



Role of Bank Participation in the Growth of UPI and IMPS in India's Digital Payment System

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Abstract: The contemporary study examined the banks participation on India's UPI and IMPS services during the period from 2016-17 to 2025-26, focusing on their complementary nature in India's digital payment system. The research design has been empirical in nature by using secondary data. Statistical assumptions such as Pearson Correlation and Linear Regression equation modelling have been used in this study to analyse the interrelationships among bank participation, transaction amount and volume. Findings of the study signify that there is strong positive correlation among the variables and there is significant effect of bank participation with volume and value of transactions in which the null statements were rejected in UPI and IMPS conditions. The study concludes, that UPI leads in the growth of more volume and small amount of retail transactions but IMPS continued to sustain the stabilized growth with support of high-value settlements.

Key words: Bank Participation, Digital payments, Immediate Payment Services (IMPS), Financial Inclusion, Transaction Volume & Transaction Value and Unified Payments Interface (UPI)

1. Introduction

1.1 Background of the Study

India has become a pioneer in the world of digital payments over the past few years owing to the rapid development of Financial Technology (FinTech) [1],[15],[33],[46],[47],[59]. Unified Payments Interface (UPI), and Immediate Payment Service (IMPS) are the foremost payment methods in India managed by the National Payments Corporation of India (NPCI) [17], [23], [34], [35], [46]. They have transformed the payment experience for consumers by providing fast and hassle-free transactions. Around 19.78 billion transactions worth of ₹24.77 lakh crore directed over UPI in March 2025 [11],[12],[28],[32],[42],[43],[48]. In this context, surge in the number of transactions through UPI and the transaction volume has surpassed by 24,161 crores with a transaction worth of more than ₹314 lakh crore in a year as per the forecast made for FY2025-26. Moreover, at the time of introduction of UPI in 2016, only 21 banks participated, however,

there has been an increased up to 703 in the month of March 2026[34],[35],[42],[43]. The complete jump in aforesaid data suggests that relevance of banks has been critical in bringing the digital payment system to the India's mainstream and ensuring its scalability and accessibilities. Meanwhile, IMPS remains an important facilitator for real-time inter-bank fund transfers as an infrastructural player. While UPI has gained popularity more than IMPS, the UPI technology was developed using IMPS settlement infrastructure [11], [12], [40], [52], [58]. But, in recent times, the IMPS transaction volume has remained stated to relatively sluggish and even in decline in relation to the phenomenal growth of UPI. This evolving nature of the UPI-IMPS relationship is an interesting research question to examine whether expanding bank participation is beneficial for both the systems equally, or whether it is giving more preference to system expansion of UPI compared to system expansion of IMPS. A key progress of the current era is the mounting of digital payment in low value transactions in the retail sector.

According to RBI reports, while UPI now accounts for almost 85% of India's total payment transactions, it has a comparatively lower percent of payment transaction value, as it functions mainly in the small-ticket retail payments category. The fading in the average ticket size of UPI outflows advocates that digital expenditures are no longer to urban consumers or huge transactions, but are becoming a part of everyday economic activities like grocery shopping, travel, paying utility bills and small merchants' transactions. Even with this notable growth, there are several issues in the working and structure of the digital payment ecosystem in India [8], [21], [26], [33], [59]. The key issues include the increased risk of cyber fraud and transaction security with the fast pace of digital adoption. In an effort to curb fraud and phishing payment requests, NPCI has called the halt to several P2P collect request methods from October 2025, along with the removal of the use of QR codes for pull transactions. NPCI has declared that it will discontinue a few person-to-person collect request methods from October 2025, and remove the use of QR codes for pull transactions, as part of a strategy to address phishing payment requests and fraud [18], [47], [48], [57]. In addition, transaction declines, downtime with banks, delayed settlements and interbank compatibility problems persist, impacting payment effectiveness and customer trust. As transaction volumes increase, the issues of failed UPI transactions, delayed credits, and server instability have also become more evident, as reported by users [2], [39], [44], [51]. Diverse theories supportive the research that includes network externality theory, technology acceptance model (TAM), innovation diffusion theory, and financial intermediation theory. These theories used in the study to debate the role made by the banks in the cumulative use of UPI and IMPS. As per the notion of network externality, the higher the number of contributors on the platform, the advanced would be the value of the platform itself. The quick increase in transactions after the increase in the number of banks

participating in UPI is a clear example of network externality [1], [14], [50]. Second, Technology Adoption Model by Fred Davis suggests that users adopt technology systems driven by two factors, namely, Perceived effectiveness and convenience of use. Both UPI and IMPS have been accepted widely because both of these technologies offer immediate transfer facilities, interoperability, low-cost transactions, and easy-to-use payments via mobile apps and QR code systems. The involvement of banks in this regard facilitates the adoption of such technologies because consumers have greater trust in digital payment systems offered by banks [9]. Next, According, to Everett Rogers' Diffusion of Innovations Theory, innovation diffusion is the process by which innovations spread through a social system over time. This theory is evident in the diffusion of the UPI network, which grew from 21 banks in 2016 to over 700 banks in 2026. Demonstration effects from early adopters among the commercial banks motivated other banks, including cooperative banks and regional rural banks, to join the UPI network. Digital payments expanded to reach semi-urban and rural areas, leading to financial inclusion and behavioral change towards cashless payment methods [49].

Lastly, The Financial Intermediation Theory elucidates the role of banks as financial intermediaries, which facilitate effective financial transactions among economic actors. Digital payment systems rely on banks as infrastructure facilitators for facilitating payment validation, settlement of payments, payment transactions, and cybersecurity. Increased involvement of banks in digital payment systems increases efficiency of transactions, lowers settlement costs, and facilitates scalability of payments. Thus, success and scalability of UPI and IMPS depend on banks' involvement [17], [27], [39], [46]. Thus, the combination of theoretical frameworks makes it clear that the involvement of banks is not just an organizational factor, but rather a key variable affecting the growth of transaction volume, growth of transaction values, trustworthiness, interoperability, financial inclusion, and the general development of UPI and IMPS in India. These theoretical frameworks serve as an excellent foundation to investigate the empirical relationship between bank involvement and the performance of India's digital payments systems. The present study which seeks to driven the integration of the increased participation of banks as a major determinant of transaction volumes and values on the growth of India's digital payment system.

1.2 Review of Literature

Several studies have addressed the fast adoption of digital payments in India, specifically considering UPI and IMPS as the prime drivers for financial transformation. Gopinath et al. showed that UPI performed better than IMPS and NFS in terms of transaction volume and value, even post-COVID-19 [14]. According to Singh et al., the majority of the payments were made through digital methods, where UPI had emerged as a dominant mode

for credit transactions [54]. In another study, Pawar and Kumar noted the exponential increase in UPI (more than 1450%) compared to IMPS' importance in higher value transactions [40]. According to Surya and Paramasivan, UPI was expanding at a higher CAGR than IMPS because of increased smartphone usage and supportive policies [56]. Verma pointed UPI's ability to conduct real-time and interoperable transactions [58]. Narayanan considered demonetization as an important factor responsible for the fast adoption of digital payments [31]. Kaur and Pathak noted the outcome of trust, convenience, and security on the diffusion of UPI [21]. Gupta and Arora discussed how FinTech innovations contributed to the growth of digital payments [15]. Mishra highlighted the contribution of UPI towards enhancing financial inclusion [26]. IMPS continued to be essential for high-value instant transfers, as per Sharma and Singh [52]. Reddy noted that portable payment applications have cut down the dependence on cash [45]. Banerjee made interoperability and regulation very important [3]. According to Sinha and Bhattacharya, digital payments increase transparency and help cut down the informal economy [55]. Agarwal et al. talked about the significance of government interventions like Digital India [1]. Jain and Kulkarni made AI-driven fraud detection mandatory [18]. Das highlighted the significance of mobile banking in increasing financial inclusion [8]. Iyer reviewed the history and regulatory developments of India's payment system [17]. Patel described banking evolution due to digitalization [39]. Roy conducted an analysis of growth patterns and reiterated the prevalence of UPI [50]. Saha focused on integrating FinTech with conventional bank networks [51]. Chatterjee discussed the significance of FinTech in emerging countries [7]. As per Dutta, UPI has had a significant impact on MSMEs through low-cost transactions [10]. Chakraborty established a connection between digital payments and efficiency/growth [6]. Kapoor identified recent trends in banking digitization [20]. Nair's study is centered on the advance of UPI system [30]. In conclusion, from the review of the prevailing works and empirical evidence, it is found that both UPI and IMPS play unique and complimentary roles in the digital payment architecture of India. While the former is mostly concerned with high-frequency low-value transactions, wherein most applications of the system use peer-to-peer and peer to merchant type of transactions, it is important for the digital payments structure of country arising from the widespread acceptance among people and inclusive character of its operations. IMPS displays lower transaction volumes but higher average transaction values, indicating its continued importance in high value, time-sensitive fund transfer needs, such as corporate transactions and urgent interbank transactions. This is further demonstrated by the different growth trends, where UPI demonstrates exponential growth in transaction volumes, while IMPS continues to show stability in transaction volumes.

The purpose of the investigation is to analyze the domination of UPI in the context of Indian digital payments and the history of the development of UPI and IMPS throughout the years. Furthermore, the study attempts to explore the impact of the presence of banks in transactions by analyzing the effect of banking participation on the volume of payments in terms of frequency and amount in the UPI and IMPS.

1.3 Research Gap

Scrutiny of the prevailing literature notable that gaps which need further investigation. First, studies like (Gopinath et al., 2022 and Pawar & Kumar, 2024) studied transaction growth through aggregated statistics of monthly or annual transactions but fail to incorporate the independent variable that indicates the number of participating banks, thus leaving out an essential institution-based factor [14], [40]. Secondly, while certain comparative trend-based studies of digital payment modes in (Singh et al., 2024 and Surya & Paramasivan, 2025), these studies fail to provide correlation or coefficient measures for association between the number of banks and transaction volume or value and regression analysis to find explanatory power [54], [56]. Third, studies on growth percentages for both volume and value have been provided separately, however, there is a lack of literature that provides information on how these two factors interact within one cohesive statistical model. Finally, there is no existing literature with a year-by-year analysis of the entire period 2016-17 to 2024-25, thereby making it difficult to analyze the changes in structure both before and after such major events as demonetization and COVID-19. The study links that gap using Pearson correlation analysis and regression analysis on the longitudinal data and thereby providing a clearer picture of the effect of bank involvement in digital outflows in India.

1.4 Statement of the problem

The swift development of digital platform in India through the implementation of UPI and IMPS has revolutionized the model of financial intermediation due to instant and convenient transactions at a low cost in an interconnected system. However, despite this impressive development in India, inadequate attention has been devoted to the drivers behind these successes regarding of sustained performance and growth of digital payment systems. It is noted that there is considerable emphasis placed on demand-side variables like user adoption, innovation, and policy incentives, there is relative paucity of discussion about the supply-side determinants, specifically the contribution of banks that facilitate the growth and scalability of networks of users of digital payment systems [1], [15], [26], [33], [46], [47]. In other words, since a digital payment system operates in a network environment, the number of banks involved could affect transaction volumes and values of such digital payment systems. This issue of uncertainty regarding the effect of institutional participation raises the following research question: How important is bank participation in

determining growth and performance of UPI and IMPS, and how does it affect the functional relevance of such systems within the Indian digital payment network?

1.5 Hypotheses for the Study:

Hypothesis for UPI:

H₀₁: No Impact of Participating banks on the UPI transactions Value and Volume.

Hypothesis for IMPS:

H₀₂: No Impact of Participating banks on the IMPS transactions Value and Volume.

2. Research Methodology

The extant research premeditated to analyze the working and efficiency of the FinTech platforms and conducted through evocative analysis under the empirical investigative approach for the year 2016-17 to 2025-26. Geographical scope of study is confined to territory of India. The study is organized on secondary data assembled from sources like papers published in academic journals and official publications like the Reserve Bank of India and NPCI reports. The study grounded Pearson's correlation and linear regression prediction models in establishing statistical results of the independent variables involved such as number of banks involved, and the dependent variables involved such as volume of transactions and value of transactions over a ten-year period.

2.1 EMPIRICAL MODEL EQUATIONS

The pragmatic models explain the investigation of how the bank participation contributories influence the volume and value of digital payment transactions.

Model 1: UPI Volume Growth

This model describes the effect of the involvement of banks on UPI volume growth within the digital payment industry.

$$UPI_VOL_GROWTH_t = \beta_0 + \beta_1 BANK_PART_t + \epsilon_t \quad (1)$$

Where:

- $UPI_VOL_GROWTH_t$ = Growth in UPI transaction volume during period t
- $BANK_PART_t$ = Number of participating banks in UPI during period t
- β_0 = Intercept term
- β_1 = Regression coefficient measuring the effect of bank participation on UPI transaction volume growth
- ϵ_t = Error term

Model 2: UPI Value Growth

This model describes the effect of the involvement of banks on UPI value growth within the digital payment industry.

$$UPI_VAL_GROWTH_t = \beta_0 + \beta_1 BANK_PART_t + \epsilon_t \quad (2)$$

Where:

- $UPI_VAL_GROWTH_t$ = Growth in UPI transaction value during period t
- $BANK_PART_t$ = Number of participating banks in UPI during period t
- β_0 = Constant term
- β_1 = Coefficient indicating the effect of bank participation on UPI transaction value growth
- ϵ_t = Error term

Model 3: IMPS Volume Growth

This model describes the effect of the involvement of banks on IMPS volume growth within the digital payment industry.

$$IMPS_VOL_GROWTH_t = \beta_0 + \beta_1 BANK_PART_t + \epsilon_t \quad (3)$$

Where:

- $IMPS_VOL_GROWTH_t$ = Growth in IMPS transaction volume during period t
- $BANK_PART_t$ = Number of participating banks in IMPS during period t
- β_0 = Intercept term
- β_1 = Regression coefficient showing the impact of bank participation on IMPS transaction volume growth
- ϵ_t = Error term

Model 4: IMPS Value Growth

This model describes the effect of the involvement of banks on IMPS value growth within the digital payment industry.

$$IMPS_VAL_GROWTH_t = \beta_0 + \beta_1 BANK_PART_t + \epsilon_t \quad (4)$$

Where:

- $IMPS_VAL_GROWTH_t$ = Growth in IMPS transaction value during period t
- $BANK_PART_t$ = Number of participating banks in IMPS during period t
- β_0 = Constant term
- β_1 = Coefficient measuring the impact of bank participation on IMPS transaction value growth
- ϵ_t = Error term

3. Results And Discussion

Table 1: Market Share of UPI applications as of March 2025-26

UPI Application	Market Share (in %)
Phone Pe	48.40
Google Pay	36.90
Pay-TM	6.90

Navi	1.40
CRED	0.80
Super Money	0.70
Amazon Pay	0.60
Others	4.20

(Source: Compiled from NPCI reports, 2026)

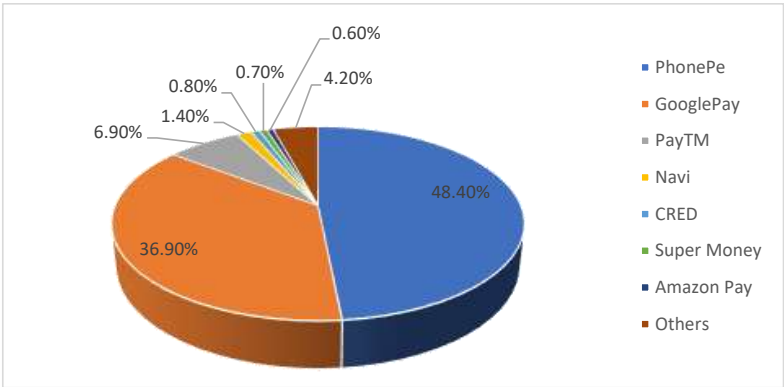


Figure 1: Market Share of UPI as at March 2025-26

Figure 1 exhibits the UPI ecosystem in India, as mentioned in March 2025-26, which is still very concentrated, with the share of Phone Pe and Google Pay exceeding 85 percent of the market share, with 48.40 percent and 36.90 percent, respectively. Paytm is the third player at 6.90 percent, which shows a substantial difference in the choices of the people. New entrants, such as Navi (1.40 percent), CRED (0.80 percent), Super Money (0.70 percent), and Amazon Pay (0.60 percent), have retained their marginal shares, which means low penetration into the market. The remaining 4.20 percent is shared among other small players. This distribution highlights a duopoly within the field of UPI, supported by smooth incorporation, brand reliance, and engagement with the two leading platforms.

Table 2: Participating Banks live on UPI with Volume and Value of Transactions

Year	No. of Banks on UPI	Growth (%)	Volume (in Mn)	Growth (%)	Value (in Cr.)	Growth (%)
2016-17	44	—	17.86	—	6,952.14	—

2017-18	91	106.82	904.87	4,964.84	1,09,831.80	1,479.77
2018-19	142	56.04	5,391.52	495.58	8,76,970.72	698.61
2019-20	148	4.23	12,518.61	132.21	21,31,730.14	143.09
2020-21	216	45.95	22,330.65	78.34	41,03,653.58	92.45
2021-22	314	45.37	45,967.53	105.9	84,17,572.48	105.13
2022-23	399	27.07	83,751.14	82.2	1,39,20,676.35	65.33
2023-24	572	43.36	1,31,129.83	56.53	1,99,95,085.51	43.66
2024-25	661	15.56	1,85,866.02	41.74	2,60,56,954.65	30.37
2025-26	705	6.66	2,41,616.88	30	3,16,22,249.71	21.36

(Source: Compiled from NPCI reports, 2026)

The Table 2 displays the Participating Banks live on UPI with transactions Volume and Value. In following years, since in launching stage of UPI in August 2016, there are only 44 banks in the early stage of roll-out as it recorded low transaction volume of 17.86 million valued at 6,952.14 Cr in 2016-17. Following the demonetization effect and intense promotion in 2017-18, the participants from the banks have grown by 106.82 percent, volume grew by 4,964.84 percent, and value grew by 1,479.77 percent. After 2018-19, with the advent of Google Pay, Phone-Pe, and Paytm UPI, volumes have grown by 495.58 percent and values by 698.61 percent, besides 56.04 percent growth from participating banks. Further, by 2019-20, with the integration of QR codes and merchants, the banks' participation increased by merely 4.23 percent but usage grew by more than double in terms of value and volumes by 132.21 percent and 143.09 percent. Contactless payments received more attention during the pandemic year of 2020-21 with a growth of 45.95 percent in the participation of banks, increase in volume 78.34 percent and increase in value 92.45 percent. UPI 2.0 was launched in 2021-22 with an increase of 45.37 percent of banks and volume doubling and value increasing 105.90 percent and 105.13 percent, respectively. In 2022-23, with the support of Digital India and Aadhaar-based facilities, the volume and value peaked to 82.20 percent and 65.33 percent, respectively and the number of banks grew 27.07 percent. In 2023-24, the contribution of tourists, credit cards linked with UPI, wallet interoperability resulted in the number of participating banks increasing 43.36 percent and volume and value growing 56.53 percent and 43.66 percent, respectively. Ultimately, in 2024-25, as a result of international partnerships in UPI transactions and recurrent payments, the number of participating banks decreased to 15.56 percent, although volume and value increased 41.74 percent and 30.37 percent, respectively. In the year 2025-26, the involvement of banks is expected to decrease by 6.66 percentage, volume is expected to be 30 percentage and value to increase by 21.63 percentage.

Table 3: Participating Banks live on IMPS with Volume and Value of Transactions

Year	No. of Member Banks on IMPS	Growth (%)	Volume (in Mn)	Growth (%)	Value (in Cr)	Growth (%)
2016-17	236	76.12	506.85	129.59	4,11,860.62	153.87
2017-18	341	44.49	1,009.84	99.19	8,92,498.12	116.58
2018-19	498	46.04	1,752.91	73.58	15,90,256.84	78.19
2019-20	573	15.06	2,579.08	47.18	23,37,390.00	46.94
2020-21	638	11.34	3,278.14	27.15	29,41,495.57	25.75
2021-22	644	0.94	4,659.68	42.20	41,68,646.02	41.72
2022-23	713	10.75	5,653.73	21.36	55,86,148.02	33.94
2023-24	867	21.62	6,005.33	6.22	64,93,903.73	16.24
2024-25	945	9.00	5,624.96	-6.32	71,39,109.97	9.94
2025-26	971	2.75	4,943.10	-12.12	76,69,928.98	7.44

(Source: Researcher Compiled from NPCI reports, 2026)

Table 3 represents the Participating Banks live on IMPS with Transactions Volume and Value. The growth experienced during the year 2016-17 was 76.12 percent in terms of banks' membership, and the transaction volume and values grew at 129.59 percent and 153.87 percent, respectively, due to the demonetization policy and faster registration of banks by the government. This trend has persisted in 2017-18, with more growth in banks 44.49 percent and transactions, where the percentage increase is much higher than 116.58 percent and 99.19 percent for the value and volume, respectively, through the penetration of semi-urban and rural communities, as well as increased use of mobile banking services. The growth trend has continued during 2018-19, where the other remaining model has grown substantially with respect to the percentage change of banks 46.04 percent, volume 73.58 percent, and value 78.19 percent. As compared to 2019-20, in which the growth rate in banks was 15.06 percent, volume 47.18 percent, and value 46.94 percent, there was still an increased usage in terms of corporate payrolls, e-commerce payments, and peer-to-peer transfer. In 2020-21 during pandemic time due to COVID-19, the proliferation of digital products was supported, with 11.34 percent growth in the banking sector, 27.15 percent growth in volume, and 25.75 percent growth in value, as customers were adopting cashless payment options. After recovery from pandemic in 2021-22, the bank showed insignificant growth of 0.94 percent, but significant increases in terms of volume and value with growth

rates of 42.20 percent and 41.72 percent, respectively, in terms of recovering economies. In the 2022-23 financial year, with growth in banks 10.75 percent, in volume 21.36 percent, and in value 33.94 percent, B2B transactions, government transactions, and large retail transactions played a key role. Growth in banks 21.62 percent, in volume 6.22 percent, and in value 16.24 percent is vital during 2023-24, which depicts value-driven settlement. As a result of an increase in banks up to 9 percent and value by 9.94 percent, the volume witnessed a fall of 6.32 percent, suggesting that users prefer making fewer and bulk transactions; this can partly be attributed to the fact that UPI handles low-value transactions. The growth of volume for 2025-26 is negative about -12.12 percentage, value at 7.44 percentage but involvement of banking is 2.75 percentage because small retail payments are shifting to the UPI but only high value of transactions retained as bank transfers. This trend highlights the role played by IMPS in transforming itself as one of the wide-based versus high-value business-oriented settlement channels in the Indian digital payment system.

Table 4: Descriptive Statistics of UPI and IMPS

Descriptive Statistics	UPI			IMPS		
	Banks Growth	Volume Growth	Value Growth	Banks Growth	Volume Growth	Value Growth
Mean (%)	39.01	665.47	297.74	17.99	33.14	41.9
Std Deviation	31.51	1619.16	490.86	16.63	36.72	35.57
Standard Error	10.5	539.72	163.62	5.54	12.24	11.86
Maximum (%)	106.82	4964.84	1479.77	46.04	99.19	116.58
Minimum (%)	4.23	30	21.36	0.94	-12.12	7.44

(Source: Data compiled from NPCI reports through SPSS)

Table 4 reports the descriptive statistics of UPI and IMPS growth pattern tendencies which indicate there is a huge disparity between the two digital modes of payment with regards to bank growth, volume growth, and value growth. The mean values for UPI include 39.01% (banks growth), 665.47 percent (volume growth), and 297.74 percent (value growth). Additionally, the standard deviation is 31.51, 1619.16, and 490.86 respectively, while the standard error is 10.5, 539.72, and 163.62 respectively. The largest and smallest observations for UPI also depict a wide range with banks growth being between 106.82 percent and 4.23 percent, volume growth being between 4964.84 percent and 30 percent, and value growth being between 1479.77 percent and 21.36 percent. However, IMPS has

lower average figures of 17.99 percent (Growth in Banks), 33.14 percent (Volume Growth), and 41.90 percent (Growth in Value) with standard deviations of 16.63, 36.72, and 35.57 and standard errors of 5.54, 12.24, and 11.86 respectively. For IMPS, the maximum and minimum figures are relatively close, where Growth in Banks is between 46.04 percent and 0.94 percent, Volume Growth between 99.19 percent and -12.12 percent, and Growth in Value between 116.58 percent and 7.44 percent. In summary, the results reveal that UPI has high growth levels with volatility, whereas IMPS has lower but steady growth levels in India’s digital payments industry.

Table 5: Pearson Correlation Test Results of UPI and IMPS

Variables	UPI Bank Growth	VOL	Variables	IMPS Bank Growth	VOL
UPI Bank Growth	—	-	IMPS Bank Growth	—	-
VOLUME	0.833	—	VOLUME	0.877	—
VALUE	0.863	0.937	VALUE	0.914	0.983

(Source: Data compiled from NPCI reports through SPSS)

Table 5 depicts the Correlation outcomes of UPI and IMPS. The findings from the Correlation estimate confirms that there is indeed very strong constructive relation between UPI bank growth and transaction volume ($r = 0.833$) as well as transaction value ($r = 0.863$). In IMPS, there is identical strong positive relation among bank growth and transaction volume ($r = 0.877$) as well as transaction value ($r = 0.914$). There is a high degree of correlation between transaction volume and transaction value in UPI ($r = 0.937$), while there is very strong correlation in IMPS ($r = 0.983$). Overall, the outcome of all the examined variables moves in the identical direction with high degree of association.

Table 6: Results summary of Regression Analysis of UPI and IMPS

Particulars	UPI		IMPS	
	Volume	Value	Volume	Value
Model	1	2	3	3
R	0.833	0.863	0.877	0.914
R ²	0.695	0.745	0.769	0.836
Sample Size (N)	10	10	10	10

Intercept:				
Estimate	-1005.2	-227.3	2.7	8.88
SE	526.1	145.73	10.766	9.601
t-statistic	-1.91	-1.56	0.251	0.925
p-value	0.098	0.163	0.808	0.382
Predictor:				
Estimate	42.8	13.5	1.68	1.86
SE	10.7	2.97	0.327	0.291
t-statistic	3.99	4.53	5.16	6.38
p-value	0.005	0.003	0.001	0.001

(Source: Data compiled from NPCI reports through SPSS)

(Alpha value=0.05)

Results of regression forecast of UPI and IMPS transactions are provided in table 6. Regression equation of UPI transactions shows that UPI transaction volumes have direct relationship with number of banks involved in transaction when $R=0.833$. Coefficient of determination ($R^2=0.695$) suggests that 69.5 percent changes in UPI transaction volumes can be explained by number of banks operating in the UPI system. The regression slope of UPI is positive and statistically significant ($\beta=42.8$, $t=3.99$, $p=0.005$). That means, an increase in number of transactions occurs with increase in the number of banks operating. For each additional bank operating in UPI platform, the transaction volume increases by 42.8 units. The intercept parameter is statistically not significant with $p=0.098$ in case of volumes and $p=0.163$ in terms of value. Moving on to the UPI value regression model, positive relationship is observed between participation and transaction values, which is represented by $R=0.863$. With the R^2 -value being equal to 0.745, it is apparent that 74.5 percent of UPI Transaction Value variance can be explained by Participation. The regression coefficient is statistically significant and positive ($\beta = 13.5$, $t = 4.53$, $p = 0.003$). It implies that there is a substantial constructive effect of Participation on UPI transaction value. Herein, with each unit increment in the level of participation, the UPI transaction value grows by 13.5 units. The null propositions regarding both UPI Transaction Volume and Value are not accepted due to the presence of statistically significant results.

Concerning the IMPS volume, it is possible to note a positive correlation between the number of participating banks and IMPS transaction volume ($R = 0.877$). With R square equal to 0.769, it means that 76.9 percent of the IMPS transaction volume variance is accounted for by the number of participating banks. The coefficient beta of the IMPS model is positive and highly statistically significant ($\beta = 1.68$, $t = 5.16$, $p < .001$). Increase in participating banks by single unit causes 1.68 units rise in transaction volume. According to results obtained, the IMPS Value Model is highly correlated to the dependent variable with R value of 0.914. This implies that R squared of 0.836 accounts for 83.6 percent of variations in the IMPS transaction value and hence the participating banks exert considerable influence on IMPS transaction value. Regression coefficient is significant ($\beta = 1.86$, $t = 6.38$, $p < 0.001$), indicating the high influence of the participating banks on IMPS transaction value. Coefficient remains insignificant ($p = 0.382$). Thus, the null hypotheses are rejected. From the outcome, it is evident that the number of participating banks effects the growing of both UPI and IMPS transactions.

4. Findings And Practical Implications of the Study

Findings of the current research have practical significance from the perspective of digital payments' implementation in India, taking into account such factors as operational effectiveness, fraud risk management, financial inclusion, and institutional involvement in UPI and IMPS. In particular, as follows from the results of empirical analysis, it can be stated that the involvement of banks positively impacts transaction growth both in UPI and IMPS, enlightening that digital payments require attention not only to technological aspects of the issue but also to operation risk management and institutional involvement. Thus, the positive impact of institutional involvement is manifested by the positive relationship between transaction growth and the number of participating banks in the discussed systems, indicating that greater participation of banks increases interoperability, transaction accessibility, and transaction efficiency as the transactions are settled instantly. Such practical implications are of high importance since, due to greater involvement of banks,

people living in rural, semi-urban, and underserved areas can enjoy safe digital payments using mobile banking, QR-code payments, and agent banking services. High interoperability level provided by NPCI, affordable smartphones, ease of UPI registration process, and low cost of data transfer allow for achieving financial inclusion.

In addition, the results of this study will contribute towards fraud prevention and awareness of transaction security. Security measures such as device fingerprinting, two-factor authentication, PIN verification through encryption technology, PKI encryption, and certified PSP applications from NPCI help in facilitating secure transactions using UPI payment systems. Considering the results from this research concerning the significant impact of transactions because of the higher number of banks involved, it becomes necessary to strengthen the cybersecurity systems. Therefore, the growing transaction volume in any digital payment systems must be complemented by stronger monitoring of frauds, real-time management of fraud risks and awareness campaigns among the customers to mitigate phishing scams, unauthorized pull requests, and transaction failures. Moreover, the findings also have relevance from the consumer protection perspective. With growing transactions in the form of UPI and IMPS, there must be proper mechanisms of dealing with disputes through systems such as BCS-IMPS, URCS, the Ombudsman Scheme for Digital Transactions, and TAT of RBI. These steps improve consumer confidence levels by offering quicker reversals, managing complaints, and compensating unsuccessful transactions. Thus, this study will help society by emphasizing the need for quicker response systems as the result of growing digital payments. The findings from this research also have real-world application for banks and regulators regarding the cyber resilience of the financial system. With increasing reliance on digital systems for financial transactions, the importance of the layered cybersecurity approach employed by NPCI, the Security Operations Centre's (SOC), disaster recovery, anti-fraud system, and encryption become more relevant. In this context, the high regression coefficients revealed in this research show that failure of operations, cybersecurity challenges, or bank outages could affect the transaction volume and value negatively. This study thus contributes in this respect by emphasizing cyber-resilient payment systems to enable economic activity through digital

means. Finally, the relevance of the research in relation to public policy lies in the finding that institutional involvement in the digital economy is not a mere formality, but an empirically observable determinant of digital payments adoption, safety, and inclusiveness. Indeed, government initiatives like Digital India program, merchant cashback programs, referral through BHIM app, and interoperability expansion are likely to prove effective only when there is active involvement of the banking sector and payment systems architecture. In other words, the research contributes by way of practical proof of the advantages of institutional involvement, consumer protection, fraud prevention, and cybersecurity resilience in India's digital payments system.

5. Conclusion

The research contributes, the impact of bank participation on the development of UPI and IMPS systems in India during 2016-17 and 2025-26 years was estimated. As shown in descriptive statistics, it has been identified that bank participation influenced the performance of transaction volume and transaction value in UPI and IMPS systems in a very significant manner. Descriptive analysis showed that there was a presence of extremely rapid growth in transaction volume and transaction value in the case of UPI system compared with the growth rate of the same parameters in the case of IMPS system. This indicates that there was faster development in the field of digital payments for retail customers in India. Growth in the case of IMPS was more or less moderate and steady. Correlation analysis revealed that there was a very strong relationship between the factors under consideration. In the case of UPI, there was 0.833 correlation between bank growth and transaction volume and 0.863 correlation between bank growth and transaction value. For IMPS system, there was 0.877 correlation between bank growth and transaction volume and 0.914 correlation between bank growth and transaction value. Moreover, the relationship between transaction volume and transaction value was extremely high. Based on the estimation results for the regressions of UPI and IMPS, the participation of banks in digital payment system transformation in India becomes evident. There is highly strong positive correlations between the participation of banks in the digital payment system

transformation process and growth measured by volume and value of transactions. This indicates the fact that higher regression coefficients and R^2 values reveal how much improvement in digital transactions would come from increasing participation of banks in the process. This implies the necessity of developing such cybersecurity policies and other measures as a part of the institutional development required for the sustainable development of digital payment systems. Moreover, in the course of studying the factors influencing the development of digital payment systems in India, the involvement of banks as an institutional factor in the process of payment digitization was revealed. Thus, the involvement of banks played a significant role in developing the processes of digital payments transaction activities.

6. Future Scope and Limitations of the Study

The research exists fewer limitations. Only two digital payment instruments, UPI and IMPS are included—the research study is highly parametric restricted to India's digital payments network. Secondly, the entire research process depends on secondary data sources. Evaluation of smart functions the study offers forthcoming scope as digitalization era studies. Aspects such as the efficiency and the dynamics of transactions between UPI and IMPS as compared to other systems like NEFT, RTGS, digital wallets, CBDC, Aadhaar Enabled Payment System can be taken into consideration in future studies. Secondly, studies conducted with regard to the customer behavior towards UPI and IMPS in terms of the issue of trust and security concern, satisfaction from the transactions, digital illiteracy issue and participation of merchants for the purpose of transacting through UPI and IMPS in both rural as well as urban areas of India.

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