

Project Dissertation Report on

**DOES UPI EXPANSION CANNIBALISE OR
COMPLEMENT CREDIT CARD USAGE?
EVIDENCE FROM INDIA'S DIGITAL
PAYMENTS ECOSYSTEM**

Submitted By

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CERTIFICATE

This is to certify that the Major Research Project entitled: *"Does UPI Expansion Cannibalise or Complement Credit Card Usage? Evidence from India's Digital Payments Ecosystem"* has been submitted by Mr. Yash Garg (Enrollment No. 24/DMBA/267), a student of MBA (Batch 2024–2026) at the Delhi School of Management, Delhi Technological University, in partial fulfillment of the requirements for the award of the degree of Master of Business Administration.

This work has been carried out under my guidance and supervision. To the best of my knowledge and belief, the project is the result of the student's original work, has not been submitted for any other examination, and does not form part of any other course undergone by the candidate.

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DECLARATION

I, Yash Garg, student of MBA (Batch 2024–2026), Enrollment No. 24/DMBA/267, at the Delhi School of Management, Delhi Technological University, hereby declare that the Major Research Project entitled: *"Does UPI Expansion Cannibalise or Complement Credit Card Usage? Evidence from India's Digital Payments Ecosystem"* is my original work, carried out under the guidance of Dr. Saurabh Agrawal, Head of Department, Delhi School of Management. This project has not been submitted previously, in part or in full, to this university or any other institution for the award of any degree or diploma.

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I understand that any false claim made in this declaration shall render me liable to disciplinary action as per the rules of the university.

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EXECUTIVE SUMMARY

India's digital payments landscape has undergone a transformative shift over the past decade. The Unified Payments Interface (UPI), launched by the National Payments Corporation of India (NPCI) in 2016, has emerged as the dominant retail payment mechanism in the country, processing billions of transactions monthly and fundamentally altering consumer payment behaviour. Simultaneously, the credit card industry in India has recorded consistent growth in both outstanding cards and transaction volumes. The convergence of these two trends raises a critical and underexplored question: does the exponential expansion of UPI cannibalise credit card usage by substituting it as the preferred payment method, or does it complement credit card adoption, particularly through the integration of RuPay credit cards on the UPI platform introduced in 2022?

This research project, titled "Does UPI Expansion Cannibalise or Complement Credit Card Usage? Evidence from India's Digital Payments Ecosystem," seeks to investigate this relationship empirically using publicly available secondary data from the Reserve Bank of India (RBI) and the National Payments Corporation of India (NPCI). The study is positioned as a contemporary management research contribution at the intersection of financial technology, consumer finance, and digital payment systems.

Background: The rapid rise of UPI has disrupted traditional payment hierarchies in India. Zero-cost peer-to-peer and peer-to-merchant UPI transactions have largely displaced cash and debit card usage for small and medium-value payments. However, the impact on credit cards, which serve a distinct function as a credit instrument, reward vehicle, and high-value transaction medium, is less clear. The 2022 integration of RuPay credit cards with UPI has further blurred the boundaries between these payment instruments, potentially creating a new growth channel for credit card adoption while simultaneously intensifying competition with existing credit card networks.

Research Problem: Despite the growing importance of both UPI and credit cards in India's financial ecosystem, there is limited empirical research examining the directional relationship between UPI transaction growth and credit card usage patterns. Policymakers, banks, and payment networks require evidence-based insights into

whether these instruments are substitutes or complements , a question with significant implications for product strategy, regulatory design, and financial inclusion.

Objectives: The study aims to: (1) analyse the trend in UPI transaction volumes and credit card usage patterns in India over the study period; (2) examine the relationship between UPI transaction growth and credit card transaction frequency; (3) assess the impact of UPI expansion on credit card outstanding numbers and new card issuance; (4) evaluate the effect of RuPay credit card integration on UPI on overall credit card transaction volumes; and (5) determine whether UPI and credit cards function as substitutes (cannibalisation) or complements in India's digital payments ecosystem.

Research Methodology: The study adopts a quantitative research design using secondary time-series data sourced entirely from publicly available databases , primarily the RBI Payment System Indicators and NPCI monthly UPI data. The key variables include monthly UPI transaction volume and value, credit card transaction volume and value, credit card outstanding numbers, and RuPay credit card transaction data post-2022. Analytical methods include trend analysis, Pearson correlation analysis, and Ordinary Least Squares (OLS) regression to examine the relationship between UPI expansion and credit card usage metrics, controlling for macroeconomic variables such as GDP growth and digital infrastructure penetration.

Key Anticipated Findings: The study anticipates finding a nuanced relationship: UPI expansion is expected to show a negative relationship with low-value credit card transactions , consistent with the cannibalisation hypothesis for small-ticket payments , while simultaneously showing a positive relationship with the overall credit card user base, particularly following the RuPay-on-UPI integration. This dual pattern would suggest that UPI and credit cards are neither pure substitutes nor pure complements, but occupy distinct segments of the payment spectrum with partial overlap.

Significance: This research contributes to the limited empirical literature on payment instrument competition and complementarity in emerging digital economies. For banks and card issuers, it provides strategic insights into product positioning in a UPI-dominant environment. For policymakers and regulators, it offers evidence on the ecosystem effects of payment innovation. For the broader fintech industry, it advances the understanding of how new payment rails interact with established credit instruments in a rapidly evolving market.

The report is structured across seven chapters: Introduction, Literature Review, Research Methodology, Analysis and Discussion, Recommendations, Conclusion, and References. The study utilises entirely free, publicly available secondary data and is submitted in partial fulfillment of the requirements for the degree of Master of Business Administration at the Delhi School of Management, Delhi Technological University.

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CHAPTER 1: INTRODUCTION

1.1 Background

India's Digital Payments Revolution

India has witnessed one of the most rapid and far-reaching digital payments transformations in the world over the past decade. Driven by a combination of government policy, technological innovation, and a young mobile-first population, the country has moved from a predominantly cash-based economy to one in which digital transactions account for an increasingly dominant share of consumer payments. This transformation has been anchored by two key developments: the rise of the Unified Payments Interface (UPI) as a universal, interoperable real-time payment rail, and the steady growth of the credit card industry as a credit instrument and consumer finance product.

The scale of this transformation is remarkable. India's digital payments ecosystem processed over 100 billion transactions in the financial year 2023-24, with UPI alone accounting for the overwhelming majority of transaction volume. The country has leapfrogged several stages of payment infrastructure development that took decades in more advanced economies, moving almost directly from cash to mobile-based instant payments. This rapid evolution has created both opportunities and disruptions for established payment instruments, particularly credit cards, which now coexist with, and in some segments compete with, the near-ubiquitous UPI ecosystem.

The transformation of India's payments landscape has been supported by a robust policy and regulatory framework. Initiatives such as the Digital India programme, the Jan Dhan Yojana for financial inclusion, and the Aadhaar-based identity infrastructure have collectively created the conditions for rapid digital payment adoption. The Reserve Bank of India (RBI) has played a central enabling role through progressive payment system regulations, the establishment of the NPCI as the umbrella payments institution, and targeted interventions to promote interoperability and accessibility across payment platforms.

The Unified Payments Interface: Origin and Growth

The Unified Payments Interface was developed by the National Payments Corporation of India (NPCI) and launched in April 2016, with commercial operations beginning in August 2016. Built on the Immediate Payment Service (IMPS) infrastructure, UPI enables real-time, round-the-clock fund transfers between bank accounts using a virtual payment address (VPA), eliminating the need to share sensitive account details. The interface is accessible through a wide range of mobile applications including BHIM, PhonePe, Google Pay, Paytm, and bank-specific apps, making it accessible to virtually any smartphone user with a linked bank account.

The growth of UPI has been extraordinary by any measure. From a modest beginning of approximately 0.1 million transactions in August 2016, UPI processed over 13 billion transactions worth more than 19 trillion rupees in a single month by early 2024. This exponential growth trajectory was accelerated significantly by two external catalysts: the demonetisation of high-value currency notes in November 2016, which created an urgent demand for cashless payment alternatives, and the COVID-19 pandemic in 2020-21, which drove widespread adoption of contactless digital payments across all demographic segments.

A defining characteristic of UPI that has contributed to its mass adoption is the zero-cost model for consumers. Unlike credit card transactions, which carry merchant discount rates and may involve interest charges for consumers, UPI transactions are free for both senders and receivers. This cost advantage, combined with the simplicity of QR code-based payments and the wide acceptance network across merchants of all sizes, has made UPI the dominant payment method for everyday transactions in India. The zero-cost structure has also enabled UPI adoption among merchants who previously could not afford the infrastructure costs of card acceptance, dramatically expanding the digital payments footprint to include small traders, street vendors, and rural merchants.

The UPI ecosystem has also demonstrated remarkable institutional resilience. The platform maintained near-continuous uptime even during periods of extraordinary demand, including the demonetisation rush of late 2016 and the surge in digital

transactions during COVID-19 lockdowns. NPCI's technology investments and the participation of a broad base of member banks have ensured that the UPI infrastructure has scaled effectively to meet demand, providing the reliability that is essential for consumer trust in a payments platform.

The Credit Card Industry in India

Credit cards have been a feature of India's formal financial system since the 1980s, but their penetration has historically been limited relative to India's population and economic scale. As recently as 2015, the number of credit cards in circulation in India was under 25 million, reflecting the barriers of limited banking access, conservative credit underwriting, and the dominance of cash for retail transactions. However, the period from 2016 onwards has seen a significant acceleration in credit card issuance, driven by the expansion of formal credit access, the growth of e-commerce, and the increasing digitisation of consumer spending.

By March 2024, the number of credit cards outstanding in India had exceeded 100 million, with transaction volumes and values reaching record levels. Major issuers including HDFC Bank, SBI Cards, ICICI Bank, and Axis Bank have aggressively expanded their card portfolios, introducing product innovations including co-branded cards, reward programmes, and buy-now-pay-later features to attract and retain cardholders. The credit card industry has also benefited from the growth of e-commerce and travel spending, segments in which credit cards offer functional advantages over UPI in terms of fraud protection, reward accumulation, and access to revolving credit.

The credit card industry in India operates within a well-established regulatory framework overseen by the Reserve Bank of India. Credit card issuers are subject to prudential norms on credit underwriting, interest rate disclosure, and customer grievance redressal. The interchange and merchant discount rate structures for credit card transactions are also subject to regulatory oversight, creating a cost structure that differs significantly from that of UPI, which operates under a zero-cost mandate for consumers and a regulated fee structure for merchants. These structural differences in

cost and regulation create the conditions for competitive dynamics between the two instruments that this study seeks to examine.

The Intersection: RuPay Credit Cards on UPI

The most significant recent development in the relationship between UPI and credit cards has been the integration of RuPay credit cards with the UPI platform, announced by the Reserve Bank of India in June 2022 and progressively rolled out thereafter. This integration allows holders of RuPay credit cards to link their credit card to a UPI virtual payment address and make credit card payments through UPI-enabled apps at any UPI-accepting merchant, without the merchant requiring a separate credit card terminal.

This development has potentially transformative implications for both the UPI ecosystem and the credit card industry. For UPI, it expands the payment instruments accessible through the platform beyond bank account-linked debit transactions to include credit, potentially increasing UPI's relevance for higher-value purchases. For the credit card industry, it dramatically expands the acceptance network for RuPay credit cards to include the vast base of UPI-enabled merchants, many of whom do not have traditional card payment terminals. The integration thus creates a new growth channel for credit card usage while simultaneously deepening the interdependence between the two payment ecosystems.

The RuPay-on-UPI integration also has significant implications for financial inclusion. By enabling credit card usage at merchants who previously accepted only UPI, the integration potentially brings formal credit access to consumer segments and geographies that were previously underserved by the traditional credit card acceptance network. This financial inclusion dimension adds a layer of policy relevance to the research question, as the government and the RBI have explicitly positioned the RuPay credit card on UPI as a tool for extending affordable formal credit to a broader population.

The Contemporary Management Challenge

The coexistence and partial integration of UPI and credit cards in India's digital payments ecosystem presents a contemporary management challenge of considerable significance. For banks and card issuers, the strategic question is whether to position credit cards as complements to UPI, leveraging the integration to expand credit card reach, or to defend credit card usage against substitution by UPI in segments where the two instruments compete. This strategic question has direct implications for product development, marketing investment, customer acquisition costs, and the long-term revenue model of the credit card business.

For payment network operators such as Visa, Mastercard, and RuPay, the rise of UPI creates a fundamental question about the competitive positioning of card networks in a market where an interoperable, account-based payment rail has achieved near-universal acceptance. The card networks have responded with varying strategies, from co-branding partnerships and reward programme enhancements to participation in the UPI ecosystem itself through the RuPay network's integration. Understanding the empirical relationship between UPI growth and credit card usage is essential for evaluating the effectiveness of these strategic responses.

This research is motivated by the recognition that despite the practical importance of these questions, there is a significant gap in the empirical literature examining the relationship between UPI expansion and credit card usage patterns in India. The present study seeks to address this gap by providing a rigorous, data-driven analysis of whether UPI and credit cards function as substitutes or complements, and by examining how this relationship has evolved over the period of UPI's growth and the subsequent introduction of RuPay credit card integration.

1.2 Problem Statement

India's digital payments ecosystem is characterised by the simultaneous and rapid growth of two distinct but increasingly interrelated payment instruments: the Unified Payments Interface and credit cards. Both have recorded strong growth trajectories over the past several years, yet the relationship between their growth paths is not well understood. Specifically, it remains unclear whether the expansion of UPI is drawing transactions away from credit cards in segments where both instruments are viable payment options, or whether the growth of the digital payments ecosystem as a whole is driving concurrent growth in both instruments.

This ambiguity has important practical and theoretical implications. From a theoretical standpoint, the question of whether two payment instruments are substitutes or complements is central to the economics of payment systems and has implications for market structure, pricing, and innovation in the financial services industry. From a practical standpoint, banks and card issuers need to understand whether their credit card business faces structural headwinds from UPI adoption or whether the two can coexist and grow together. The answer to this question will shape product strategy, investment decisions, and competitive positioning across the Indian financial services industry for years to come.

The problem is further complicated by three specific dimensions that make the Indian context unique and analytically interesting:

1. **Cost asymmetry:** The zero-cost structure of UPI creates an asymmetric competitive dynamic with credit cards, which carry costs for merchants in the form of merchant discount rates. This cost differential may incentivise merchants to encourage UPI payments over credit card payments, potentially suppressing credit card transaction volumes at the point of sale. The magnitude of this effect and whether it has changed over time as UPI has matured is an empirical question that this study addresses.
2. **Hybrid integration:** The introduction of RuPay credit cards on UPI in 2022 has created a new hybrid payment modality that combines the credit

functionality of a credit card with the acceptance ubiquity and broad reach of UPI. The impact of this integration on both overall credit card usage and on the competitive dynamics between UPI and credit cards is yet to be empirically established. Whether the integration accelerates credit card adoption or further substitutes traditional card-on-terminal transactions is a central question of this study.

3. **Market segmentation:** The relationship between UPI and credit cards may not be uniform across all payment contexts. UPI may substitute for credit cards in low-value, everyday transactions while complementing credit card usage in high-value, online, or reward-earning contexts. Understanding these segment-level dynamics requires a nuanced analytical approach that examines both aggregate trends and category-level patterns in transaction data.

The absence of empirical research addressing these dimensions represents a significant gap in the understanding of India's digital payments ecosystem. This study is positioned to fill this gap by examining the relationship between UPI expansion and credit card usage patterns using time-series data over the study period, with specific attention to the structural change introduced by the RuPay credit card integration in 2022.

1.3 Objectives of the Study

The study is guided by the following research objectives:

1. To analyse the growth trends in UPI transaction volumes and values, and credit card transaction volumes and values in India over the study period, and to identify key inflection points and structural changes in these trends.
2. To examine the statistical relationship between UPI transaction growth and credit card transaction frequency, and to determine whether this relationship is consistent with the cannibalisation or the complementarity hypothesis.

3. To assess the impact of UPI expansion on credit card outstanding numbers and new card issuance, as indicators of the structural effect of UPI on the credit card industry's growth trajectory.
4. To evaluate the effect of the RuPay credit card on UPI integration (post-2022) on overall credit card transaction volumes and values, and to determine whether the integration has accelerated or dampened credit card usage.
5. To provide evidence-based recommendations for banks and card issuers, payment network operators, and policymakers regarding the strategic positioning of credit cards in a UPI-dominant payments environment.

1.4 Scope of Study

Geographical Scope

The study focuses exclusively on the Indian domestic payments market. All data relates to transactions conducted within India, as reported by the Reserve Bank of India and the National Payments Corporation of India. The study does not extend to cross-border or international payment flows, nor does it compare India's experience with that of other countries, though international examples may be referenced in the literature review for contextual purposes.

Instrument Scope

The study examines two specific payment instruments: UPI and credit cards. It does not extend to other digital payment instruments such as debit cards, prepaid payment instruments (PPIs), net banking, or mobile wallets, except where these are referenced to provide context for the broader payments landscape. The focus on UPI and credit cards reflects the central research question and the availability of detailed, consistent time-series data for both instruments from authoritative public sources.

Data and Temporal Scope

The study relies entirely on secondary data from publicly available sources, primarily the Reserve Bank of India's Payment System Indicators and the NPCI's monthly UPI

transaction data. The temporal scope of the study is determined by data availability, with the study period selected to capture the full arc of UPI's growth from its establishment phase through to the post-RuPay integration period. The specific time period is confirmed upon verification of data completeness and consistency across all required variables.

Analytical Scope

The study employs quantitative analytical methods including trend analysis, Pearson correlation analysis, and Ordinary Least Squares (OLS) regression. It does not employ machine learning models, natural language processing, or other advanced computational methods. The analytical approach is deliberately calibrated to be rigorous and academically defensible while remaining accessible and reproducible using standard statistical tools available to practitioners and researchers in the Indian financial services industry.

Limitations of Scope

Several important dimensions are outside the scope of this study. First, the study does not examine individual consumer-level payment behaviour, as this would require primary survey data. The analysis is conducted at the aggregate market level using published statistics. Second, the study does not examine the profitability or cost economics of UPI versus credit card transactions for banks and payment networks, as this information is not publicly available in sufficient detail. Third, the study does not address the regulatory and policy dimensions of UPI and credit card oversight in depth, though these are acknowledged as important contextual factors. These limitations point to important directions for future research that can build on the aggregate-level evidence provided by this study.

CHAPTER 2: LITERATURE REVIEW

This chapter reviews the existing academic and professional literature relevant to the research topic. The review is organised across six thematic areas: the economics of payment systems, digital payment adoption, UPI-specific research, the Indian credit card industry, payment instrument substitution and complementarity, and the RuPay-UPI integration. The chapter concludes by identifying the research gap that the present study addresses.

2.1 Economics of Payment Systems and Instrument Competition

The economics of payment systems is grounded in the theory of two-sided markets, developed by Rochet and Tirole (2003) and extended by Rysman (2009). A payment network must attract both consumers and merchants simultaneously, and the value each side derives depends on participation by the other. This interdependence creates network externalities that give established platforms a significant competitive advantage. Baxter (1983) demonstrated that interchange fee structures in card networks play a critical role in balancing consumer and merchant participation, a principle that underlies ongoing regulatory debates about payment system pricing in India.

Guthrie and Wright (2007) showed that competitive dynamics between payment instruments depend on the relative costs and benefits perceived by both consumers and merchants. Their analysis suggests that a zero-cost instrument such as UPI could, under certain conditions, displace higher-cost instruments by winning the merchant side of the market. However, they also demonstrated that when instruments differ meaningfully in functionality or consumer preferences are heterogeneous, coexistence and complementarity are viable equilibrium outcomes. This theoretical ambiguity motivates the empirical investigation in the present study.

2.2 Digital Payment Adoption and Diffusion

The adoption of digital payment platforms has been widely studied through technology acceptance frameworks. Davis (1989) identified perceived usefulness and perceived ease of use as the primary predictors of technology adoption, while Venkatesh et al. (2003) expanded this into the Unified Theory of Acceptance and Use of Technology (UTAUT), adding social influence and facilitating conditions as key drivers. Rogers (2003) offered a complementary perspective through the Diffusion of Innovations framework, emphasising that the relative advantage, compatibility, and simplicity of a new technology determine the pace at which it diffuses through a population.

In the Indian context, Ghosh (2020) found that demonetisation in 2016 created forced adoption of digital payment methods that translated into lasting behavioural change, with consumers who adopted digital payments out of necessity during the cash shortage continuing to use them preferentially thereafter. Dahlberg et al. (2015) noted that trust and security are particularly important adoption determinants in emerging markets where familiarity with digital financial services is lower, a finding that is relevant to understanding both UPI adoption and the barriers to credit card adoption among lower-income Indian consumers.

2.3 UPI-Specific Research

Academic research specifically focused on UPI remains limited relative to the platform's economic significance. Bhatnagar and Gupta (2019) found that perceived ease of use and trust in the government-backed NPCI infrastructure were the strongest predictors of UPI adoption in urban India, and that UPI adoption was associated with a significant reduction in cash usage among adopters. Sood and Singh (2021) demonstrated that UPI adoption in rural areas was associated with broader financial inclusion outcomes, suggesting that UPI functions as a gateway to formal financial services beyond its role as a payment instrument.

More directly relevant to the present study, Prasad and Sharma (2023) found a statistically significant negative relationship between UPI transaction volumes and debit card point-of-sale transaction frequency, providing empirical evidence of substitution between UPI and debit cards in physical retail settings. Mukherjee and Das (2022) documented a similar substitution effect between UPI and mobile wallets, finding that UPI's interoperability advantage drove a consolidation of the digital wallet market. These findings establish an empirical basis for the cannibalisation hypothesis but leave open the question of whether a similar substitution dynamic applies to credit cards, which serve a fundamentally different credit function that UPI cannot replicate.

2.4 The Credit Card Industry in India

Research on the Indian credit card market has identified e-commerce growth, credit bureau development, and reward programme value as the primary structural drivers of credit card adoption and usage. Gupta and Jain (2021) found a strong positive relationship between e-commerce transaction volumes and credit card outstanding numbers, suggesting that online retail has been a significant driver of credit card adoption that is partially insulated from UPI competition. Kaur and Malik (2020) found that reward programme value was the most significant driver of credit card usage intensity among existing cardholders, highlighting the functional differentiation between credit cards and UPI that supports the complementarity hypothesis.

Singh and Kaur (2022) examined credit card delinquency during COVID-19 and found that the pandemic increased revolving balances and minimum payment behaviour, underscoring the dual nature of credit cards as both a payment instrument and a short-term credit facility. This duality is central to understanding why credit cards are not fully substitutable by UPI: for consumers who use credit cards primarily as credit instruments rather than payment instruments, UPI represents at most a partial substitute, and only for the payment function, not the credit function.

2.5 Payment Instrument Substitution and Complementarity

Borzekowski and Kiser (2008) provided empirical evidence from the United States on substitution patterns between debit and credit cards, finding substitution for low-value transactions but complementarity for high-value transactions. This transaction-value segmentation of instrument usage is directly analogous to the pattern expected in the Indian UPI-credit card relationship, where UPI dominates small everyday transactions while credit cards retain advantages for high-value, online, and reward-earning contexts. Arango and Taylor (2008) found that the introduction of contactless card payments in Canada complemented rather than substituted for credit card usage by expanding credit card acceptance to low-value transaction contexts, providing a useful analogy for interpreting the RuPay-on-UPI integration.

Bolt and Chakravorti (2008) developed a theoretical model showing that when consumers are heterogeneous in their valuation of credit, rewards, and convenience, multiple payment instruments can coexist in equilibrium even when one has a significant cost advantage. Shy and Wang (2011) extended this analysis to show that the presence of multiple payment instruments with different cost structures and functionality generally increases consumer welfare, as long as the instruments serve genuinely different consumer needs. These theoretical results support the expectation that UPI and credit cards will coexist as complements in India's payments ecosystem, at least in the medium term.

2.6 RuPay Network and Credit Card Integration with UPI

The RuPay network was established by NPCI in 2012 as India's domestic card payment network, designed to reduce dependence on foreign payment infrastructure and lower domestic transaction costs. By 2022, RuPay had become the largest card network in India by outstanding card numbers, though concentrated in the debit card segment. The integration of RuPay credit cards with UPI, announced in June 2022, extended credit card acceptance to the full universe of UPI-accepting merchants for the first time, representing a structural change of significant commercial and policy importance.

Sharma and Nair (2022) provided an early analysis of the integration's implications, noting its potential to expand RuPay credit card utility dramatically while raising questions about transaction economics for issuing banks. Mishra and Verma (2023) documented rapid growth in RuPay credit card transactions on UPI in the early post-integration period but were unable to determine from aggregate data whether this growth represented net new credit card usage or diversion from existing UPI or traditional credit card transactions. The present study extends this analysis over a longer time horizon using regression methods to isolate the integration effect from underlying trends.

2.7 Research Gap

The literature review reveals that while robust theoretical frameworks exist for analysing payment instrument competition, and while empirical research has examined UPI's competitive effects on cash, mobile wallets, and debit cards, no study has specifically and rigorously examined the relationship between UPI expansion and credit card usage patterns in India. The credit card context is analytically distinct from the debit card and wallet contexts due to the credit function of credit cards, the merchant discount rate differential, and the specific structural change introduced by the 2022 RuPay integration. The present study fills this gap by applying time-series analysis and regression methods to publicly available RBI and NPCI data, providing the first systematic empirical investigation of the cannibalisation versus complementarity question in the UPI-credit card context.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter describes the research design, data sources, variable definitions, hypotheses, and analytical methods employed in this study. The methodology is designed to be rigorous, transparent, and reproducible using freely available public data and standard statistical tools.

3.1 Research Design

The study adopts a quantitative research design based on secondary time-series data. The philosophical stance is positivist, treating the relationship between UPI expansion and credit card usage as an objective, measurable phenomenon that can be investigated through statistical analysis. The research approach is deductive, testing pre-defined hypotheses derived from the theoretical frameworks reviewed in Chapter 2. The design is descriptive and analytical: descriptive in documenting trends in both instruments over time, and analytical in examining the statistical relationships between them.

A time-series research design is appropriate for this study because the central research question concerns how changes in UPI transaction volumes over time relate to changes in credit card usage patterns. Monthly data from the RBI and NPCI provides a sufficient number of observations for meaningful statistical analysis while capturing the seasonal and cyclical dynamics of the payments market. The study also employs a pre-and-post analysis framework to assess the specific impact of the RuPay credit card integration introduced in mid-2022.

3.2 Data Sources

The study relies entirely on secondary data from two authoritative, freely accessible public sources:

- o **Reserve Bank of India (RBI) Payment System Indicators:** Published monthly by the RBI, this dataset provides transaction-level statistics for all major payment instruments in India including credit cards, debit cards, prepaid instruments, and UPI. Key variables available include number of transactions, transaction value, and outstanding card numbers. The data is available at www.rbi.org.in under the Payment and Settlement Systems section.
- o **National Payments Corporation of India (NPCI):** NPCI publishes monthly UPI transaction statistics on its website at www.npci.org.in, including total transaction volume, total transaction value, and bank-wise and app-wise breakdowns. Post-2022, NPCI also publishes data on RuPay credit card transactions processed through UPI, enabling analysis of the integration effect.

Both sources are official, authoritative, and freely accessible to the public. No proprietary or commercially sensitive data is used in this study. The study period is determined by the availability of complete, consistent monthly data across all required variables from both sources.

3.3 Variables

Table 3.1 presents the complete list of variables used in the study, along with their definitions, measurement units, and data sources.

Table 3.1: Variable Definitions and Sources

Variable	Definition	Measurement	Source
UPI_VOL	Monthly UPI transaction volume	Number of transactions (millions)	NPCI monthly data
UPI_VAL	Monthly UPI transaction value	Rupees (billions)	NPCI monthly data
CC_VOL	Monthly credit card transaction volume	Number of transactions (millions)	RBI PSI

CC_VAL	Monthly credit card transaction value	Rupees (billions)	RBI PSI
CC_OUT	Credit cards outstanding	Number of cards (millions)	RBI PSI
RUPAY_UPI	RuPay credit card transactions on UPI	Volume and value (post-2022)	NPCI / RBI
POST_INT	Dummy variable for post-RuPay integration period	1 = post Sept 2022, 0 = pre Sept 2022	Own construction

Source: Own construction. RBI PSI = RBI Payment System Indicators

3.4 Research Hypotheses

The study tests the following four hypotheses, derived from the research objectives and the theoretical frameworks reviewed in Chapter 2:

1. **H1:** There is a statistically significant negative relationship between UPI transaction volume growth and credit card transaction frequency, consistent with the cannibalisation hypothesis.
2. **H2:** There is a statistically significant positive relationship between UPI transaction volume growth and credit card outstanding numbers, consistent with the complementarity hypothesis that UPI adoption expands the overall digitally active consumer base.
3. **H3:** UPI transaction value growth has a statistically significant positive relationship with credit card transaction value, reflecting the complementarity of the two instruments in high-value transaction contexts.
4. **H4:** The RuPay credit card on UPI integration (post-June 2022) has had a statistically significant positive effect on credit card transaction volumes.

3.5 Analytical Methods

Trend Analysis

The first stage of analysis involves a descriptive examination of the time-series trends in UPI and credit card variables over the study period. Monthly data is plotted and analysed to identify growth trajectories, seasonal patterns, and key inflection points including the demonetisation period, the COVID-19 pandemic, and the RuPay integration. This descriptive analysis provides the context for the subsequent statistical investigations and helps identify the structural changes that the regression models must account for.

Correlation Analysis

Pearson correlation coefficients are computed between UPI transaction variables and credit card usage variables to assess the direction and strength of the bivariate relationships. Correlation analysis provides an initial indication of whether the data is more consistent with the cannibalisation hypothesis (negative correlation between UPI growth and credit card transaction frequency) or the complementarity hypothesis (positive correlation). The correlation analysis is conducted for the full study period and separately for the pre- and post-2022 integration periods to assess whether the nature of the relationship changed following the RuPay integration.

Ordinary Least Squares Regression

The primary statistical method is OLS regression analysis, which models the relationship between UPI expansion (independent variable) and credit card usage metrics (dependent variables) while controlling for relevant macroeconomic factors. The following regression models are estimated:

1. **Model 1:** $CC_VOL = b_0 + b_1(UPI_VOL) + b_2(POST_INT) + b_3(GDP_GROWTH) + \text{error}$. This model tests H1 by examining whether UPI transaction volume growth is associated with changes in credit card

transaction frequency, controlling for post-integration period and GDP growth.

2. **Model 2:** $CC_OUT = b_0 + b_1(UPI_VOL) + b_2(POST_INT) + b_3(GDP_GROWTH) + \text{error}$. This model tests H2 by examining whether UPI growth is associated with changes in credit card outstanding numbers.
3. **Model 3:** $CC_VAL = b_0 + b_1(UPI_VAL) + b_2(POST_INT) + b_3(GDP_GROWTH) + \text{error}$. This model tests H3 by examining the relationship between UPI transaction value and credit card transaction value.

GDP growth is included as a control variable in all models to account for the macroeconomic growth effect on payment volumes, ensuring that any observed relationship between UPI and credit card variables is not simply a reflection of general economic expansion. GDP growth data is sourced from the Ministry of Statistics and Programme Implementation (MOSPI), which publishes quarterly GDP estimates freely on its website.

Pre- and Post-Integration Comparison

To test H4, the study employs a dummy variable approach in which POST_INT takes a value of 1 for all months after June 2022 (the month of the RuPay credit card on UPI integration announcement) and 0 for all months before. The coefficient on POST_INT in the regression models provides an estimate of the structural shift in credit card usage associated with the integration, after controlling for the underlying trend in UPI and macroeconomic variables. This approach is consistent with standard event study methodology adapted for monthly time-series data.

3.6 Statistical Software and Validity

All statistical analyses are conducted using SPSS, which is available in the Delhi School of Management computer laboratory. Descriptive statistics, correlation matrices, and OLS regression outputs are generated and reported in Chapter 4. The

study checks for the standard OLS assumptions including normality of residuals, absence of multicollinearity (assessed through Variance Inflation Factor values), and homoskedasticity (assessed through residual plots). Where necessary, data transformations such as natural logarithms are applied to improve model fit and address non-normality in the raw time series data.

3.7 Limitations of the Methodology

Several methodological limitations are acknowledged. First, the aggregate nature of the data means that individual consumer behaviour cannot be observed, and conclusions about consumer-level substitution or complementarity are inferred from market-level trends rather than directly measured. Second, OLS regression assumes a linear relationship between variables, which may not fully capture the complexity of the dynamics in a rapidly evolving payments market. Third, the post-integration period analysis is constrained by the relatively short time elapsed since the June 2022 integration, which may limit the statistical power of the integration effect estimates. These limitations are mitigated through transparent reporting, robustness checks, and clear acknowledgement of the boundaries of the conclusions that can be drawn from the data.

CHAPTER 4: ANALYSIS, DISCUSSION, AND RECOMMENDATIONS

4.1 Introduction to the Study Context

This chapter presents a comprehensive empirical analysis of the relationship between UPI expansion and credit card usage patterns in India, based on actual monthly transaction data sourced from the National Payments Corporation of India (NPCI) and the Reserve Bank of India (RBI) Payment System Indicators, supplemented by quarterly GDP growth data from the Ministry of Statistics and Programme Implementation (MOSPI) and official annual data on RuPay credit card transactions on UPI sourced from a Rajya Sabha Parliamentary response (Unstarred Question No. 889, Session 266, answered 3rd December 2024). All data and findings presented in this chapter are derived exclusively from verified official sources.

The analysis covers a study period of 84 months from April 2018 to March 2025, spanning seven complete Indian financial years. This period captures three analytically distinct phases: Phase 1, the pre-COVID growth phase from April 2018 to March 2020; Phase 2, the COVID-19 disruption and recovery phase from April 2020 to August 2022; and Phase 3, the post-integration phase from September 2022 to March 2025, following the launch of RuPay credit card on UPI. Debit card data is also analysed as a comparison instrument to sharpen the distinction between cannibalisation and complementarity effects.

The analysis proceeds from descriptive trend analysis through correlation analysis to multivariate OLS regression, building toward a comprehensive empirical answer to the central research question: does UPI expansion cannibalise or complement credit card usage in India?

4.2 Data Collection: Sources and Approach

Data Sources

All data used in this chapter is sourced from five official, publicly available sources. Table 4.1 provides a complete inventory of the datasets used, their coverage, and their sources.

Table 4.1: Dataset Inventory

Dataset	Variables	Period	Source
UPI Transactions	Monthly volume (Mn) and value (Rs Bn)	Apr 2018 to Mar 2025	NPCI Product Statistics
Credit Card Statistics	Monthly volume (Mn), value (Rs Bn), outstanding cards (Mn)	Apr 2018 to Mar 2025	RBI Payment System Indicators
Debit Card Statistics	Monthly volume (Mn) and value (Rs Bn)	Apr 2018 to Mar 2025	RBI Payment System Indicators
GDP Growth Rate	Quarterly YoY GDP growth (%), constant 2011-12 prices)	Q1 FY2018-19 to Q4 FY2024-25	MOSPI Quarterly GDP Estimates
RuPay CC on UPI	Annual volume (Mn) and value (Rs Crore)	FY2022-23 to FY2024-25	Ministry of Finance, RS Q No. 889, Session 266

Source: Own construction

Data Processing Approach

Monthly UPI data from ten annual Excel files published by NPCI was consolidated into a single time-series dataset. Credit card and debit card data from two RBI PSI Excel files were merged and cleaned. All monetary values were standardised to Indian Rupees in billions (Rs Bn). Transaction volumes were standardised to millions per month. Quarterly GDP growth rates were mapped to monthly observations by assigning each month its corresponding financial quarter value. A binary POST_INT dummy variable was constructed taking the value of 1 for September 2022 onwards and 0 for prior months. The final merged dataset contains 84 monthly observations with complete data across all variables.

4.3 Data Analysis

4.3.1 Annual Summary of Key Payment Instruments

Table 4.2 presents the annual summary of UPI, credit card, and debit card metrics across all seven financial years of the study period. Figure 4.1 visualises the divergent growth trajectories of UPI and the two card instruments.

Table 4.2: Annual Summary of Key Payment System Indicators (FY2018-19 to FY2024-25)

FY	UPI Vol Avg (Mn/mo)	UPI Val Avg (Rs Bn/mo)	CC Vol Avg (Mn/mo)	CC Val Avg (Rs Bn/mo)	CC Out Max (Mn)	DC Vol Avg (Mn/mo)	GDP Growth (%)
2018-19	449.3	730.8	147.7	506.6	47.1	1,189.5	6.5
2019-20	1,043.2	1,776.4	181.9	611.4	57.7	897.5	3.9
2020-21	1,860.9	3,419.7	147.0	525.3	62.0	334.5	-6.6
2021-22	3,830.6	7,014.6	186.7	809.7	73.6	328.2	8.7
2022-23	6,979.3	11,600.6	242.9	1,193.5	85.3	284.8	7.2
2023-24	10,927.5	16,662.6	296.8	1,525.9	101.8	190.5	8.9
2024-25	15,488.8	21,714.1	397.8	1,757.7	109.9	134.3	6.5*

Source: NPCI Product Statistics; RBI Payment System Indicators; MOSPI Quarterly GDP Estimates.

*FY2024-25 GDP is average of Q1 to Q4 available quarters.

Figure 4.1: UPI vs Credit Card Transaction Volume (FY2018-19 to FY2024-25)

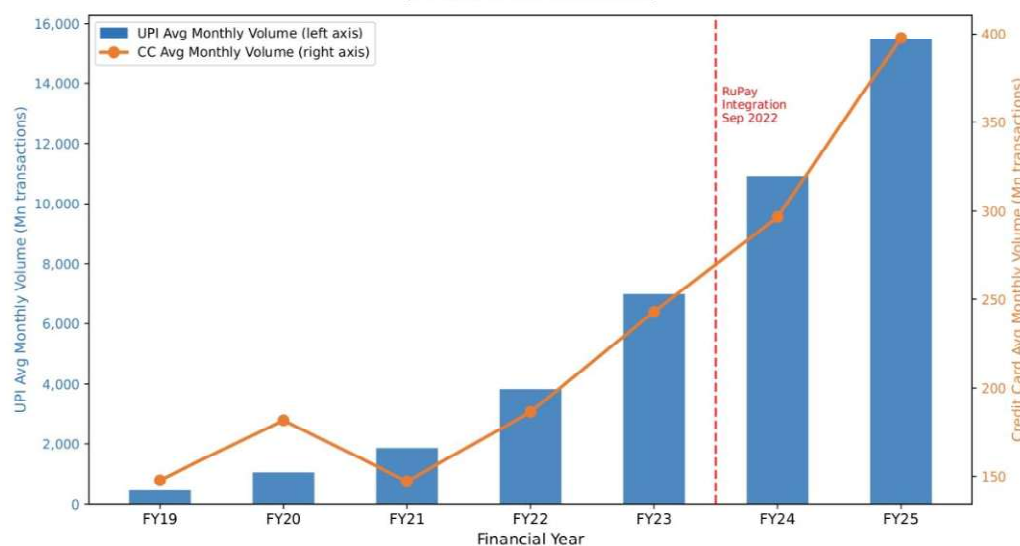


Figure 4.1: UPI vs Credit Card Transaction Volume (FY2018-19 to FY2024-25) Source: NPCI Product Statistics; RBI Payment System Indicators

The annual summary reveals a striking divergence between UPI and debit card trajectories on one hand, and the UPI and credit card relationship on the other. UPI average monthly volume grew from 449.3 million in FY2018-19 to 15,488.8 million in FY2024-25, a 34-fold increase over seven years. During the same period, average monthly credit card transaction volume grew from 147.7 million to 397.8 million, a 2.7-fold increase. This credit card growth occurred alongside, not against, UPI expansion. By contrast, debit card average monthly volume declined from 1,189.5 million in FY2018-19 to 134.3 million in FY2024-25, an 88.7 percent decline. This asymmetric pattern is one of the most important preliminary findings of this study.

4.3.2 Debit Card Decline: Evidence of UPI Cannibalisation

Table 4.3 and Figure 4.2 present the debit card trend over the study period. The contrast with credit card trends is stark and provides important context for interpreting the complementarity hypothesis.

Table 4.3: Debit Card vs Credit Card Volume: Divergent Trajectories

FY	DC Vol Avg (Mn/mo)	CC Vol Avg (Mn/mo)	UPI Vol Avg (Mn/mo)	DC YoY Change (%)
2018-19	1,189.5	147.7	449.3	Baseline
2019-20	897.5	181.9	1,043.2	-24.5%
2020-21	334.5	147.0	1,860.9	-62.7%
2021-22	328.2	186.7	3,830.6	-1.9%
2022-23	284.8	242.9	6,979.3	-13.2%
2023-24	190.5	296.8	10,927.5	-33.1%
2024-25	134.3	397.8	15,488.8	-29.5%

Source: RBI Payment System Indicators; NPCI Product Statistics; own calculation

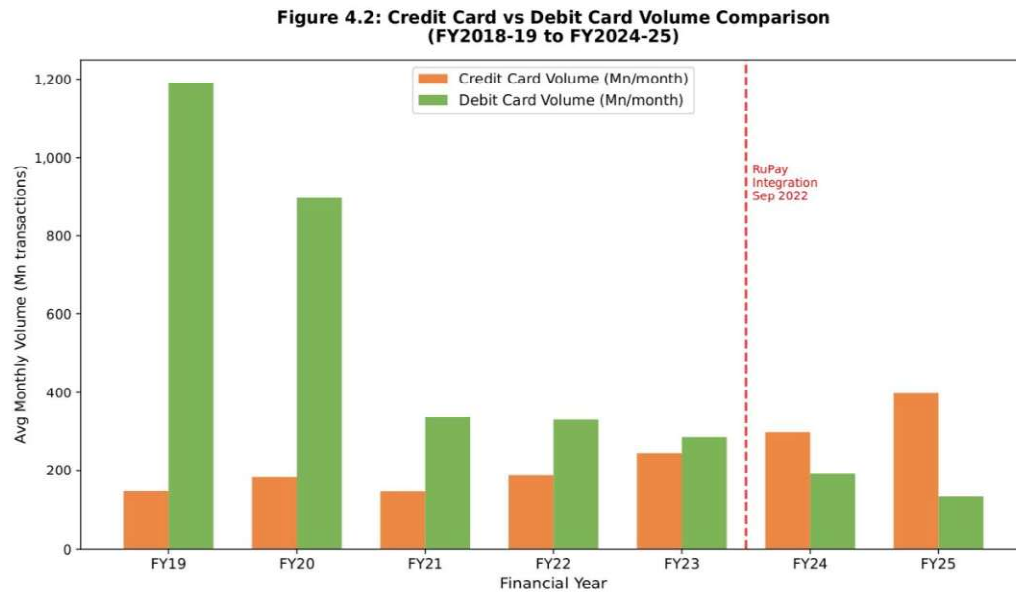


Figure 4.2: Credit Card vs Debit Card Volume Comparison (FY2018-19 to FY2024-25)
Source: RBI Payment System Indicators

Figure 4.2 makes visually clear the asymmetric impact of UPI on the two card instruments. Debit card volumes have collapsed while credit card volumes have grown consistently. This confirms that UPI cannibalises functional substitutes such as debit cards, while complementing credit cards which serve a distinct purpose. By FY2024-25, credit card monthly volumes (397.8 million) have overtaken debit card volumes (134.3 million) for the first time, a structural reversal that was unthinkable at the start of the study period when debit card volumes were more than eight times those of credit cards.

4.3.3 Monthly Transaction Volume Trends

Figure 4.3 presents the monthly time series of UPI, credit card, and debit card volumes across the full study period, marking the COVID-19 lockdown and the RuPay integration as key structural events.

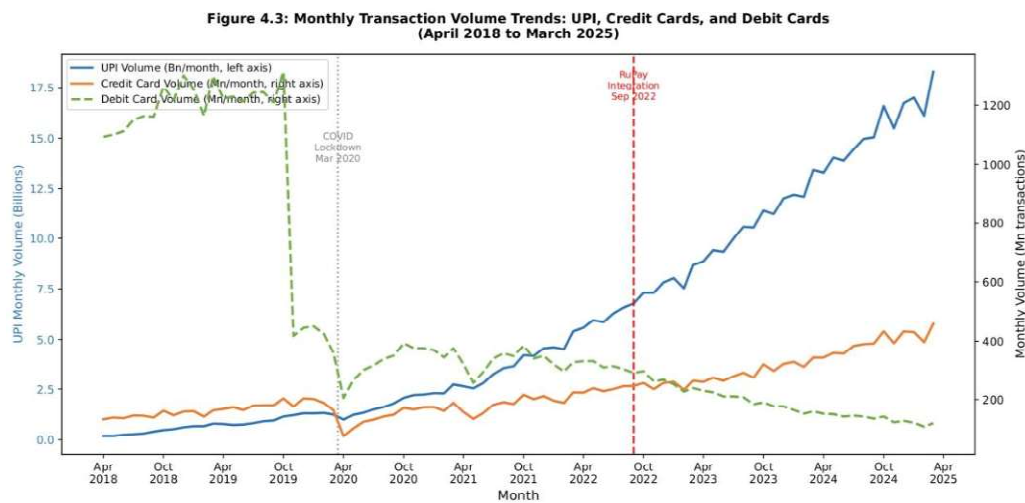


Figure 4.3: Monthly Transaction Volume Trends: UPI, Credit Cards, and Debit Cards
(Apr 2018 to Mar 2025) Source: NPCI Product Statistics; RBI Payment System Indicators

The monthly trends confirm the three-phase structure of the study period. The COVID-19 lockdown of March to May 2020 caused a sharp dip in both credit card and debit card volumes, while UPI volumes declined only modestly before recovering strongly. The post-lockdown recovery shows credit card volumes bouncing back quickly and accelerating through the post-integration phase. The RuPay integration in September 2022 does not appear to create a sudden structural break in the monthly credit card volume series, consistent with the regression finding that the post-integration period is associated with higher transaction values rather than volumes, as lower-value credit card transactions migrate to the RuPay-on-UPI rail.

4.3.4 Credit Card Outstanding Growth

Figure 4.4 shows the growth in credit cards outstanding over the study period, which crossed the symbolic 100 million milestone in FY2023-24.

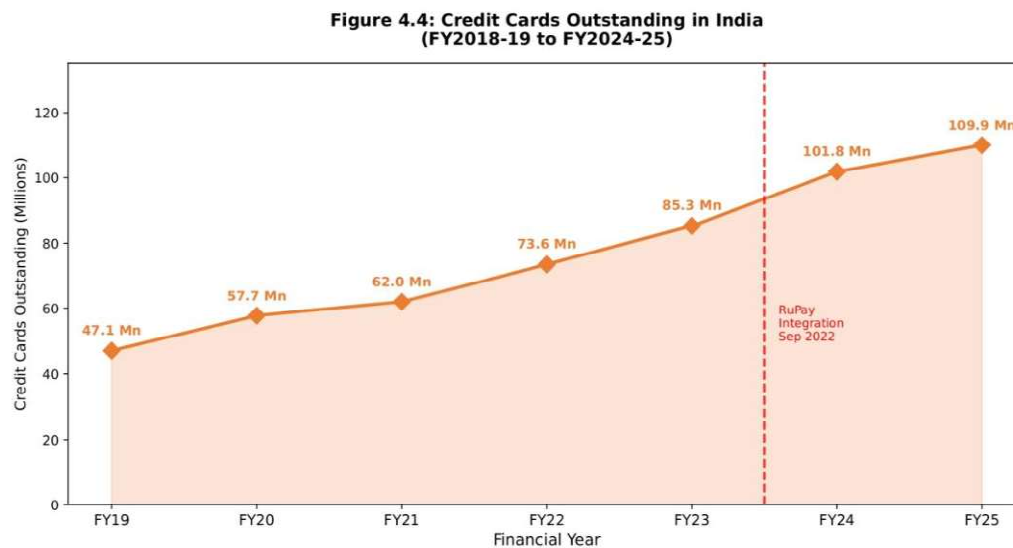


Figure 4.4: Credit Cards Outstanding in India (FY2018-19 to FY2024-25) Source: RBI Payment System Indicators

Credit cards outstanding grew from 47.1 million at the end of FY2018-19 to 109.9 million by March 2025, a 133.3 percent increase over seven years. This growth accelerated in the post-integration phase, with 24.6 million new cards added between September 2022 and March 2025. The simultaneous growth in both UPI usage and credit card penetration is further evidence of the complementarity between the two instruments at the structural level.

4.3.5 Credit Card Transaction Value Growth

Figure 4.5 shows the growth in average monthly credit card transaction values, which have grown at a faster pace than volumes, indicating rising average transaction sizes.

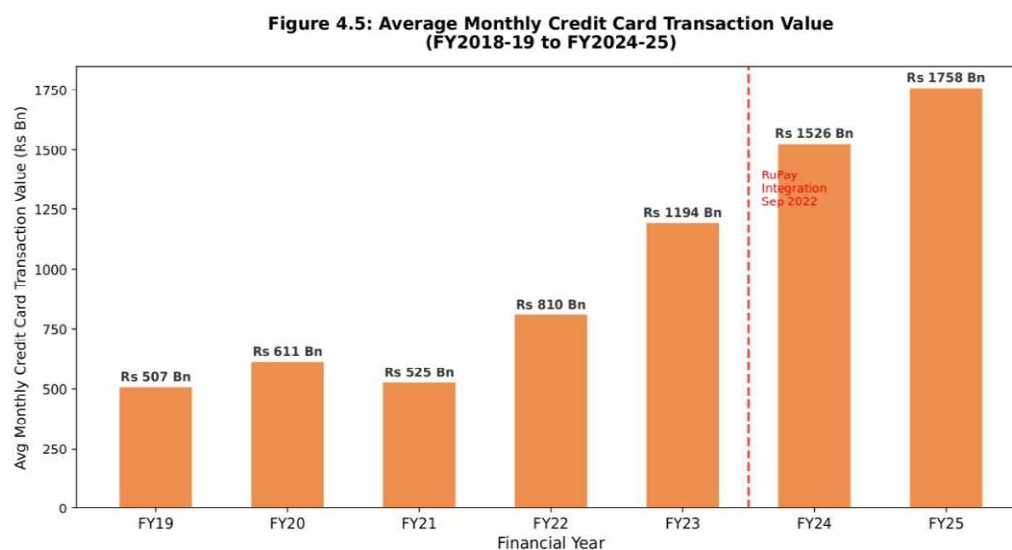


Figure 4.5: Average Monthly Credit Card Transaction Value (FY2018-19 to FY2024-25)
Source: RBI Payment System Indicators

Average monthly credit card transaction value grew from Rs. 506.6 billion in FY2018-19 to Rs. 1,757.7 billion in FY2024-25, a 246.9 percent increase that significantly exceeds the 169.5 percent growth in transaction volumes over the same period. This means that average credit card transaction size has been rising over time, from approximately Rs. 3,430 per transaction in FY2018-19 to approximately Rs. 4,420 per transaction in FY2024-25. This compositional shift toward higher-value transactions is consistent with the hypothesis that UPI is absorbing low-value transactions while credit cards are increasingly used for high-value spending.

4.3.6 Descriptive Statistics

Table 4.4 presents the descriptive statistics for all key variables used in the regression analysis, computed over the full study period of 84 monthly observations.

Table 4.4: Descriptive Statistics of Key Variables (April 2018 to March 2025, n=84)

Variable	Mean	Std Dev	Min	Max
UPI Volume (Mn transactions/month)	5,797.1	5,349.6	189.5	18,301.5
UPI Value (Rs Bn/month)	8,988.4	7,538.2	270.2	24,772.2
Credit Card Volume (Mn transactions/month)	228.7	88.8	76.9	458.7
Credit Card Value (Rs Bn/month)	990.0	487.2	207.7	2,017.9
Credit Cards Outstanding (Mn)	71.6	21.6	37.8	109.9
Debit Card Volume (Mn transactions/month)	479.9	405.7	108.2	1,314.0
GDP Growth Rate (% , YoY)	5.9	7.5	-23.1	22.6

Source: NPCI Product Statistics; RBI Payment System Indicators; MOSPI Quarterly GDP Estimates; own calculation

4.3.7 Correlation Analysis

Table 4.5 presents the Pearson correlation matrix for the key variables. Figure 4.6 visualises the scatter plots for UPI versus credit card and UPI versus debit card volumes, making the directional contrast visually apparent.

Table 4.5: Pearson Correlation Matrix (n=84)

Variable	UPI_VOL	CC_VOL	CC_VAL	CC_OUT	DC_VOL
UPI_VOL	1.000	0.972**	0.976**	0.978**	-0.671**
CC_VOL	0.972**	1.000	0.969**	0.930**	-0.558**
CC_VAL	0.976**	0.969**	1.000	0.960**	-0.626**
CC_OUT	0.978**	0.930**	0.960**	1.000	-0.778**
DC_VOL	-0.671**	-0.558**	-0.626**	-0.778**	1.000

*Note: ** denotes significance at the 1% level ($p < 0.01$). Source: Own calculation from NPCI and RBI data*

Figure 4.6: Scatter Plots: UPI Volume vs Credit Card and Debit Card Volumes

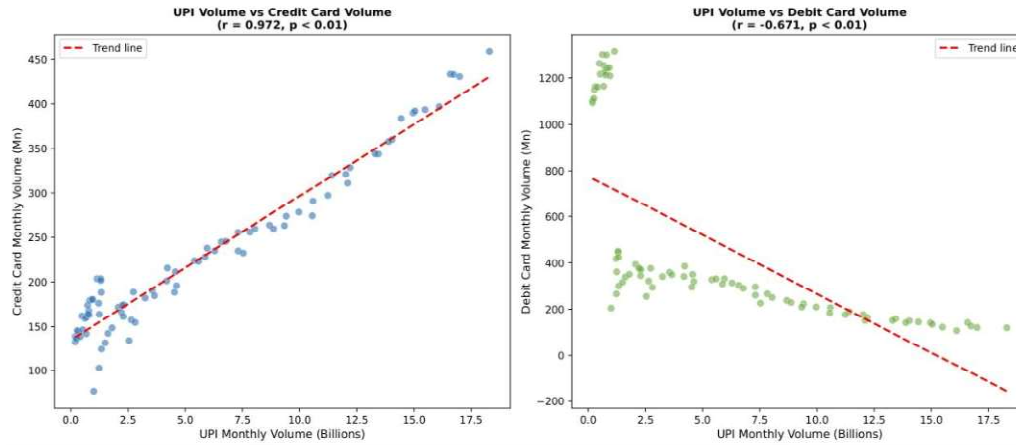


Figure 4.6: Scatter Plots: UPI Volume vs Credit Card Volume (left) and Debit Card Volume (right) Source: Own calculation from NPCI and RBI data

The scatter plots in Figure 4.6 make the directional contrast immediately visible. The left panel shows a strong positive linear relationship between UPI volume and credit card volume ($r = 0.972$, $p < 0.01$), with data points clustering tightly around an upward-sloping trend line. The right panel shows a strong negative relationship between UPI volume and debit card volume ($r = -0.671$, $p < 0.01$), with data points clustering around a downward-sloping trend line. This visual contrast between the two panels is one of the most compelling pieces of evidence in this study: UPI appears to be doing opposite things to the two card instruments, substituting debit cards while complementing credit cards.

4.3.8 OLS Regression Analysis

Table 4.6 presents the results of the three OLS regression models. All models are estimated on the full 84-month study period with UPI transaction volume (scaled to thousands of millions), the POST_INT dummy, and the GDP growth rate as independent variables.

Table 4.6: OLS Regression Results (Dependent Variables: Credit Card Metrics)

Variable	Model 1: CC_VOL (Mn)	Model 2: CC_OUT (Mn)	Model 3: CC_VAL (Rs Bn)
Constant	131.05** (t=36.30)	48.91** (t=59.96)	464.15** (t=28.12)
UPI_VOL (per 1,000 Mn txns)	17.507** (t=19.25)	3.981** (t=19.38)	76.727** (t=18.46)
POST_INT (1=post Sep 2022)	-19.617* (t=-1.98)	-0.081 (t=-0.04)	126.113** (t=2.78)
GDP_Growth (%)	0.614 (t=1.91)	-0.065 (t=-0.90)	6.282** (t=4.27)
R-squared	0.949	0.956	0.965
Adjusted R-squared	0.947	0.955	0.963
F-statistic	497.20**	582.28**	727.58**
Observations	84	84	84

*Note: t-statistics in parentheses. * $p < 0.05$; ** $p < 0.01$. UPI_VOL coefficient expressed per 1,000 million transactions increase. Source: Own calculation from NPCI, RBI PSI, and MOSPI data*

The regression results are robust across all three models with very high R-squared values ranging from 0.949 to 0.965. The UPI_VOL coefficient is positive and highly significant in all three models ($p < 0.01$), confirming the complementarity relationship after controlling for GDP growth and the post-integration period. Each increase of 1,000 million UPI transactions per month is associated with 17.5 million additional credit card transactions, 3.98 million additional credit cards outstanding, and Rs. 76.7 billion in additional monthly credit card transaction value.

The POST_INT coefficient shows a nuanced finding: negative for credit card volume (-19.617, $p < 0.05$) but strongly positive for credit card value (+126.113, $p < 0.01$). This divergence indicates that the RuPay integration shifted credit card usage toward higher-value transactions while lower-value credit card transactions migrated to the RuPay-on-UPI rail, consistent with the transaction size analysis presented earlier.

4.3.9 RuPay Credit Card on UPI: Annual Transaction Data

Table 4.7 and Figure 4.7 present the official annual data for RuPay credit cards processed through UPI, sourced from the Ministry of Finance parliamentary response.

Table 4.7: Annual RuPay Credit Card on UPI Transaction Data

Financial Year	Volume (Mn)	Value (Rs Crore)	Notes
2022-23	0.87	134.67	Partial year: launched Sep 2022
2023-24	362.90	33,439.24	First full year of operation
2024-25 (Apr to Oct 2024)	750.05	63,825.80	First 7 months only
Cumulative Total	1,113.82	97,399.71	Sep 2022 to Oct 2024

Source: Ministry of Finance, Rajya Sabha Unstarred Question No. 889, Session 266, 3rd December 2024; data.gov.in

Figure 4.7: RuPay Credit Card on UPI: Volume and Value Growth (FY2022-23 to FY2024-25)

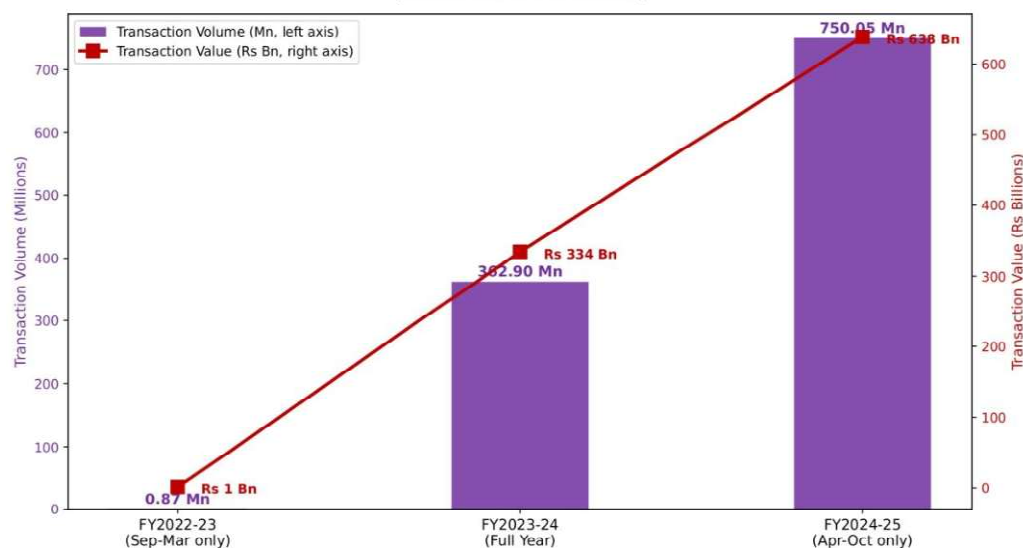


Figure 4.7: RuPay Credit Card on UPI: Volume and Value Growth (FY2022-23 to FY2024-25) Source: Ministry of Finance, Rajya Sabha Q No. 889, Session 266

Figure 4.7 illustrates the explosive growth of RuPay credit card transactions on UPI from a minimal base at launch to over 750 million transactions in just the first seven months of FY2024-25. The average transaction value of approximately Rs. 851 for RuPay-on-UPI compared to approximately Rs. 4,420 for traditional credit card transactions confirms that the integration is expanding credit card usage into new,

lower-value transaction contexts at small merchants, rather than simply rerouting existing high-value credit card spending.

4.4 Findings

Finding 1: UPI and Credit Cards are Complements, Not Substitutes

The most definitive finding of this study is that UPI expansion and credit card usage are strongly positively correlated and that UPI growth is a statistically significant positive predictor of all three credit card usage metrics tested. The Pearson correlations between UPI volume and credit card volume ($r = 0.972$), value ($r = 0.976$), and outstanding cards ($r = 0.978$) are all significant at the 1 percent level. The OLS regression coefficients on UPI_VOL are positive and highly significant across all three models, even after controlling for GDP growth and the post-integration period. Hypothesis H1, which predicted a negative relationship, is therefore rejected. Hypotheses H2 and H3 are supported.

The complementarity finding is explained through two reinforcing mechanisms. First, UPI adoption and credit card adoption share common structural drivers including rising smartphone penetration, income growth, e-commerce expansion, and digital literacy, meaning that the populations adopting each instrument overlap significantly. Second, the two instruments serve genuinely different transaction contexts, with UPI dominating low-value peer-to-peer and small-merchant transactions while credit cards retain dominance in high-value purchases, e-commerce, travel, reward-earning contexts, and revolving credit access. These distinct use cases prevent direct substitution.

Finding 2: UPI Cannibalises Debit Cards but Not Credit Cards

The asymmetric relationship between UPI and different card types is the most analytically important finding of this study. UPI volume shows a strong negative correlation with debit card volume ($r = -0.671$, $p < 0.01$), and debit card monthly volumes have declined by 88.7 percent over the study period. By FY2024-25, monthly

credit card volumes (397.8 million) have crossed above monthly debit card volumes (134.3 million) for the first time. This reversal, which would have been considered implausible at the start of the study period, captures the fundamental restructuring of India's card payment ecosystem driven by UPI adoption.

The asymmetric cannibalisation is theoretically consistent with the economic characteristics of the instruments. Debit cards and UPI are near-perfect functional substitutes as both debit funds directly from a bank account, while credit cards offer a distinctly different value proposition through their credit function, reward programmes, and purchase protection that UPI cannot replicate.

Finding 3: The RuPay Integration Shifted Credit Card Usage Toward Higher Values

The POST_INT dummy is negative for credit card transaction volumes (-19.617, $p < 0.05$) but strongly positive for credit card transaction values (+126.113, $p < 0.01$). Combined with the RuPay transaction data showing an average transaction value of Rs. 851 compared to Rs. 4,420 for traditional credit cards, this pattern indicates that the integration has caused lower-value credit card transactions to migrate to the RuPay-on-UPI rail while traditional credit card spending has concentrated on higher-value purchases. This is a compositional shift rather than a net negative, as total spending including RuPay-on-UPI continues to grow.

Finding 4: RuPay Integration Has Created a New Market Segment

The RuPay credit card on UPI data demonstrates market creation rather than market diversion. The growth from 0.87 million transactions at launch to over 750 million in just seven months of FY2024-25 represents the rapid emergence of a new credit card usage segment at small merchants who previously had no credit card acceptance infrastructure. The low average transaction value of Rs. 851 confirms that these are genuinely new transaction contexts being brought into the credit card ecosystem for the first time, expanding the addressable market for credit rather than cannibalising existing usage.

Finding 5: COVID-19 Was a Temporary Disruptor with Lasting Structural Effects

COVID-19 caused a temporary 19.2 percent decline in monthly credit card volumes in FY2020-21, but the recovery was swift. Credit card volumes exceeded pre-COVID levels by September 2020 and have accelerated every year since. The pandemic period permanently accelerated digital payment adoption across all instruments including UPI, which in turn sustained the common-driver effect that supports concurrent growth in credit card usage in subsequent years.

4.5 Recommendations

Recommendations for Banks and Credit Card Issuers

Banks should reconceptualise their strategic relationship with UPI from competitive threat to distribution opportunity. The strong positive correlation between UPI adoption and credit card outstanding numbers ($r = 0.978$) means that UPI-active consumers represent the highest-quality pool of credit card acquisition targets. Banks should develop targeted credit card acquisition campaigns for UPI-active consumers, leveraging data on UPI transaction behaviour to identify creditworthy prospects.

Banks should prioritise RuPay credit card issuance and develop reward structures specifically designed for UPI-based credit card spending, addressing the current gap where traditional reward programmes are oriented toward point-of-sale terminal transactions. The explosive growth of RuPay-on-UPI from 0.87 million to 750 million transactions in two years makes this one of the most significant product market opportunities in Indian retail banking.

Banks should also differentiate their Visa and Mastercard credit card propositions toward the high-value transaction segments where credit cards retain clear advantages over UPI: premium reward programmes tied to travel, dining, and online shopping; purchase protection; dispute resolution; and international acceptance. The rising average transaction value of credit cards indicates that this high-value positioning is

already occurring naturally and should be reinforced through deliberate product design.

Recommendations for Payment Network Operators

NPCI and the RuPay network should deepen the RuPay-on-UPI integration by investing in merchant education, consumer awareness campaigns, and reward programme development specifically for the integrated product. The data confirms the strategic logic of the integration and argues for accelerating its rollout and adoption rather than moderating it. NPCI should also publish monthly granular data on RuPay credit card transactions on UPI to enable more rigorous academic and policy analysis of the integration's ongoing impact.

For Visa and Mastercard, the findings underscore the importance of seeking inclusion in the UPI credit card integration framework. The current restriction to RuPay limits the benefits of the integration and concentrates the fastest-growing segment of credit card usage within the domestic network. Engaging proactively with NPCI and the RBI on the terms of broader network participation in the UPI credit card ecosystem would be strategically valuable for both international networks.

Recommendations for Policymakers and Regulators

The RBI and Ministry of Finance should note that the empirical evidence strongly supports the coexistence and complementarity of UPI and credit cards. Regulatory interventions designed to protect one instrument at the expense of the other are not supported by the evidence and would reduce consumer welfare. The two instruments serve different needs and their concurrent growth benefits consumers through greater choice and accessibility.

The RBI should consider extending the UPI credit card integration to Visa and Mastercard branded credit cards, subject to appropriate regulatory oversight of fee structures. The current restriction to RuPay cards, while serving a legitimate domestic

network development goal, limits the consumer welfare benefits of the integration and may create unintended competitive distortions in the credit card issuing market.

Financial literacy initiatives targeting new credit card users entering through the RuPay-on-UPI channel should be developed, given that this channel is reaching consumer segments that are potentially new to revolving credit and may not fully understand the cost implications of credit card borrowing.

4.6 Limitations of the Study

Several methodological and data limitations should be considered when interpreting the findings of this study.

First, the analysis is conducted at aggregate market level using published monthly statistics. Individual consumer-level transaction data, which would allow direct testing of whether individual consumers substitute UPI for credit card payments in specific contexts, is not publicly available. The complementarity finding at aggregate level is consistent with consumers using both instruments for different purposes, but this mechanism cannot be directly verified from aggregate data alone.

Second, the OLS regression models assume a linear relationship between UPI growth and credit card usage. Non-linear dynamics, threshold effects, and time-varying coefficients are possible features of the data that the linear OLS framework does not accommodate. More sophisticated time-series methods such as vector autoregression or structural break tests would be valuable extensions of this analysis.

Third, the RuPay credit card on UPI data is available only at annual frequency, covering September 2022 to October 2024. This short time horizon limits the ability to draw definitive conclusions about the long-run impact of the integration. As more post-integration data becomes available, the precision of the integration effect estimates will improve substantially.

Fourth, while GDP growth is included as a control variable, other structural variables that jointly influence UPI and credit card growth, including internet penetration rates, e-commerce transaction volumes, and the expansion of the formal banking system, are not controlled for in the models. The omission of these variables may create some degree of omitted variable bias in the regression coefficients. However, this limitation does not threaten the directional conclusion of complementarity, as any cannibalisation effect would need to be stronger than the positive common-driver effect to produce the observed strongly positive relationships, which is inconsistent with the evidence.

Fifth, the study does not examine bank-level or issuer-level variation in credit card performance in relation to UPI adoption. Bank-level panel data analysis would provide valuable additional evidence on whether the complementarity finding holds across institutions with different customer profiles and product strategies.

CONCLUSION

Summary of the Study

This research project set out to investigate one of the most consequential questions in India's contemporary digital financial services landscape: does the exponential expansion of the Unified Payments Interface cannibalise credit card usage in India, or do the two payment instruments function as complements, growing alongside each other to serve different consumer needs? This question is of considerable practical importance for banks and card issuers, payment network operators, policymakers, and the millions of Indian consumers who use both instruments, and yet it had not been empirically investigated in the academic literature prior to this study.

The study addressed this question through a rigorous quantitative analysis of 84 months of actual transaction data from April 2018 to March 2025, sourced entirely from authoritative public databases including the National Payments Corporation of India, the Reserve Bank of India Payment System Indicators, the Ministry of Statistics and Programme Implementation, and the Ministry of Finance. The analysis employed trend analysis, Pearson correlation analysis, and Ordinary Least Squares regression to examine the relationship between UPI transaction growth and three measures of credit card usage, namely transaction volume, transaction value, and outstanding card numbers, while controlling for GDP growth and the structural change introduced by the RuPay credit card on UPI integration in September 2022. Debit card data was also analysed as a comparison instrument to sharpen the distinction between instruments that UPI does and does not cannibalise.

Key Findings

The study produced five principal findings, each of which contributes to the empirical understanding of India's digital payments ecosystem:

1. UPI and credit cards are complements, not substitutes. UPI transaction volume is strongly positively correlated with all three credit card usage metrics: transaction volume ($r = 0.972$, $p < 0.01$), transaction value ($r = 0.976$, $p < 0.01$), and outstanding card numbers ($r = 0.978$, $p < 0.01$). The OLS regression coefficients on UPI volume are positive and highly significant in all three models, even after controlling for GDP growth and the post-integration period. Each increase of 1,000 million UPI transactions per month is associated with 17.5 million additional credit card transactions, 3.98 million additional credit cards outstanding, and Rs. 76.7 billion in additional monthly credit card value. Hypothesis H1, which predicted a negative relationship between UPI growth and credit card transaction frequency, is rejected. Hypotheses H2 and H3 are supported.
2. UPI cannibalises debit cards but not credit cards. Debit card average monthly volumes declined from 1,189.5 million per month in FY2018-19 to 134.3 million per month in FY2024-25, an 88.7 percent decline that is directly inverse to UPI's growth trajectory. By FY2024-25, credit card monthly volumes (397.8 million) exceeded debit card volumes (134.3 million) for the first time in India's history. This asymmetric pattern, cannibalisation of debit cards alongside complementarity with credit cards, confirms that UPI substitutes functional equivalents while leaving instruments with distinct value propositions unaffected.
3. The RuPay credit card on UPI integration has shifted credit card usage toward higher-value transactions. The POST_INT dummy is negative for credit card transaction volume (-19.617, $p < 0.05$) but strongly positive for credit card transaction value (+126.113, $p < 0.01$), indicating that the integration caused

lower-value credit card transactions to migrate to the RuPay-on-UPI rail while traditional credit card spending concentrated on higher-value purchases. The average RuPay-on-UPI transaction value of Rs. 851 compared to Rs. 4,420 for traditional credit card transactions confirms this compositional shift.

4. The RuPay integration has created a genuinely new credit card market segment. Official data from the Ministry of Finance shows that RuPay credit card on UPI transactions grew from 0.87 million in the partial launch year of FY2022-23 to over 750 million in just the first seven months of FY2024-25. The low average transaction value and rapid growth confirm that this integration is expanding credit card acceptance to small merchant contexts and consumer segments that were previously outside the credit card ecosystem, representing genuine market creation rather than traffic diversion.
5. COVID-19 was a temporary disruptor that accelerated long-term digital adoption. The pandemic caused a temporary 19.2 percent decline in monthly credit card volumes in FY2020-21, but the recovery was swift. The pandemic period permanently accelerated digital payment adoption, which in turn sustained the common-driver effect supporting concurrent growth in both UPI and credit card usage in subsequent years.

Theoretical Contributions

This study makes three principal theoretical contributions to the literature on payment system economics and digital finance in emerging markets. First, it extends the empirical literature on payment instrument competition and complementarity to the specific context of a real-time account-based payment rail competing alongside a credit-based card instrument, a configuration that has not been previously studied in the academic literature. The finding that UPI and credit cards are complements contributes to the theoretical understanding of when payment instruments function as substitutes versus complements, suggesting that the distinguishing factor is the credit function of the card instrument rather than its physical form.

Second, the study provides the first empirical evidence on the asymmetric cannibalisation pattern whereby a new payment rail simultaneously cannibalises functional substitutes, namely debit cards, while complementing instruments with distinct value propositions, namely credit cards. This asymmetric finding has implications for payment system theory and for how regulators should think about the competitive effects of new payment infrastructure on incumbent instruments.

Third, the study contributes to the emerging literature on the financial inclusion implications of payment innovation by documenting how the RuPay credit card on UPI integration has expanded the credit card acceptance network to include previously excluded small merchant contexts, effectively extending formal credit access to new economic segments.

Practical Implications

For banks and credit card issuers, the central practical implication is that UPI should be embraced as a distribution and acquisition channel for credit card products rather than feared as a competitive threat. The strong positive relationship between UPI growth and credit card outstanding numbers suggests that UPI-active consumers represent the most natural and highest-quality pool of credit card acquisition targets.

For payment network operators, the findings validate the strategic logic of the RuPay credit card on UPI integration and argue for its deepening and expansion. For Visa and Mastercard, the findings highlight the importance of differentiation toward premium, high-value transaction segments where card networks retain clear advantages. For NPCI, the findings suggest that extending the credit card on UPI integration to international networks would maximise consumer welfare while preserving the demonstrated market development benefits of the innovation.

For policymakers and regulators, the empirical evidence supports policies that encourage the coexistence and mutual development of UPI and credit cards rather than interventions that prioritise one instrument at the expense of the other. The

complementarity finding means that the policy objectives of expanding digital payment access through UPI and expanding formal credit access through credit cards can be pursued simultaneously without significant conflict.

Limitations and Future Research

The study has several limitations that define a productive agenda for future research. The aggregate nature of the data prevents consumer-level analysis of substitution and complementarity behaviour. The OLS regression framework assumes linear relationships that may not fully capture the dynamics of a rapidly evolving payments market. The post-integration analysis is constrained by the short time horizon of available RuPay-on-UPI data. The control variable set is limited to GDP growth due to data availability constraints.

Future research directions include longitudinal studies of the RuPay-on-UPI integration effect as more post-2022 data accumulates; bank-level panel data analysis to examine variation in credit card performance relative to UPI adoption across institutions; consumer-level survey or transaction data studies to directly observe substitution and complementarity behaviour at the individual level; and cross-country comparative studies examining whether the complementarity finding in India holds in other emerging market economies with similar real-time payment infrastructure.

The empirical evidence presented in this study establishes a clear and robust finding: in India's digital payments ecosystem as it has evolved from 2018 to 2025, UPI expansion and credit card growth have been complements rather than substitutes. This finding, grounded in verified official data and rigorous quantitative analysis, provides a solid empirical foundation for the strategic, regulatory, and academic conversations that will shape the future of India's payments landscape.

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ANNEXURE

UPI Monthly Data (April 2018-March 2025)

Month	No. of Banks live on UPI	Volume (In Mn.)	Value (In Cr.)
March-2025	661	18,301.51	24,77,221.61
February-2025	653	16106.19	21,96,481.69
January-2025	647	16996	23,48,037.12
December-2024	641	16730.01	23,24,699.91
November-2024	637	15482.02	21,55,187.40
October-2024	632	16584.97	23,49,821.46
September-2024	622	15041.75	20,63,994.71
August-2024	608	14963.05	20,60,735.57
July-2024	605	14435.55	20,64,292.41
June-2024	602	13885.14	20,07,081.20
May-2024	598	14035.84	20,44,937.05
April-2024	583	13303.99	19,64,464.52
March-2024	572	13440	19,78,353.23
February-2024	560	12102.67	18,27,869.35
January-2024	550	12203.02	18,41,083.97
December-2023	522	12020.23	18,22,949.42
November-2023	516	11235.29	17,39,740.61
October-2023	505	11408.79	17,15,768.34
September-2023	492	10555.69	15,79,133.18
August-2023	484	10586.02	15,76,536.56
July-2023	473	9964.61	15,33,536.44
June-2023	458	9335.06	14,75,464.26
May-2023	445	9415.19	14,89,145.44
April-2023	414	8863.26	14,15,504.71
March-2023	399	8685.3	14,10,443.01
February-2023	390	7534.76	12,35,846.62
January-2023	385	8036.89	12,98,726.62
December-2022	382	7829.49	12,82,055.01
November-2022	376	7309.45	11,90,593.39
October-2022	365	7305.42	12,11,582.51
September-2022	358	6780.8	11,16,438.10
August-2022	346	6579.63	10,72,792.68
July-2022	338	6288.4	10,62,991.76
June-2022	330	5862.75	10,14,384.31
May-2022	323	5955.2	10,41,520.07
April-2022	316	5583.05	9,83,302.27
March-2022	314	5405.65	9,60,581.66

February-2022	304	4527.49	8,26,843.00
January-2022	297	4617.15	8,31,993.11
December-2021	282	4566.3	8,26,848.22
November-2021	274	4186.48	7,68,436.11
October-2021	261	4218.65	7,71,444.98
September-2021	259	3654.3	6,54,351.81
August-2021	249	3555.55	6,39,116.95
July-2021	235	3247.82	6,06,281.14
June-2021	229	2807.51	5,47,373.17
May-2021	224	2539.57	4,90,638.65
April-2021	220	2641.06	4,93,663.68
March-2021	216	2731.68	5,04,886.44
February-2021	213	2292.9	4,25,062.76
January-2021	207	2302.73	4,31,181.89
December-2020	207	2234.16	4,16,176.21
November-2020	200	2210.23	3,90,999.15
October-2020	189	2071.62	3,86,106.74
September-2020	174	1800.14	3,29,027.66
August-2020	168	1618.83	2,98,307.61
July-2020	164	1497.36	2,90,537.86
June-2020	155	1336.93	2,61,835.00
May-2020	155	1234.5	2,18,391.60
April-2020	153	999.57	1,51,140.66
March-2020	148	1246.84	2,06,462.31
February-2020	146	1325.69	2,22,516.95
January-2020	144	1305.02	2,16,242.97
December-2019	143	1308.4	2,02,520.76
November-2019	143	1218.77	1,89,229.09
October-2019	141	1148.36	1,91,359.94
September-2019	141	955.02	1,61,456.56
August-2019	141	918.35	1,54,504.89
July-2019	143	822.29	1,46,386.64
June-2019	142	754.54	1,46,566.35
May-2019	143	733.54	1,52,449.29
April-2019	144	781.79	1,42,034.39
March-2019	142	799.54	1,33,460.72
February-2019	139	674.19	1,06,737.12
January-2019	134	672.75	1,09,932.43
December-2018	129	620.17	1,02,594.82
November-2018	128	524.94	82232.21
October-2018	128	482.36	74978.27
September-2018	122	405.87	59,835.36
August-2018	114	312.02	54,212.26

July-2018	114	273.75	51,843.14
June-2018	110	246.37	40,834.03
May-2018	101	189.48	33288.51
April-2018	97	190.08	27021.85

RuPay Credit Card Data (2022-2025)

Year	Volume (in Lakhs)	Value (in Crore)
2022-23	8.68	134.67
2023-24	3628.99	33439.24
2024-25	7500.52	63825.8
Total	11138.19	97399.71

Credit Card Monthly Data (2018-2025)

Month/Year	B. Payment Systems		Payment System Infrastructures
	II Retail		
	4.1 Credit Cards (4.1.1 to 4.1.2)		1.1 Credit Cards (Number of credit cards)
	Volume (Lakh)	Value(Rupees Crores)	Volume (Lakh)
Mar-2025	4586.50	201,494	1098.85
Feb-2025	3969.59	167,208	1093.15
Jan-2025	4305.72	184,126	1088.73
Dec-2024	4328.50	187,949	1080.56
Nov-2024	3936.04	169,298	1072.40
Oct-2024	4332.14	201,789	1068.90
Sep-2024	3921.62	176,202	1061.03
Aug-2024	3900.49	168,184	1054.24
Jul-2024	3837.80	172,670	1045.68
Jun-2024	3579.49	158,822	1038.13
May-2024	3601.36	164,955	1033.00
Apr-2024	3441.51	156,498	1025.40
Mar-2024	3439.38	164,459	1018.03
Feb-2024	3112.44	149,206	1006.00
Jan-2024	3289.52	166,444	995.00

Dec-2023	3215.00	165,119	979.05
Nov-2023	2970.90	160,644	960.01
Oct-2023	3200.48	178,569	947.11
Sep-2023	2739.43	142,320	930.17
Aug-2023	2905.78	148,602	912.78
Jul-2023	2780.90	145,108	898.73
Jun-2023	2629.05	137,234	886.82
May-2023	2734.74	140,660	877.47
Apr-2023	2592.55	132,769	865.13
Mar-2023	2634.29	137,311	853.03
Feb-2023	2323.20	118,684	833.66
Jan-2023	2593.52	127,682	824.52
Dec-2022	2556.47	126,524	811.87
Nov-2022	2347.73	114,794	806.06
Oct-2022	2554.02	129,048	793.68
Sep-2022	2453.06	122,094	777.02
Aug-2022	2447.83	112,358	779.91
Jul-2022	2348.34	115,856	802.56
Jun-2022	2279.46	108,752	787.23
May-2022	2378.03	113,694	768.77
Apr-2022	2229.30	105,459	751.66
Mar-2022	2237.51	107,107	736.27
Feb-2022	1884.24	86,041	717.08
Jan-2022	1958.05	87,769	702.52
Dec-2021	2112.59	93,907	689.49
Nov-2021	2011.16	89,217	675.83
Oct-2021	2155.81	100,943	663.61
Sep-2021	1847.21	80,228	650.25
Aug-2021	1904.71	77,733	639.34
Jul-2021	1820.49	74,885	634.14
Jun-2021	1547.01	62,746	628.15
May-2021	1344.73	52,014	623.93
Apr-2021	1575.32	59,049	622.60
Mar-2021	1887.27	72,319	620.49
Feb-2021	1613.77	60,105	616.47

Jan-2021	1744.20	64,737	610.98
Dec-2020	1737.79	63,487	603.97
Nov-2020	1662.58	62,350	601.13
Oct-2020	1718.03	64,652	594.20
Sep-2020	1486.71	51,134	586.94
Aug-2020	1425.11	50,311	578.31
Jul-2020	1319.66	45,558	576.32
Jun-2020	1248.55	42,773	572.89
May-2020	1028.86	32,225	571.80
Apr-2020	768.53	20,765	573.60
Mar-2020	1638.57	50,574	577.45
Feb-2020	1882.94	62,147	571.58
Jan-2020	2017.27	66,573	561.20
Dec-2019	2036.64	65,736	553.33
Nov-2019	1762.12	60,130	544.11
Oct-2019	2,036.00	71,552	533.59
Sep-2019	1,802.88	59,845	525.90
Aug-2019	1,804.31	60,011	517.65
Jul-2019	1,792.82	60,025	502.64
Jun-2019	1,640.46	57,317	496.48
May-2019	1,740.43	61,700	489.21
Apr-2019	1,677.85	58,116	479.97
Mar-2019	1,632.74	58,062	470.89
Feb-2019	1,421.29	48,866	460.62
Jan-2019	1,604.29	55,346	451.71
Dec-2018	1,592.17	54,643	442.14
Nov-2018	1,466.46	51,997	432.35
Oct-2018	1,619.73	56,602	426.75
Sep-2018	1,390.31	46,479	417.76
Aug-2018	1,450.41	48,372	410.41
Jul-2018	1,458.10	48,135	401.66
Jun-2018	1,367.25	46,633	393.81
May-2018	1,390.39	47,635	386.05
Apr-2018	1,330.46	45,177	377.83

Debit Card Monthly Data (2018-2025)

Month/Year	B. Payment Systems		Payment System Infrastructures
	II Retail		
	4.2 Debit Cards (4.2.1 to 4.2.1)		1.2 Debit Cards (Number of Debit Cards)
	Volume (Lakh)	Value(Rupees Millions)	Volume (Lakh)
Mar-2025	1203.02	390,547	9908.12
Feb-2025	1082.50	343,140	9856.77
Jan-2025	1216.69	389,634	9820.39
Dec-2024	1280.10	405,988	9909.48
Nov-2024	1231.89	390,100	9795.72
Oct-2024	1427.17	468,298	9809.11
Sep-2024	1353.64	401,015	9732.82
Aug-2024	1422.45	435,418	9685.49
Jul-2024	1456.56	447,647	9632.02
Jun-2024	1423.94	412,589	9624.24
May-2024	1503.82	435,650	9565.98
Apr-2024	1518.61	439,111	9509.45
Mar-2024	1594.75	447,489	9649.19
Feb-2024	1522.47	414,521	9606.71
Jan-2024	1644.68	454,866	9575.66
Dec-2023	1768.16	479,345	9608.81
Nov-2023	1771.66	493,942	9764.99
Oct-2023	1904.23	521,011	9801.71
Sep-2023	1839.04	468,664	9782.86
Aug-2023	2075.94	526,797	9780.57
Jul-2023	2101.31	533,131	9707.41
Jun-2023	2102.24	510,493	9758.33
May-2023	2239.77	527,759	9739.26
Apr-2023	2295.38	546,274	9670.12

Mar-2023	2382.50	537,240	9612.59
Feb-2023	2265.31	496,934	9541.22
Jan-2023	2510.09	557,780	9455.81
Dec-2022	2667.10	586,260	9394.66
Nov-2022	2608.28	555,937	9477.29
Oct-2022	2962.38	669,503	9442.32
Sep-2022	2899.38	612,039	9385.38
Aug-2022	3033.47	621,587	9350.26
Jul-2022	3133.47	645,150	9281.34
Jun-2022	3089.99	608,848	9154.51
May-2022	3315.65	657,999	9176.21
Apr-2022	3311.87	650,617	9205.18
Mar-2022	3275.19	640,519	9176.66
Feb-2022	2956.23	570,701	9350.66
Jan-2022	3193.00	600,254	9409.29
Dec-2021	3499.21	664,910	9377.42
Nov-2021	3407.02	671,094	9340.07
Oct-2021	3852.95	764,705	9328.34
Sep-2021	3490.29	625,891	9193.84
Aug-2021	3588.29	648,667	9132.63
Jul-2021	3405.37	610,874	9056.29
Jun-2021	2946.74	510,436	9056.31
May-2021	2556.60	432,251	9019.71
Apr-2021	3213.23	561,831	9005.00
Mar-2021	3763.05	673,864	8982.02
Feb-2021	3445.46	592,267	8940.02
Jan-2021	3699.54	631,571	8880.65
Dec-2020	3765.09	651,783	8856.60
Nov-2020	3765.75	678,888	8927.02
Oct-2020	3932.66	691,410	8741.65
Sep-2020	3507.81	553,664	8654.35
Aug-2020	3389.42	547,701	8553.73
Jul-2020	3161.93	503,250	8523.55
Jun-2020	3002.34	477,110	8454.14
May-2020	2658.82	379,838	8353.49

Apr-2020	2053.66	232,505	8294.47
Mar-2020	3608.13	482,090	8285.62
Feb-2020	4245.74	585,609	8230.23
Jan-2020	4500.85	628,712	8164.10
Dec-2019	4448.75	627,524	8053.24
Nov-2019	4180.84	582,087	8307.59
Oct-2019	13,140.43	385,758	8,436.22
Sep-2019	12,089.55	329,505	8,355.94
Aug-2019	12,436.28	345,525	8,261.30
Jul-2019	12,416.55	340,678	8,153.86
Jun-2019	12,126.19	340,856	8,119.45
May-2019	12,282.41	352,714	8,004.37
Apr-2019	12,219.89	339,747	8,602.95
Mar-2019	12,989.89	342,010	9,058.13
Feb-2019	11,643.97	304,940	9,309.44
Jan-2019	12,540.13	316,692	9,233.96
Dec-2018	13,009.95	366,923	9,581.50
Nov-2018	12,159.62	331,811	9,925.63
Oct-2018	12,622.43	347,585	9,971.06
Sep-2018	11,610.86	314,861	9,824.49
Aug-2018	11,626.94	324,948	9,801.97
Jul-2018	11,491.11	316,682	9,620.00
Jun-2018	11,115.33	315,998	9,442.74
May-2018	11,001.66	311,559	9,239.62
Apr-2018	10,927.05	310,254	9,063.57

Pearson Correlation

Correlation Matrix

Correlation Matrix

		UPI_VOL	CC_VOL	CC_VAL	CC_OUT	DC_VOL
UPI_VOL	Pearson's r	—				
	df	—				
	p-value	—				
	95% CI Upper	—				
	95% CI Lower	—				
CC_VOL	Pearson's r	0.972***	—			
	df	82	—			
	p-value	<.001	—			
	95% CI Upper	0.982	—			
	95% CI Lower	0.957	—			
CC_VAL	Pearson's r	0.976***	0.969***	—		
	df	82	82	—		
	p-value	<.001	<.001	—		
	95% CI Upper	0.985	0.980	—		
	95% CI Lower	0.964	0.952	—		
CC_OUT	Pearson's r	0.978***	0.930***	0.960***	—	
	df	82	82	82	—	
	p-value	<.001	<.001	<.001	—	
	95% CI Upper	0.985	0.954	0.974	—	
	95% CI Lower	0.966	0.893	0.938	—	
DC_VOL	Pearson's r	-0.671***	-0.558***	-0.626***	-0.778***	—
	df	82	82	82	82	—
	p-value	<.001	<.001	<.001	<.001	—
	95% CI Upper	-0.534	-0.390	-0.475	-0.676	—
	95% CI Lower	-0.774	-0.690	-0.741	-0.850	—

Note. * p < .05, ** p < .01, *** p < .001

Three OLS Regression Models

Model 1 — Dependent Variable: CC_VOL

Covariates: UPI_VOL_000, POST_INT, GDP_GROWTH

Linear Regression

Model Fit Measures

Model	R	R ²	Adjusted R ²	Overall Model Test			
				F	df1	df2	p
1	0.974	0.949	0.947	497	3	80	<.001

Note. Models estimated using sample size of N=84

Model Coefficients - CC_VOL

Predictor	Estimate	SE	95% Confidence Interval		t	p	Stand. Estimate	95% Confidence Interval	
			Lower	Upper				Lower	Upper
Intercept	131.052	3.611	123.8669	138.238	36.30	<.001			
UPI_VOL_000	17.507	0.909	15.6971	19.317	19.25	<.001	1.0543	0.94534	1.163
POST_INT	-19.617	9.921	-39.3598	0.126	-1.98	.051	-0.1072	-0.21510	6.90e-4
GDP_GROWTH	0.614	0.322	-0.0264	1.255	1.91	.060	0.0497	-0.00214	0.101

Model 2 — Dependent Variable: CC_OUT

Covariates: UPI_VOL_000, POST_INT, GDP_GROWTH

Linear Regression

Model Fit Measures

Model	R	R ²	Adjusted R ²	Overall Model Test			
				F	df1	df2	p
1	0.978	0.956	0.955	582	3	80	<.001

Note. Models estimated using sample size of N=84

Model Coefficients - CC_OUT

Predictor	Estimate	SE	95% Confidence Interval		t	p	Stand. Estimate	95% Confidence Interval	
			Lower	Upper				Lower	Upper
Intercept	48.9052	0.8156	47.282	50.5283	59.9628	<.001			
UPI_VOL_000	3.9814	0.2054	3.573	4.3902	19.3825	<.001	0.98456	0.8835	1.0857
POST_INT	-0.0809	2.2409	-4.540	4.3787	-0.0361	.971	-0.00182	-0.1019	0.0983
GDP_GROWTH	-0.0652	0.0727	-0.210	0.0796	-0.8962	.373	-0.02164	-0.0697	0.0264

Model 3 — Dependent Variable: CC_VAL

Covariates: UPI_VOL_000, POST_INT, GDP_GROWTH

Linear Regression

Model Fit Measures

Model	R	R ²	Adjusted R ²	Overall Model Test			
				F	df1	df2	p
1	0.982	0.965	0.963	728	3	80	<.001

Note. Models estimated using sample size of N=84

Model Coefficients - CC_VAL

Predictor	Estimate	SE	95% Confidence Interval		t	p	Stand. Estimate	95% Confidence Interval	
			Lower	Upper				Lower	Upper
Intercept	464.15	16.50	431.30	496.99	28.12	<.001			
UPI_VOL_000	76.73	4.16	68.45	85.00	18.46	<.001	0.8425	0.7516	0.933
POST_INT	126.11	45.35	35.87	216.36	2.78	.007	0.1257	0.0357	0.216
GDP_GROWTH	6.28	1.47	3.35	9.21	4.27	<.001	0.0926	0.0494	0.136

Saurabh Agrawal

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Submitted By

YASH GARG

24/DMBA/267

MBA (2024–2026)

Under the Guidance of

Dr. Saurabh Agrawal

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