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A Study of Digital Transaction and GDP Growth in Context of India: An Empirical Analysis

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Abstract: This study undertaken analyses the relation between digital payment expansion and the growth of economy in India during the period of 2016–2024, with particular emphasis on the Unified Payments Interface (UPI), financial inclusion under the PMJDY, and the policy framework of the Digital India and Jan Dhan–Aadhaar–Mobile (JAM) trinity. Using secondary time-series data collected from the authentic sources like RBI and the National Payments Corporation of India. The analysis of the study is based on correlation, regression, ANOVA, and other statistical tools to see the effect of digital payments on the growth of GDP. The findings reveal an exponential rise in UPI transactions, indicating deep digital transformation of India's payment ecosystem. However, empirical results show a weak and statistically insignificant short-term relationship between digital payment growth and GDP growth. Analysis of the study concludes that transactions made digitally contributes primarily through long-term structural effects such as enhanced efficiency, financial inclusion, and economic formalization rather than immediate GDP acceleration. Findings of the study provides an important findings for policymakers aiming to strengthen India's digital economy.

Keywords: digital payment, economic growth, efficiency, inclusion, acceleration.

1. INTRODUCTION

India has undergone a transformation in financial and economic aspects over the past decade, largely driven by the digital payment expansion. Digital payments include transactions through online banking, mobile wallets, UPI (Unified Payment Interface), etc. The structural shifty from cash – dominated transactions to digital payment practices in India economy have significantly impacted economic efficiency, productivity, and ultimately economic growth. India financial system before 2010 was characterized by low – level financial inclusion, limited access to formal banking system, and high – dependence on cash – based transactions. Financial system of India has been revolutionized by the launch of major government policy initiatives such as PMJDY. Adhaar-enabled services, Digital India Mission, and later UPI. Digital payments contribute to economic growth through multiple ways- reduction in transaction costs, transaction in digital mode which enhances productivity, digital transactions have become an important tool that enhances tax revenue.

The pandemic of COVID 19 further accelerated the digital payment system in India. E- commerce rapidly expanded due to contactless payment and other social distancing measures and practices adopted during the period. This led to a long- term rapid structural change in terms of the behavior of the businesses and consumer. Digital transaction in modern economy has been enhanced by the advancement in technology, increase in internet penetration, and government initiatives like 'Digital India'.

India's digital transformation began in the early 2000s with the expansion of internet connectivity and services, which accelerated during 2014 with the initiative by the government named as 'Digital India'. The Digital India Mission in 2015played an important role in integrating technology into governance, delivery of services, promotion of digital literacy, and improvement in the infrastructure of the internet. Study conducted by Zhou (2022) analyzed the relationship between economic development with sustainability, transactions made digitally, and consumer's demand empirically to

find the impact of digital transaction on the consumption of household in China. Adhikary et. al (2021) examines the effect of digital transaction technologies on the performance of the retailers in the unorganized sector of markets which are emerging. The Digital India Mission (2015) by integrating technology into governance, played an important role in economic activities of the nation. The schemes like PMJDY (Pradhan Mantri Jan Dhan Yojna) expanded the penetration of banking system to the population leading to the financial inclusion. Thus, the increase in digital payment is through the technological innovation, policy intervention, better internet connectivity, increase in smartphone usage and basic infrastructure required for transactions digitally. The study undertaken will focus on the analysis of relation between digital payment and growth rate of India on the basis of the adoption of technologies in finance and banking which influences the GDP and enhancement in productivity.

Gross Domestic Product (GDP) is widely accepted indicator to observe any country's economic growth and development prospects. There is a multidimensional relationship between the GDP and growth of digital payments in any economy. Digital payment stimulates smoother transactions which improves the efficiency of trade, consumption and allocation of resources. This further increases the level of income, consumption, production, and overall economic activity. In context of India and its welfare programme, digital payment progress have enhanced transparency, effectiveness of welfare programme through Direct Benefit Transfers (DBT)

Types of Digital Payment

Several types of digital payments are as follows:

1. Unified Payment Interface (UPI): it is India's most revolutionary digital payment system launched on April, 2016 by National Payment Corporation of India (NPCI) to enable fund transfers through mobile devices. UPI system which integrates multiple bank accounts allowing users to receive and send money instantly without the need of bank account details.
2. Mobile Wallet: It is an instrument which allows the storage of money electronically and use it for financial transactions through their smartphones. It is a virtual form of the physical wallet that allows to store funds, add bank accounts, and make payments securely.
3. Debit / Credit Cards: These are the payment instruments issued by the bank which allows transaction electronically from their bank account. Credit card in addition allows to borrow funds from bank up to a predetermined limit for purchasing goods and services.
4. Internet Banking: It is digital service provided by the banks to their customers for performing financial transactions through a web portal. This allows customers to check account balance, transferring of funds, applying for loans, downloading of statements, etc.

2.PAST LITERATURE

Digital payment's foundation on the basis of two – sided theory which serves as the platform which facilitates the financial transaction between payer and payee.

In a report of **RBI (2018)** on a study of digital payment and their role in enhancing economic efficiency outlined that the expansion of electronic payment platforms has contributed positively to financial transaction and its transparency. According to the report, digital payment has reduced transaction cost, improved money circulation, and enhancing economic formalization. RBI in their report have linked increased financial inclusion and payment efficiency to higher economic output and productivity. The study of **Suri and Jack (2016)** on the long – run poverty and gender impacts of mobile money, they examined the implications made digitally particularly in context of mobile money platforms using micro – level data from developing economies. Using econometric analysis, the findings suggest that among marginalized population the mobile- based digital transaction promoted financial inclusion and economic resilience.

Sharma and Kukreja (2013) in their study through the secondary data and trend analysis analyzed that that the development of e – banking and financial services in context of India. the study concluded that the mobile banking and use of internet have improved transaction efficiency between consumers and businesses which has enhanced productivity and economic activity across the sector. The study indirectly supports that there is a significant transaction made in digital mode and growth of GDP. **Singh and Rana (2017)** in their study on consumer's perception made in digital mode focused on consumer's behavior and their acceptance of digital payment systems using survey method and

regression analysis. The study concluded that the consumer acceptance widely will increase market efficiency in the form of higher transaction volumes which would lead to overall growth of economic activity.

In a study by **Bhattacharya (2019)** based on digital financial services and macroeconomic indicators using time – series analysis concluded that the positive correlation between the growth of transaction volumes in digital mode and growth of GDP rates in context of India. He concluded that digital payments promote efficient allocation of financial resources which further stimulates consumption and investment. **Kumar and Gupta (2020)** in their study considered the variables of financial inclusion and digital payments in context of Indian economy concluded that there is an increase in saving and investment among low – income groups due to increased access to digital payment systems.

3.STATAEMENT OF THE PROBLEM

India has become the global leader in digital payments by volume, but the extent of its contribution to GDP growth remains inadequately researched. Although policymakers often assert that digital payments fuel economic growth, there is limited statistical evidence that measures the precise magnitude of this contribution.

4.RESEARCH METHODOLOGY

The study will follow a quantitative, analytical, and longitudinal research design. It will use time-series data from 2010–2024 to explore trends and relationships. The nature of study will be descriptive (to present trends), correlational (to measure relationships), and causal (through econometric modelling)

This study is primarily based on the secondary data which are collected from the authentic national and international sources. The study being undertaken primarily relies on the secondary data which is collected from the sources such as- Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), Ministry of Statistics & Programme Implementation (MOSPI), Economic Survey of India, NITI Aayog, World Bank, IMF, and Ministry of Finance reports

Hypotheses

1. Digital payment growth has significantly positive relationship with India's GDP growth
2. Digital India and Jan Dhan-Aadhaar-Mobile (JAM) trinity has significantly increased digital payment adoption

This research aims to address these problems by conducting a comprehensive study that measures, analyses, and interprets the relation between India's digital payment ecosystem and the growth of GDP over the period 2010–2024.

5.OBJECTIVES

Primary Objective

To analyse the payments made digitally and growth of GDP in India.

Secondary Objectives

- To examine growth trends of payments made in digital mode in India during 2010–2024.
- To analyse sector-wise and overall GDP growth trends in India over the same period.
- To determine the statistical relation between digital payments (UPI, IMPS, AEPS, cards, etc.) and growth of the GDP.
- To assess how payment in digital mode supports financial inclusion, formalisation, and economic productivity.
- To identify the transaction instruments that have contributed most to economic growth.
- To propose recommendations to policymakers regarding contribution of digital transactions in India.

6.ANALYSIS OF THE STUDY

We have taken mainly three variables for the analysis of our study which are namely- GDP Growth Rate, UPI Transactions in Volume, and PMJDY. The combination of these three variables allows the study to analyse how digital financial initiatives and financial inclusion impact India's economic growth:

- GDP Growth Rate → Dependent variable (Economic outcome)

- UPI Volume → Independent variable (Digital payment adoption)
- PMJDY Accounts → Independent variable (Financial inclusion)

Together, these variables provide a comprehensive framework to explore the influence of modern financial technology and inclusion policies on macroeconomic growth.

H_0: Digital payment growth has significantly positive relationship with India's GDP growth

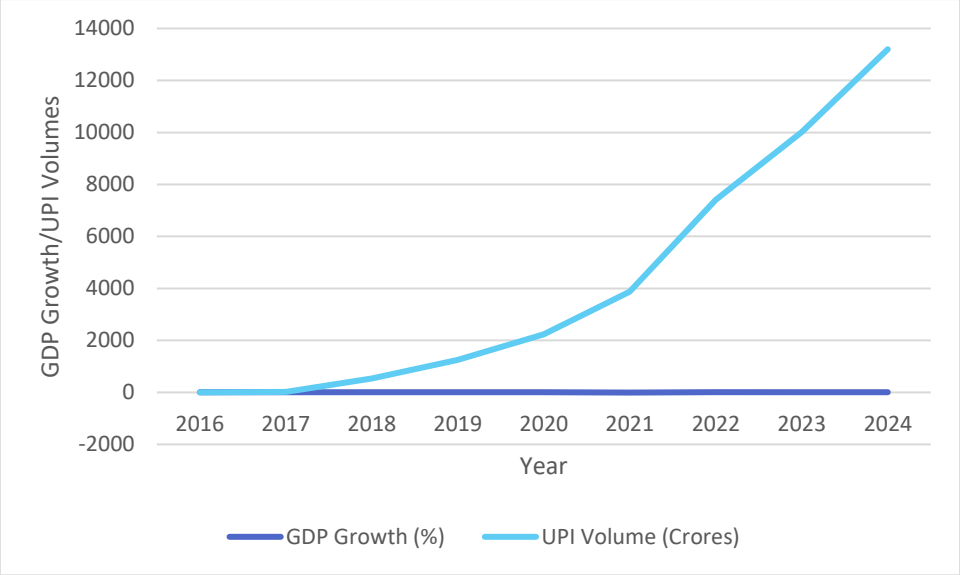
Table 1.1

Year	GDP Growth (%)	UPI Volume (Crores)
2016	8	0.001
2017	8.3	17.9
2018	6.8	535.4
2019	6.5	1252
2020	3.7	2233
2021	-5.8	3874
2022	9.1	7405
2023	7.2	10,018
2024	7	13200

Source: RBI (2024)

The data provides a striking illustration of how India's digital payment landscape—particularly UPI—has undergone a transformative shift from 2016 to 2024, far outpacing the fluctuations seen in GDP growth over the same period.

Figure 1.1



The graph illustrates a clear divergence between the rapid expansion of India's digital payment ecosystem and the relatively stable pattern of overall economic growth. UPI transaction volumes show an almost exponential rise from 2016 to 2024, beginning from a negligible base and accelerating sharply after 2018. By 2020, UPI volumes already crossed significant thresholds, and the upward momentum intensified in the post-pandemic period, reaching nearly 14,000 crore transactions in 2024.

Table 1.2

	GDP Growth (%)	UPI Volume (Crores)
GDP Growth (%)	1	
UPI Volume (Crores)	0.069028662	1

The correlation matrix shows the statistical relationship between India's GDP growth rate and UPI transaction volumes from 2016 to 2024. The correlation coefficient between GDP growth (%) and UPI Volume (Crores) is 0.069, which indicates a very weak positive correlation. This means that although both variables show upward movement in some years, the increase in UPI transaction volumes does not strongly move in tandem with changes in GDP growth.

Table 1.3

Regression Statistics	
Multiple R	0.069028662
R Square	0.004764956
Adjusted R Square	-0.137411479
Standard Error	5146.409879
Observations	9

ANOVA

	df	SS	MS	F	Significance F
Regression	1	887646.4924	887646.492	0.03351	0.85993
Residual	7	185398742.5	26485534.6		
Total	8	186286389			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	3868.479553	2835.083871	1.36450268	0.21465	-2835.4	10572.4	-2835.4	10572.4
X Variable 1	73.20836656	399.894166	0.18306935	0.85993	-872.39	1018.81	-872.39	1018.81

The regression analysis examining the impact of UPI transaction volumes on India's GDP growth from 2016 to 2024 clearly indicates that the relationship between the two variables is weak and statistically insignificant. The model produced a Multiple R of 0.069, which represents an extremely weak positive relationship, suggesting that any movement in GDP growth is not meaningfully associated with changes in UPI volumes.

Turning to the ANOVA results, the F-statistic of 0.0335 with a Significance F ($p = 0.8599$) indicates that the regression model as a whole is not statistically significant at any conventional confidence level (1%, 5%, or even 10%). This means that the independent variable—UPI volumes—does not jointly explain changes in GDP growth in a statistically meaningful way. From a hypothesis-testing perspective, the extremely high p-value leads to a clear decision: the null hypothesis (H_0), which states that UPI volume has no significant impact on GDP growth, must be accepted, while the alternative hypothesis (H_1) is rejected.

Thus, from the above analysis we see that UPI transaction volume does not have a statistically significant impact on GDP growth within the given dataset (2016–2024), and we reject the null hypothesis.

H_0: Digital India and Jan Dhan-Aadhaar-Mobile (JAM) trinity has significantly increased digital payment adoption

Table 2.1

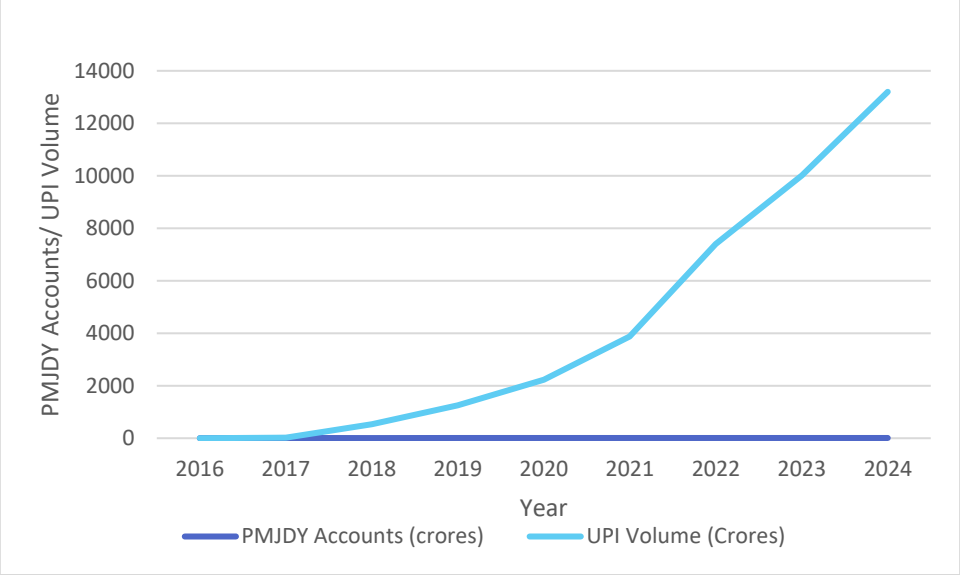
Year	PMJDY Accounts (crores)	UPI Volume (Crores)
2016	2.1	0.001
2017	5.1	17.9
2018	6.2	535.4

2019	4	1252
2020	3.5	2233
2021	3.9	3874
2022	4.5	7405
2023	4.2	10,018
2024	5	13200

Source: RBI (2024)

Between 2016 and 2024, the trajectory of PMJDY (Pradhan Mantri Jan Dhan Yojana) accounts and UPI (Unified Payments Interface) transaction volumes in India illustrates a significant shift in the country's financial landscape. The PMJDY initiative, launched to enhance financial inclusion by providing accessible banking facilities to the unbanked population, witnessed a remarkable surge in account openings during its initial years.

Figure 2.1



The chart illustrates the contrasting growth trajectories of PMJDY (Pradhan Mantri Jan Dhan Yojana) account ownership versus UPI transaction volumes between 2016 and 2024. Over this period, the number of PMJDY accounts, shown by the blue line, remains relatively stable with only incremental yearly increases. This suggests that the financial-inclusion phase in India—where the government encouraged citizens to open basic bank accounts—has largely reached saturation, with most eligible individuals already brought into the formal banking network. In contrast, the orange line representing UPI transaction volumes shows a dramatic and exponential rise, especially after 2020.

Table 2.2

	Digital Literacy Rate (%)	UPI Volume (Crores)
Digital Literacy Rate (%)	1	
UPI Volume (Crores)	0.931403349	1

In this case, the correlation coefficient between Digital Literacy Rate and UPI Volume is 0.9314, which is extremely high and strongly positive. This means that as the digital literacy rate increases, UPI transaction volume also tends to increase significantly. A correlation of this magnitude suggests that improvements in digital skills—such as the ability to use smartphones, navigate apps, and understand online transactions—are closely linked to higher adoption and usage of UPI for payments.

This strong relationship indicates that digital literacy is likely one of the major drivers behind the rapid rise in UPI usage in India. It also implies that regions or populations with higher digital literacy are more likely to participate actively in

digital financial systems. Overall, the matrix reveals a powerful association: greater digital literacy strongly corresponds with greater engagement in digital payment ecosystems like UPI.

Table 2.3

Regression Statistics	
Multiple R	0.178391413
R Square	0.031823496
Adjusted R Square	-0.106487433
Standard Error	5075.967252
Observations	9

ANOVA

	df	SS	MS	F	Significance F
Regression	1	5928284.2	5928284.18	0.230087	0.646084146
Residual	7	180358105	25765443.5		
Total	8	186286389			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1069.766086	6906.5457	0.154891622	0.881278	-15261.6194	17401.15	-15261.6	17401.15
X Variable 1	750.8417202	1565.3184	0.479673467	0.646084	-2950.548216	4452.232	-2950.55	4452.232

The null hypothesis states that Digital India and the Jan Dhan–Aadhaar–Mobile (JAM) trinity have significantly increased digital payment adoption, implying that improvements in digital infrastructure, digital literacy, and financial inclusion should show a measurable and statistically significant impact on digital payment usage, such as UPI transactions. However, the regression results do not provide empirical support for this claim within the given dataset. The model produces an extremely low R Square value of 0.031, indicating that only about 3.1% of the variation in digital payment adoption (UPI volume) can be explained by the digital literacy variable, which is used here as a proxy for the impact of Digital India and JAM.

7.CONCLUSION

The present study provides a comprehensive analysis of India's digital payment ecosystem during the period 2016–2024, examining its relationship with GDP growth, financial inclusion, and the policy framework of the Digital India initiative and the Jan Dhan–Aadhaar–Mobile (JAM) trinity. The findings reveal an unprecedented expansion of digital payments, particularly through the Unified Payments Interface (UPI), which increased from a negligible level in 2016 to over 13,200 crore transactions by 2024. This rapid growth reflects deep structural and technological transformation driven by smartphone penetration, internet accessibility, supportive government policies, and a growing preference for cashless transactions.

Despite this remarkable expansion, correlation and regression analyses indicate that digital payment adoption has not exerted a statistically significant short-term impact on India's GDP growth. The results suggest that year-to-year GDP variations are primarily influenced by broader macroeconomic factors such as investment cycles, fiscal and monetary policies, global economic conditions, and exogenous shocks, including the COVID-19 pandemic.

The study highlights that the principal economic contribution of digital payments lies in their long-term and structural effects, including enhanced transaction efficiency, greater financial inclusion, formalization of economic activity, and improved transparency and tax compliance. Overall, the findings underscore that digital payments are a cornerstone of India's evolving digital economy, shaping a more resilient, inclusive, and future-ready financial ecosystem.

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