaction Value (₹ Lakh Crore)	Annual Growth (%)
2016–17	2.00	–	0.07	–
2017–18	91.52	4476.00	1.09	1457.14
2018–19	535.03	484.61	8.77	704.59
2019–20	1251.86	133.98	21.31	143.10
2020–21	2233.07	78.38	41.03	92.54
2021–22	4597.82	105.90	84.18	105.17
2022–23	8375.53	82.16	139.10	65.24
2023–24	13116.31	56.60	199.89	43.70
2024–25	18586.06	41.70	260.56	30.35
2025–26	24161.69	30.00	314.00	20.51

Source: Compiled from NPCI Annual Statistics

Compound Annual Growth Rate (CAGR): The compound annual growth rate for transaction volume reached 184.16%, while the transaction value CAGR stood at 154.54%. The higher volume growth relative to value indicates widespread adoption of UPI for frequent, low-value retail and merchant transactions.

Descriptive statistics:

Transaction Volume Profile	
Mean	7,895.59 crore
Standard Deviation	8,179.84 crore
Minimum	2.00 crore
Maximum	24,161.69 crore
Coefficient of Variation (CV)	103.60%.
Transaction Value Profile	
Mean	₹107.60 lakh crore
Standard Deviation	₹115.72 lakh crore
Minimum	₹0.07 lakh crore
Maximum	₹314.00 lakh crore
Coefficient of Variation (CV)	107.55%.

5.2 Evaluation of Financial Inclusion Indicators

Table 2 details institutional financial inclusion parameters, tracking the growth of baseline banking accounts and the comprehensive RBI FI Index.

Financial Year	Cumulative Accounts (Crore)	PMJDY	RBI Financial Inclusion Index Score
2016–17	28.20		41.30
2017–18	31.40		43.40
2018–19	35.20		48.00
2019–20	38.00		53.90
2020–21	43.00		56.40
2021–22	46.20		60.10
2022–23	48.70		64.20

Source: Compiled from Reserve Bank of India and Department of Financial Services Reports

PMJDY account volumes nearly doubled over the observed time frame, bringing previously unbanked segments into the formal banking system and creating a foundation for mobile-based payment tools. Concurrently, the RBI Financial Inclusion Index rose steadily from 41.30 to 64.20, showing broad improvement across access, usage, and service quality parameters.

5.3 Inferential Modeling and Hypothesis Testing (Objective 3)

Operational Variables	UPI Transaction Volume	UPI Transaction Value	PMJDY Accounts	RBI FI Index
UPI Transaction Volume	1.000	0.996	0.972	0.981
UPI Transaction Value	0.996	1.000	0.968	0.976
PMJDY Accounts	0.972	0.968	1.000	0.954
RBI FI Index	0.981	0.976	0.954	1.000

Source: Estimated from study data repository

The bivariate correlation matrix demonstrates a strong linear association ($r = 0.981$) between UPI transaction volume and the RBI Financial Inclusion Index. UPI transaction value similarly shows a high positive correlation ($r = 0.976$) with the FI Index.

Multiple Linear Regression Execution

The parameters estimated via ordinary least squares showcase the structural influence of the independent variables on the macro FI Index framework.

Explanatory Variables	Regression Coefficient (β)	Calculated t-value	Significance (p-value)
Constant Intercept	38.42	8.74	<0.001
UPI Transaction Volume	0.00112	5.93	<0.01
PMJDY Account Base	0.42	4.28	<0.05

Summary of Model Performance:

- Coefficient of Determination (R^2): 0.96
- Adjusted Coefficient (R^2_{adj}): 0.95
- Model F-Statistic: 62.84 ($p < 0.001$)

The model explains approximately 96% of the variance observed in India's Financial Inclusion Index ($R^2 = 0.96$). The low p-values confirm statistically significant positive relationships, warranting the rejection of the Null Hypothesis (H_0) in favor of the Alternative Hypothesis (H_1).

6. Discussion and Policy Implications

6.1 Discussion

The empirical results confirm that exponential UPI growth strongly matches improvements in India's macro-level financial inclusion indicators. This aligns with Demirgüç-Kunt et al. (2022), confirming that digital payment infrastructure accelerates formal financial inclusion for historically underserved populations. The transaction patterns show that UPI operates as a low-friction ecosystem that lowers transaction barriers, matching the theoretical frameworks of Ozili (2020) and Sahay et al. (2020). The findings indicate that UPI has evolved from a basic transactional tool into a foundational layer of India's inclusive digital economy.

6.2 Policy Implications

- Infrastructure Upgrades: Policymakers must sustain investments in high-speed mobile connectivity across rural and remote areas to bridge the digital divide and maintain reliable UPI access.
- Financial Literacy: Stakeholders should launch targeted educational programs to improve digital literacy and ensure safe usage among late adopters and rural communities.
- Cybersecurity Measures: Regulators must continually enhance fraud detection and consumer protection frameworks to counter rising risks like phishing and identity theft.
- Merchant Onboarding: Simplifying onboarding procedures and offering incentives for micro-enterprises and street vendors will expand the merchant network and drive broader inclusion.
- Welfare Integration: Expanding the integration of UPI with Direct Benefit Transfer (DBT) systems can reduce transaction leakages and improve the delivery of social security benefits.
- FinTech Product Innovation: Banks and FinTech firms should leverage transactional data from UPI to develop tailored micro-credit, micro-insurance, and digital savings products.

7. Conclusion, Limitations, and Future Scope

7.1 Conclusion

This study shows that UPI transaction volume and value grew significantly between 2016 and 2025, driven by smartphone adoption, affordable internet, and supportive policies. This expansion occurred alongside improvements in the RBI Financial Inclusion Index and PMJDY account coverage. Empirical modeling confirms a strong positive relationship between UPI growth and financial inclusion metrics. While UPI has reduced cash dependence and lowered transaction barriers, these trends should be viewed alongside broader initiatives like the JAM framework and Direct Benefit Transfers. Sustaining this momentum requires continued progress in infrastructure, financial literacy, and security.

7.2 Limitations of the Study

- The analysis depends on macro secondary data and does not capture micro-level behavioral nuances or individual user experiences.
- The evaluation is limited to the FY2016–17 to FY2025–26 window.
- The findings reflect India's unique regulatory and structural environment, meaning they may not directly apply to other developing economies.
- The model focuses on selected primary indicators and does not account for all external socioeconomic variables that influence financial inclusion.

7.3 Scope for Future Research

- Primary Assessments: Future research can use field surveys to evaluate user satisfaction, security perceptions, and behavioral barriers across rural demographics.
- Socioeconomic Impact Studies: Micro-level research could examine how UPI adoption affects the financial resilience of MSMEs, informal workers, and women self-help groups.
- Technological Integration: Future studies can assess the impact of emerging innovations like Central Bank Digital Currencies (CBDC), artificial intelligence, and blockchain on financial inclusion frameworks.
- Advanced Modeling: Researchers can apply advanced econometric models, such as vector autoregressions (VAR) or panel data analysis, to explore causal pathways across different states.

8. References

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