

Growth and Structural Transformation of India's Retail Payment Ecosystem: An Analysis of Major Digital Payment Platforms

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Abstract—The rapid growth of digital payment systems has transformed India's retail payment ecosystem by improving the speed, accessibility, and efficiency of financial transactions. This study examines the growth and changing contribution of major digital payment platforms in India's retail payment system. The analysis is based on secondary data obtained from the Reserve Bank of India (RBI), the National Payments Corporation of India (NPCI), and scheduled banks for the period 2017-18 to 2022-23. Trend analysis, percentage share analysis, and comparative analysis were used to assess the performance of nine major retail payment systems in terms of transaction value and transaction volume.

The findings reveal a substantial increase in both the value and volume of digital payment transactions during the study period, indicating the rapid expansion of India's digital payment ecosystem. The study also identifies a significant shift in the composition of retail payment systems, with the Unified Payments Interface (UPI) emerging as the dominant payment platform, while the relative contribution of traditional payment systems such as the Cheque Truncation System (CTS) and the National Financial Switch (NFS) declined considerably. The findings highlight the growing importance of technology-driven, real-time payment systems in supporting an efficient and inclusive retail payment infrastructure. The study provides useful insights for policymakers, financial institutions, and other stakeholders for strengthening India's digital payment ecosystem and promoting a digitally enabled economy.

Index Terms— Digital payments, Retail payment system, UPI, NPCI, Digital economy, Financial inclusion.

I. INTRODUCTION

Digital technology has transformed the way economies function by improving communication, business activities, financial services, and governance. Among these developments, digital payment systems have become one of the most important components of the digital economy. They enable faster, safer, and more convenient financial transactions while reducing the dependence on cash. Digital payments also lower transaction costs, improve transparency, promote financial inclusion, and enhance the overall efficiency of the financial system (World Bank, 2022; BIS, 2023). As a result, countries across the world are encouraging the adoption of digital payment systems to support economic growth and strengthen their financial infrastructure. Studies have also shown that efficient retail payment systems improve trade, consumption, and overall economic activity by facilitating faster movement of money across the economy (Humphrey et al., 1996; Hasan et al., 2013). India has witnessed remarkable growth in digital payments during the last decade. The rapid expansion of internet connectivity, increasing smartphone penetration, affordable mobile data, and supportive government policies have significantly changed the country's payment ecosystem. The launch of the Digital India programme in 2015 provided a strong foundation for promoting digital infrastructure and digital financial services. At the same time, initiatives such as the Pradhan Mantri Jan Dhan Yojana (PMJDY), Aadhaar, Direct Benefit Transfer (DBT), and mobile banking expanded access to formal financial services and encouraged digital transactions

(Government of India, 2015; Reserve Bank of India, 2024). These initiatives have contributed significantly to improving financial inclusion and expanding the digital economy.

The adoption of digital payments accelerated further after the demonetisation of high-value currency notes in November 2016, which encouraged consumers and businesses to move from cash-based transactions to electronic payment methods. Subsequently, the COVID-19 pandemic further increased the use of contactless and online payment systems because of restrictions on physical movement and growing preference for digital transactions (RBI, 2024; National Payments Corporation of India [NPCI], 2024). Consequently, India has emerged as one of the world's largest digital payment markets. Payment platforms such as the Unified Payments Interface (UPI), Immediate Payment Service (IMPS), National Financial Switch (NFS), National Automated Clearing House (NACH), Aadhaar Enabled Payment System (AEPS), Bharat Bill Payment System (BBPS), RuPay, National Electronic Toll Collection (NETC), and Cheque Truncation System (CTS) now form the backbone of India's retail payment system. Among these, UPI has become the most widely used platform because of its real-time, interoperable, and low-cost payment mechanism, transforming the way individuals and businesses conduct financial transactions.

The rapid expansion of digital payment systems has generated several economic benefits. Digital payments reduce transaction costs, improve the speed and efficiency of financial transactions, encourage formalisation of economic activities, and increase transparency. They also promote financial inclusion by providing easy access to banking and payment services for households, small businesses, and people living in remote areas. These improvements contribute to higher productivity, better allocation of financial resources, and stronger economic growth (Hasan et al., 2013; Zandi et al., 2013; Demirgüç-Kunt et al., 2022). Electronic payment systems also improve tax compliance, reduce leakages in government welfare programmes, and enhance the efficiency of public service delivery, making them an important driver of inclusive economic development.

The relationship between digital payments and economic development has received considerable attention in recent years. Humphrey et al. (1996)

argued that electronic payment systems reduce the cost of payment processing and improve the efficiency of financial markets. Hasan et al. (2013) found that greater use of electronic payment instruments positively influences GDP, trade, and household consumption across European economies. Similarly, Zandi et al. (2013) reported that increased use of electronic payments contributes to higher consumption, economic output, and employment. In the Indian context, Google and Boston Consulting Group (2019) projected that digital payments could make a substantial contribution to India's GDP while creating employment opportunities, particularly in the micro, small, and medium enterprise (MSME) sector. Recent reports of the RBI (2024) and NPCI (2024) also highlight the rapid increase in both the value and volume of digital payment transactions, with UPI emerging as the dominant retail payment platform in the country.

Although a substantial body of literature exists on digital payments, most studies have focused on consumer adoption, technology acceptance, financial inclusion, cybersecurity, and behavioural aspects of digital payment usage. Comparatively fewer studies have examined the changing composition of India's digital payment ecosystem by analysing the relative contribution of different payment platforms over time. Since each payment system performs a distinct role and has grown at a different pace, understanding their changing contribution is important for assessing the overall impact of digital payments on the Indian economy. Such an analysis provides valuable insights into the structural transformation of India's payment system and the growing importance of digital financial infrastructure.

Against this background, the present study examines the magnitude of the impact of digital payment platforms on the Indian economy by analyzing the trends and changing composition of major retail payment systems operating through the National Payments Corporation of India (NPCI). Using secondary data collected from the Reserve Bank of India, NPCI, and scheduled banks, the study analyses digital payment transactions in terms of both transaction value and transaction volume and evaluates the changing contribution of major payment platforms, including UPI, IMPS, NFS, NACH, CTS, AEPS, BBPS, RuPay, and NETC. The findings of the study are expected to provide useful insights for

policymakers, financial institutions, researchers, and other stakeholders regarding the role of digital payment systems in promoting sustainable and inclusive economic growth in India.

II. LITERATURE REVIEW

The economic implications of digital payment systems have received increasing attention in recent years. Early empirical evidence by Humphrey et al. (1996) showed that replacing paper-based payment instruments with electronic payment systems reduces transaction costs and improves the efficiency of financial markets. Extending this work, Hasan et al. (2013) found that greater use of electronic retail payments contributes positively to GDP, trade, and household consumption by improving the efficiency of financial intermediation.

Patra and Sethi (2024), using panel data for emerging economies, found that digital payments have a significant positive impact on economic growth, particularly in countries with stronger institutional quality and higher consumption expenditure. Their study highlights that digital payment systems promote economic development by strengthening financial intermediation and supporting productive economic activities. Similarly, Purushotham (2023) examined India's retail payment system and reported both short-run and long-run relationships between retail digital payments and GDP, indicating that the expansion of digital payments contributes to sustained economic growth.

Agarwal et al. (2024) used India's 2016 demonetisation as a natural experiment and found that consumers who shifted towards digital payments significantly increased their spending. The study concluded that digital payment systems reduce dependence on cash and encourage greater consumer expenditure through improved payment convenience. Fouillet et al. (2021) argued that demonetisation accelerated the adoption of digital payment systems, although unequal access to digital infrastructure continued to limit their benefits across regions. In contrast, Yadav and Das (2025) found that the COVID-19 pandemic had a stronger and more sustained effect on digital payment adoption than demonetisation, while internet penetration and smartphone availability remained important determinants of digital payment usage.

Recent literature has increasingly focused on the Unified Payments Interface (UPI), which has transformed India's retail payment ecosystem. Gupta et al. (2025) found that regional income inequality significantly influences UPI adoption, suggesting that the benefits of digital payments are not evenly distributed across districts. Motheram and Buteau (2026) further reported that merchant acceptance infrastructure and digital connectivity are key factors supporting the long-term growth of the UPI ecosystem. These findings indicate that the expansion of digital payments depends not only on technological innovation but also on the availability of supporting infrastructure.

The existing literature confirms that digital payments improve payment efficiency, stimulate economic activity, and strengthen financial inclusion. However, most studies focus on consumer adoption, payment behaviour, or the economic effects of a single payment instrument, particularly UPI. Comparatively little attention has been given to analysing the changing contribution of different payment platforms within India's retail payment system. The present study addresses this gap by examining the relative contribution of NFS, NACH, CTS, IMPS, RuPay, AEPS, BBPS, UPI, and NETC in terms of both transaction value and transaction volume, thereby providing a comprehensive assessment of the structural transformation of India's digital payment ecosystem.

III. OBJECTIVE

- To analyse the growth and trends of digital payment transactions in India.
- To assess the magnitude of the contribution of major digital payment platforms to India's retail payment system in terms of transaction value and transaction volume.

IV. MATERIALS AND METHODS

4.1 Research Design

The present study adopts a descriptive and analytical research design to examine the growth and structural transformation of India's digital payment ecosystem. The analysis is based on secondary time-series data and focuses on the performance of major retail payment systems in India.

4.2 Data Source

The study is based entirely on secondary data collected from authentic and publicly available sources. Data on transaction value and transaction volume of digital payment systems were obtained from the Reserve Bank of India (RBI), primarily from the Database on Indian Economy (DBIE), RBI Annual Reports, and publications on payment and settlement systems. Additional information relating to the Unified Payments Interface (UPI), participating banks, and the market share of major UPI applications was obtained from the National Payments Corporation of India (NPCI).

4.3 Study Period

The study covers the period from 2014-15 to 2022-23. This period was selected because it captures the rapid expansion of India's digital payment ecosystem following major policy initiatives such as Digital India, Demonetisation (2016), and the accelerated adoption of digital payments during the COVID-19 pandemic.

4.4 Coverage of Payment Systems

The analysis encompasses nine major retail payment systems operating in India, namely National Financial Switch (NFS), National Automated Clearing House (NACH), Cheque Truncation System (CTS), Immediate Payment Service (IMPS), RuPay, Aadhaar Enabled Payment System (AEPS), Bharat Bill Payment System (BBPS), Unified Payments Interface (UPI), and National Electronic Toll Collection (NETC). These payment systems collectively represent the core components of India's retail digital payment infrastructure.

4.5 Data Analysis

The collected data were analysed using descriptive statistical techniques. Trend analysis was employed to examine the growth of digital payment transactions over the study period in terms of both transaction value (₹ crore) and transaction volume (million transactions). Further, percentage share analysis was used to assess the relative contribution of each payment platform to the overall retail payment system. Comparative analysis across payment platforms was undertaken to identify changes in their relative importance and to examine the structural transformation of India's digital payment ecosystem

over time. The results are presented through tables and graphical illustrations for ease of comparison and interpretation.

V. RESULTS AND DISCUSSIONS

5.1 Growth Trends in Digital Payment Transactions in India

Figure 1 illustrates the trend in the total value and total volume of digital payment transactions in India during the period 2017-18 to 2022-23. The findings reveal a remarkable expansion in both the value and volume of digital payments, reflecting the rapid transformation of India's retail payment ecosystem.

The total value of digital payment transactions increased from ₹1,962 lakh crore in 2017-18 to ₹3,434 lakh crore in 2022-23, representing an overall increase of approximately 75 per cent during the study period. The growth was particularly pronounced between 2017-18 and 2019-20, when transaction value rose from ₹1,962 lakh crore to ₹2,953 lakh crore, indicating rapid adoption of digital payment platforms following major policy initiatives promoting a less-cash economy. Although the pace of increase moderated during 2020-21 and 2021-22, transaction values continued to rise, suggesting sustained confidence in digital payment systems despite disruptions associated with the COVID-19 pandemic. The substantial increase to ₹3,434 lakh crore in 2022-23 reflects the continued expansion of digital financial infrastructure, increasing merchant acceptance, and the widespread integration of real-time payment platforms into routine economic transactions.

A similar but even more pronounced trend is observed in the volume of digital payment transactions. The total transaction volume increased from 2,071 crore transactions in 2017-18 to 15,576 crore transactions in 2022-23, representing an increase of more than seven-fold over six years. Transaction volume grew steadily throughout the study period, with a particularly sharp acceleration after 2020-21. This rapid increase indicates that digital payments have become increasingly embedded in everyday consumer behaviour, particularly for low-value and high-frequency transactions. The expansion of Unified Payments Interface (UPI), improvements in internet connectivity, increased smartphone penetration, enhanced interoperability among payment systems, and supportive policy initiatives by the Reserve Bank

of India (RBI) and the Government of India have collectively contributed to this remarkable growth. The simultaneous increase in both the value and volume of digital payment transactions demonstrates not only a higher frequency of digital transactions but also a substantial rise in the monetary value processed through digital payment platforms. These findings

provide strong evidence of the increasing maturity, efficiency, and resilience of India's digital payment ecosystem, reinforcing its growing contribution to financial inclusion, payment system efficiency, and the country's transition towards a digitally driven economy.

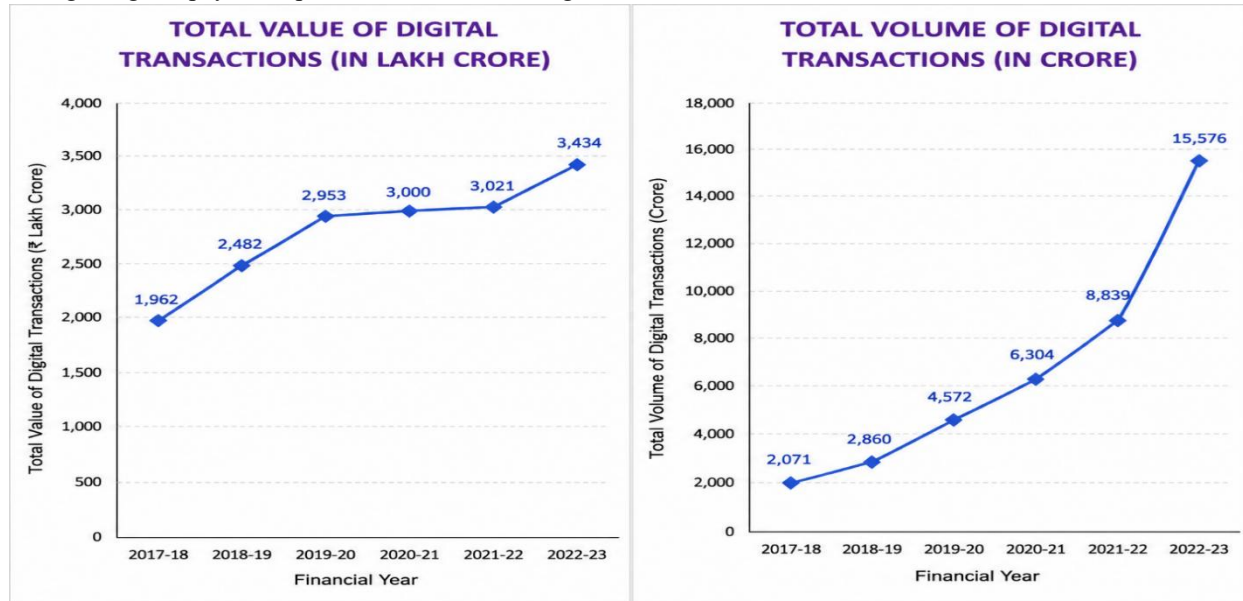


Figure 1. Growth Trends in Digital Payment Transactions in India: Value and Volume (2017–18 to 2022–23)

Source: RBI, NPCI and banks

5.2 Retail Payment Transactions by Value (Table 1 & Figure 2)

Table 1 : Retail Payments Transactions on Payments Corporation of India (NPCI) Platform : Value (%share in total: 2014-15:to 2022-23)									
Particular	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
National Financial Switch (NFS)	10.92	11.72	11.2		11.06	10.04	9.05	6.72	5.33
National Automated Clearing House (NACH)	1.57	4.36	7.46	8.59	9.79	10.96	11.5	9.26	9.33
CTS cheque clearing (processed volume)	86.73	81.96	76.62	69.97	59.64	49.2	33.84	27.37	22.71
IMPS	0.76	1.9	4.26	7.86	11.63	14.53	17.77	17.77	17.44
RuPay card usage at (POS)	0.01	0.05	0.3	0.43	0.59	0.71	0.71	0.63	0.53
RuPay card usage at (eCom)	0	0.01	0.06	0.15	0.27	0.38	0.56	0.41	0.26
AEPS (inter bank) transaction over micro ATM (e.g. Cash withdrawal/Cash deposit)	0	0	0.02	0.24	0.5	0.74	1.38	1.31	1.1
BBPS (bill payment passing through BBPCU)	0	0	0	0.01	0.07	0.13	0.26	0.49	0.63
Unified Payments Interface (UPI)	0	0	0.07	0.97	6.41	13.25	24.79	35.88	42.5
National Electronic Toll Collection (NETC)	0	0	0.01	0.03	0.04	0.07	0.14	0.16	0.17
Financial transactions	100	100	100	100	100	100	100	100	100

Source: RBI, NPCI and banks

Table 1 presents the percentage share of major retail payment platforms in the total value of retail payment transactions in India during the period 2014-15 to 2022-23. The findings indicate a fundamental transformation in the country's retail payment landscape, characterised by a gradual shift from conventional payment instruments to digitally enabled payment systems. Among the traditional payment channels, the share of Cheque Truncation System (CTS) declined markedly from 86.73 per cent in 2014-15 to 22.71 per cent in 2022-23, reflecting the diminishing reliance on cheque-based transactions.

In contrast, digital payment platforms recorded substantial growth over the study period. The most notable expansion was observed in the Unified Payments Interface (UPI), whose share increased from a negligible level in 2014-15 to 42.50 per cent in 2022-23, making it the largest contributor to the total value of retail payment transactions. Likewise, the share of Immediate Payment Service (IMPS) increased consistently from 0.76 per cent to 17.44 per cent, while National Automated Clearing House (NACH)

expanded from 1.57 per cent to 9.33 per cent, indicating the increasing preference for electronic and real-time fund transfer mechanisms. Conversely, the contribution of the National Financial Switch (NFS) declined from 10.92 per cent to 5.33 per cent, suggesting a gradual reduction in the relative importance of ATM-based transactions.

Although RuPay, AEPS, BBPS, and NETC exhibited steady growth during the study period, their individual contributions to the overall transaction value remained comparatively modest. Collectively, these trends underscore the rapid evolution of India's retail payment ecosystem, driven by technological advancements, supportive regulatory initiatives, expanding digital infrastructure, and increasing consumer preference for secure, convenient, and real-time digital payment solutions. The dominance of UPI by the end of the study period highlights its pivotal role in reshaping the country's payment architecture and accelerating the transition towards a digitally integrated economy.

Figure 2: Retail Payments Transactions on Payments Corporation of India (NPCI) Platform : Value (% share in total: 2014-15:to 2022-23)

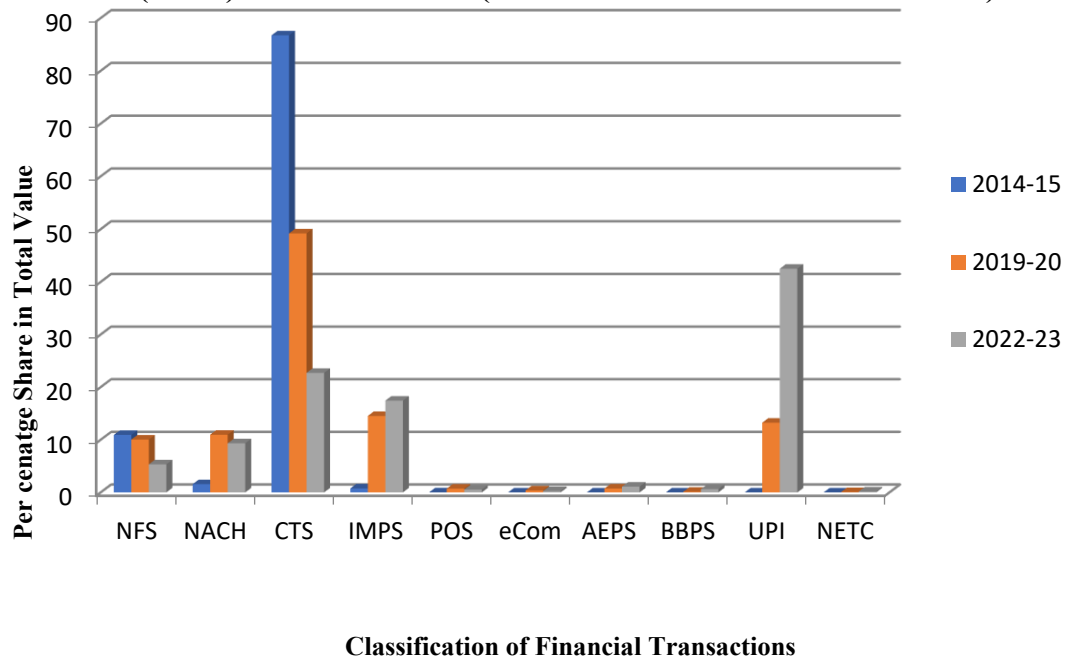


Figure 2 illustrates the changing composition of retail payment transaction value across major NPCI platforms during 2014-15, 2019-20, and 2022-23. The figure clearly highlights the declining share of CTS and the remarkable rise of UPI and IMPS over the study period. While CTS remained the dominant payment channel in 2014-15, its share declined

substantially by 2022-23, whereas UPI emerged as the leading retail payment platform. The increasing shares of IMPS and NACH further reflect the growing preference for digital and real-time payment systems, indicating a significant shift in India's retail payment ecosystem from traditional to technology-driven payment instruments.

5.3 Retail Payment Transactions by Volume (Table 2 & Figure 3)

Table 2 : Retail Payments Transactions on Payments Corporation of India (NPCI) Platform : Volume (% Share in Total: 2014-15 to 2022-23)									
Particular	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
National Financial Switch (NFS)	53.92	44.4	36.66		20.04	13.62	8.44	5.25	3.59
National Automated Clearing House (NACH)	7.37	21.8	22.76	17.41	14.27	10.75	8.36	5.29	4.33
CTS cheque clearing (processed volume)	21.03	14.4	12.86	8.34	5.55	3.27	1.54	0.97	0.63
IMPS	1.78	3.46	5.86	7.4	8.74	8.15	7.56	6.45	5.02
RuPay card usage at (POS)	0.12	0.4	2.26	3.37	3.47	2.6	1.62	1.17	0.79
RuPay card usage at (eCom)	0.02	0.16	1.01	1.53	2.16	2.08	1.57	0.93	0.38
AEPS (inter bank) transaction over micro ATM (e.g. Cash withdrawal/ Cash deposit)	0	0.01	0.19	0.78	1.27	1.38	2.22	1.57	1.14
BBPS (bill payment passing through BBPCU)	0	0	0	0.08	0.37	0.46	0.64	0.92	0.93
Unified Payments Interface (UPI)	0	0	0.21	6.71	26.71	39.54	51.47	63.6	70.54
National Electronic Toll Collection (NETC)	0	0	0.27	0.93	1.27	1.84	3.06	3.38	2.97
Financial transactions (A)	84.24	84.61	82.54	72.26	83.84	83.68	86.47	89.52	90.32
Non-financial transactions (B)	15.76	15.39	17.46	27.74	16.16	16.32	13.53	10.48	9.68
Total transactions (A+B)	100	100	100	100	100	100	100	100	100

Source: RBI, NPCI and banks

Table 2 presents the percentage share of major NPCI retail payment platforms in terms of transaction volume during 2014-15 to 2022-23. The results reveal a significant structural transformation in India's retail payment ecosystem, characterised by a rapid shift towards digital payment platforms. The share of UPI increased dramatically from a negligible level in 2014-15 to 70.54 per cent in 2022-23, establishing it as the dominant retail payment channel by transaction

volume. In contrast, the shares of traditional payment instruments, particularly NFS and CTS, declined substantially from 53.92 per cent to 3.59 per cent and 21.03 per cent to 0.63 per cent, respectively. Although NACH, IMPS, RuPay, AEPS, BBPS, and NETC contributed to the expansion of digital payments, their shares remained relatively modest compared to UPI. Furthermore, the proportion of financial transactions increased from 84.24 per cent to 90.32 per cent, while

non-financial transactions declined from 15.76 per cent to 9.68 per cent, indicating greater utilisation of digital payment platforms for actual financial transactions. Overall, the findings demonstrate the

increasing dominance of real-time digital payment systems and highlight the transformative role of UPI in reshaping India's retail payment landscape.

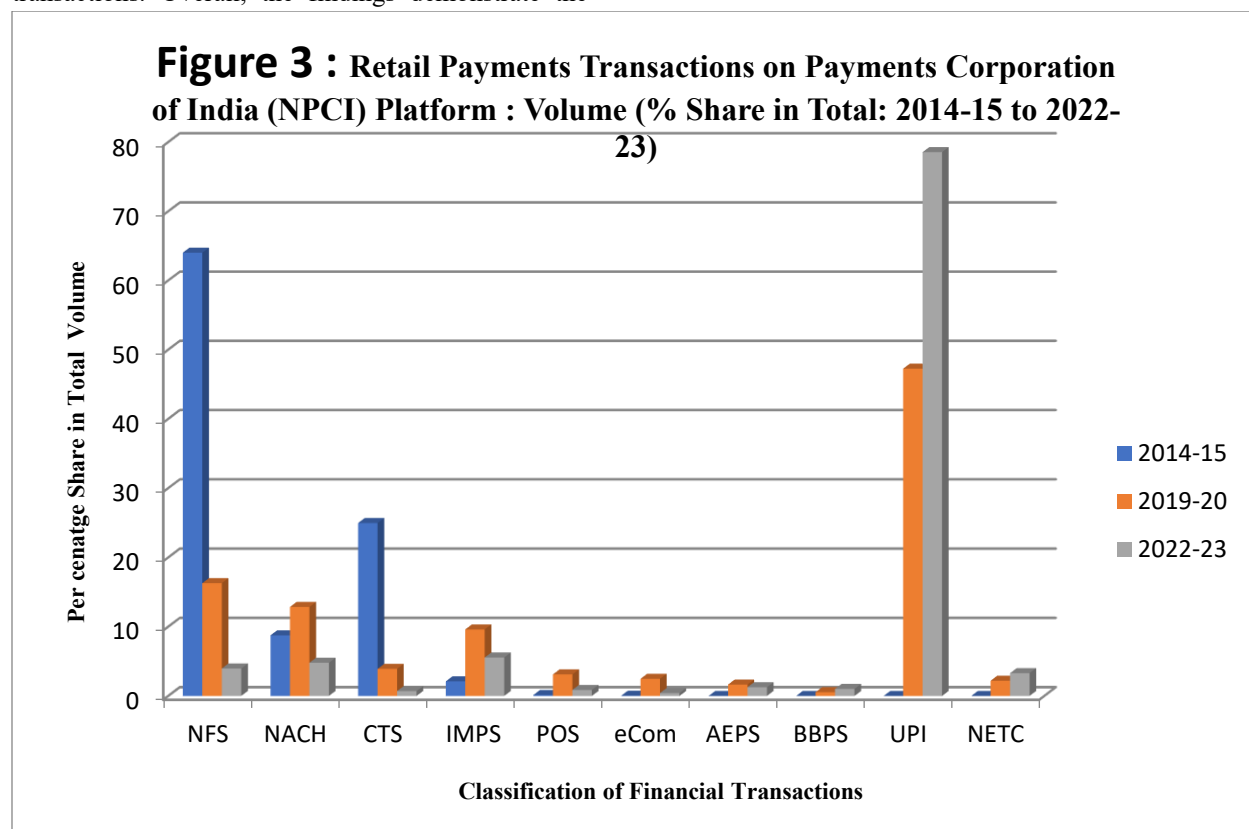


Figure 3 illustrates the changing composition of retail payment transaction volume across major NPCI payment platforms during 2014-15, 2019-20, and 2022-23. The figure highlights a pronounced shift in transaction volume from conventional payment channels towards digital payment platforms. The share of UPI increased remarkably over the study period, emerging as the dominant payment system by 2022-23. In contrast, the relative shares of NFS and CTS declined substantially, indicating a reduced reliance on ATM-based and cheque-based transactions. Although NACH, IMPS, AEPS, BBPS, RuPay, and NETC also contributed to the expansion of digital payments, their shares remained comparatively modest. These trends reflect the progressive transformation of India's retail payment architecture, characterised by the widespread adoption of real-time digital payment systems and the growing centrality of UPI in facilitating high-frequency retail transactions.

5.4 Policy Implications and Discussion

The findings of the study demonstrate that India's retail payment ecosystem has undergone a profound structural transformation, characterised by a rapid shift from conventional payment instruments to digital payment platforms. The sustained increase in both the value and volume of digital payment transactions reflects the growing acceptance of digital payment systems across individuals, businesses, and government institutions. In particular, the emergence of the Unified Payments Interface (UPI) as the dominant retail payment platform highlights the effectiveness of India's digital public infrastructure in facilitating secure, low-cost, and real-time financial transactions. These findings are consistent with the observations of Hasan et al. (2013), Purushotham (2023), and Patra and Sethi (2024), who reported that efficient digital payment systems enhance payment efficiency, strengthen financial intermediation, and contribute to overall economic growth.

The declining contribution of traditional payment instruments such as the Cheque Truncation System (CTS) and the National Financial Switch (NFS), coupled with the rapid expansion of UPI, IMPS, and NACH, reflects changing consumer preferences towards faster, interoperable, and technology-driven payment mechanisms. The widespread adoption of these platforms has improved the efficiency of retail payment systems by reducing transaction time, lowering operational costs, and enhancing the accessibility of digital financial services. Furthermore, the increasing share of financial transactions relative to non-financial transactions indicates the growing integration of digital payments into routine economic activities.

From a policy perspective, the findings suggest that sustaining the growth of digital payments will require continued investment in digital infrastructure, cybersecurity, payment interoperability, and digital financial literacy. Expanding merchant acceptance in rural and semi-urban areas, strengthening consumer protection mechanisms, and ensuring secure and inclusive access to digital financial services will further enhance the resilience and efficiency of India's payment ecosystem. Such measures are likely to deepen financial inclusion, promote formalisation of economic activities, improve transaction transparency, and support the country's transition towards a digitally empowered economy.

VI. CONCLUSION

The study provides a comprehensive assessment of the growth and structural transformation of India's retail payment ecosystem by analysing the changing contribution of major digital payment platforms. The findings highlight the increasing prominence of technology-driven payment systems in India's financial landscape and underscore their role in supporting a more efficient, accessible, and digitally integrated payment ecosystem. The study contributes to the existing literature by documenting the evolving composition of retail payment platforms using recent secondary data and offers useful insights for policymakers, financial institutions, and other stakeholders. Sustained investment in digital infrastructure, cybersecurity, payment interoperability, and digital financial literacy will be essential to ensure

the continued growth, resilience, and inclusiveness of India's digital payment ecosystem.

VII. LIMITATIONS OF THE STUDY

The present study is based exclusively on secondary data and adopts a descriptive analytical approach to examine the growth and changing composition of India's digital payment ecosystem. Consequently, it does not establish causal relationships between the expansion of digital payment systems and macroeconomic outcomes. Future research may employ econometric techniques using longer time-series or panel data to examine the impact of digital payments on economic growth, productivity, employment, financial inclusion, and consumer welfare.

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