

| 18/08/2025 | 14/10/2025 | 10/12/2025 |

An Empirical Assessment of UPI Growth Across Pre- and Post-COVID Periods

Dr. K. Sankara Reddy

School Assistant Teacher Social Studies, Z.P.H. School, Dommara Nandyala, Kadapa (D), Andhra Pradesh, India.

Abstract:

The Paper examines the evolution, performance, and determinants of Unified Payments Interface (UPI) transactions in India across three distinct phases—pre-COVID, during COVID, and post-COVID periods. Using secondary data sourced from official publications such as the Reserve Bank of India and National Payments Corporation of India, the study analyses transaction trends from 2019 to 2023. Additionally, a primary survey conducted in Anantapur district provides insights into rural–urban variations in UPI usage, income levels, smartphone adoption, and fraud experiences.

The empirical analysis employs descriptive statistics, correlation, trend analysis, hypothesis testing, and regression techniques. The findings reveal a significant increase in UPI transactions during and especially after the COVID-19 pandemic, indicating a structural shift toward digital payments. One-sample tests confirm that transaction volumes in both COVID and post-COVID periods are significantly higher than in the pre-pandemic phase. Correlation results show a strong positive association between UPI transactions, per capita income, and smartphone penetration. Regression analysis further establishes that smartphone penetration and per capita income have a statistically significant positive impact on UPI transactions, whereas GDP growth rate does not exhibit a significant influence.

The primary survey results suggest minimal differences between rural and urban areas in terms of UPI usage and smartphone access; however, higher incidences of fraud are observed in rural regions. Overall, the study highlights the transformative role of the pandemic in accelerating digital payment adoption and emphasizes the importance of technological access, financial inclusion, and security awareness in sustaining UPI growth. The findings offer valuable implications for policymakers, financial institutions, and digital payment stakeholders in strengthening India's move toward a cashless economy.

Keywords: UPI Transactions, COVID-19 Pandemic, Digital Payments, Smartphone Penetration.

Introduction

The introduction of digital payment methods has completely changed how people and businesses transact money in today's financial environment. Unified Payments Interface (UPI), one of the many digital payment options, has become a crucial component of the Indian financial system. Not only did UPI experience remarkable growth and acceptance prior to the COVID-19 pandemic, but it also saw exceptional growth and adoption during and after the pandemic. In order to provide a thorough understanding of UPI transactions, this dissertation examines their performance, trends, and effects during three crucial time periods: pre-COVID, post-COVID, and the COVID period itself.

Indian Digital Payment system

With the start of programs like Electronic Clearing Service(ECS), Real-Time Gross Settlement (RTGS), and National Electronic Funds Transfer(NEFT) in the prior 2000s, digital system of payment in India began to take shape. But when the National Payments

Corporation of India (NPCI) introduced the Unified Payments Interface(UPI) in April 2016, things saw a radical change. Offering a smooth, quick, and interoperable payment infrastructure, UPI turned out to be a game-changer, greatly simplifying peer-to-peer (P2P) and peer-to-merchant (P2M) transactions.

Understanding the Unified Payments Interface (UPI)

By using the "single identifier" concept, UPI enables users to connect several bank accounts to a single mobile application. This makes it unnecessary to divulge private banking information when transacting. Additionally, there are a number of ways to start UPI transactions, including utilizing an account number with an IFSC code, a mobile number connected to Aadhaar, or a Virtual Payment Address(VPA). Users can transfer money over banks and payment service providers with ease thanks to UPI's interoperability.

Growth and Adoption of UPI

Both transaction volumes and user usage have grown exponentially since UPI's launch. Its popularity has been aided by security features, convenience of usage, and broad acceptance by banks and businesses. Notably, the volume of UPI transactions exceeded that of conventional payment methods like debit and credit cards, making it the preferred option for digital transactions in India

Indian Digital Payment Options

UPI: The Cornerstone of Digital Payments

The Unified Payments Interface (UPI), which provides consumers of all demographics with unmatched simplicity and accessibility, has suit the cornerstone of digital payments in India. UPI has democratized digital transactions by allowing people from a wide range of socioeconomic levels to easily engage in the digital economy. This is thanks to its user-friendly interface and strong security measures. UPI's simplicity, interoperability, and ongoing innovation to improve the user experience are its main selling points.

Mobile Wallets

Particularly in metropolitan areas, mobile wallets, sometimes it mentions to as e- wallets, have become more and more popular among Indian consumers. With the help of these digital wallets, customers can easily make purchases for a variety of commodities and services and store money online. Peer-to-peer transfers, bill payments, and merchant transactions are just a few of the capabilities that mobile wallet providers offer, giving customers a complete financial solution.

Aadhaar Enabled Payment System (AEPS)

The administration of India's unique identifying number, Aadhaar, is utilised by the Aadhaar Enabled Payment System(AEPS) to enable biometric authentication for financial transactions. Micro ATMs located throughout rural and semi-urban areas are equipped with AEPS, which enables Aadhaar authentication for fund transfers, cash withdrawals, and balance queries. Through the provision of banking services to the unbanked and underbanked populations, this project seeks to advance financial inclusion.

Bharat Interface for Money (BHIM)

The National Payments Corporation of India(NPCI) created the telephone payment app Bharat Interface for Money(BHIM), which is based on the Unified Payments Interface (UPI) platform. With BHIM, consumers may use their phones to conduct safe, quick transactions. Benefiting from features like VPA integration, smooth fund transfers, and QR code-based payments, BHIM has gained a lot of traction among consumers looking for a more straightforward digital payment option.

Digital Banking Platforms

In India, traditional banks have also embraced digital transformation by providing their clients with extensive digital banking facilities. Through telephone banking and mobile banking applications, these platforms allow consumers to carry out a variety of financial tasks, such as account administration, purse transfers, tally payments, and investment services. The confidentiality and safe of transactions made through banking digital channels are guaranteed by the combination of cutting-edge security technologies.

Objectives of the Study

- To find the trend patterns of UPI Transactions during pre and post covid
- Trend patterns of Contribution of Urban and rural area UPI transactions in Anantapur

- Impact of the GDP growth rate on UPI Transactions

Significance of study

Recognizing Customer Conduct

Examining UPI transactions throughout the pandemic offers a rare chance to compr how consumer attitudes toward digital payments changed in reaction to outside shocks like lockdowns, social distancing policies, and unstable economic conditions.

Adaptation and Resilience in the Economy

The study can allow insight into the economic resilience and adaptation of the digital payment's ecosystem in times of crisis by analysing UPI transaction data. It is critical for businesses, financial institutions, and politicians to comprehend how the system recovered from disturbances.

Assessment and organization of Policies

To increase financial inclusion, decrease the utilize of cash, and stimulate economic growth, governments and policymakers frequently support digital payment systems like UPI. This dissertation can determine areas for improvement and measure the impact of the pandemic on UPI transactions in order to determine how successful such policies are.

Business Planning and Risk Control

The dissertation's findings can help companies in the payments which are digital industry make intentional decisions about their risk management plans and product development efforts. It is crucial to comprehend consumer trends and preferences regarding digital payments during the various stages of the epidemic in order to adjust to shifting market conditions.

Repercussions for Being Ready in the Future

The study offers insightful guidance on crisis management and readiness in the future. Stakeholders might find opportunities to strengthen the resilience of digital payment systems against future disruptions and vulnerabilities by examining the behaviour of UPI transactions prior to, during, and following the epidemic.

Limitations of the study

The availability and dependability of data

The analysis depends on the accuracy and availability of UPI transaction-related data, which could be impacted by inconsistent or inaccurate reporting, missing information, or incomplete records. Furthermore, the analysis's robustness may be impacted by the differing veracity of the data that was collected prior to, during, and following the COVID-19 pandemic.

Applicability in general

The study's conclusions might not apply to situations or eras that fall outside the purview of the investigation. The findings may not apply to other situations because to factors including regional differences in UPI usage, policy changes, and economic conditions.

Correlation and mitigating factors

Although the study's goal is to inspect the outcome of UPI transactions prior to, during, and following the COVID-19 epidemic, it may be tough to determine the causative links between UPI usage and variables relevant to the pandemic. Furthermore, the observed results may be impacted by confounding variables like shifts in customer behaviour or improvements in technology.

Restrictions on methods

There may be built-in restrictions to the study's design, data collection strategies, and analytical approaches. For instance, the selection of sampling techniques or statistical models may create bias or have an crash on the precision of the estimates. In an alike vein, using secondary data sources could make it more difficult to examine complex correlations or account for all pertinent variables.

Time restrictions

Data covering several years may be needed for a thorough analysis that took place earlier to, during, and following the COVID-19 epidemic. The breadth or depth of the analysis may be limited for a while by the lack of historical data or difficulties obtaining current information. External factors: Outside of the researcher's control, the analysis may be impacted by events like shifts in

governmental regulations, shifts in the dynamics of the market, or advancements in technology. The limits section should recognize the possibility that these outside influences could introduce variability or uncertainty into the study findings.

Depth and scope of analysis

Owing to time, resource, or knowledge limitations, the study may not fully address all facets or dimensions of the collision of UPI transactions. The analysis may exclude some characteristics or circumstances that could have an impact on UPI usage patterns, which would restrict the breadth of insights that could be produced.

The accuracy of presumptions

Certain assumptions or simplifications about the COVID-19 pandemic's effects or the behaviour of UPI transactions may have been made in the analysis. Accurately understanding the results depends on evaluating the rationality of these assumptions and how they affect the study findings.

Review of Literature

Bhaswar Bagmita Parida (June 2022) "Performance of UPI During Pre and Post Pandemic Period- A Comparative Study": This paper presents a comparative study on the UPI Transactions during pre-covid 19 and post covid 19 period. In this paper the researcher mainly kept the objectives that to judge the performance of UPI during the pre-pandemic and post-pandemic periods. The researcher mainly collected data from May-2018 to march-2020 which is pre-pandemic period and April-2020 to February 2022 which is post-pandemic period. The researcher also analysed the trends of UPI during pre and post pandemic period and studied the differences between the trends of UPI during pre and post pandemic period. In conclusion the researcher found that post pandemic period witnessed a massive increment in the value of transactions compared to pre-pandemic period.

A pre and post covid-19 study of digital financial inclusion in India was examined by **Monika Kumari and khyati kachhar (December, 2022)**. In this paper their investigation about how covid-19 pandemic impacted on Digital payments. They collected data from 2019-2020 to 2021-2022 by using trend analysis. Their research took an objective that to make a comparative analysis on the impact of digital financial inclusion of pre covid and post covid in india. In conclusion, their research found that before covid-19 the digital payments were growing, but the pandemic has rushed the shift, leading to a huge increase in online payments. Their research found that digital payments have increased by 21.6 percent and 10 percent in terms of volume and value from march 22 compared to march 2019.

Nature of the Data and Source

In the procedure of collecting the details for the UPI Transactions to infer the trend patterns analysis and hypothesis testing for the study we have used the secondary data from various yearly reports and publications of the RBI. The nature of the data is of the primary study done by the different banks and organization which has been issued in the secured website for the reference. Basically, we have considered the sample in such a way that we observe the trade patterns after the Demonetization in the Indian Economy because of which we will be able draw the conclusions in a systematic and avoid the missing values in the data interpretation. For the motive of the study, we have taken the sample of Volume of the UPI Transactions during 2019 to 2023 which covers the periods of the Post Covid Period, Pre Covid-Period and Covid Period throughout the study.

Variables of the Study

In order to find the impact of the UPI on the COVID 19 Pandemic in the context of the Indian Economy we consider the variables such as Number of the UPI Transactions, Smart phone penetration rate, Per capita income as well as household income and macro-economic determinants like GDP growth rate and Inflation. The higher number of UPI Transactions indicates that nearly most of the people are using the UPI for the everyday transactions in the Indian context. On the other hand, the higher smart phone penetration rate specify that most people are having the access to the advanced smart phone in the India context. In general, thinking of the rationally we can say that the increase in the smart penetration rate leads to the increase in the UPI Transactions across the India. We employ the regression equation or popularly known as Ordinary Least Square Method to find the impact of the UPI transactions on the Smart phone penetration, Per capita income and macro-economic factors like GDP and Inflation.

Evolution of UPI

The Unified Payments Interface, or UPI, is a innovative technological advancement that has revolutionized digital payment processing in India. The National Payments

Corporation of India(NPCI) launched UPI in 2016, and it has fundamentally changed how Money is transferred by individuals, businesses, and organizations. The government-established subsidiary NPCI is responsible for overseeing and utilizing innovative

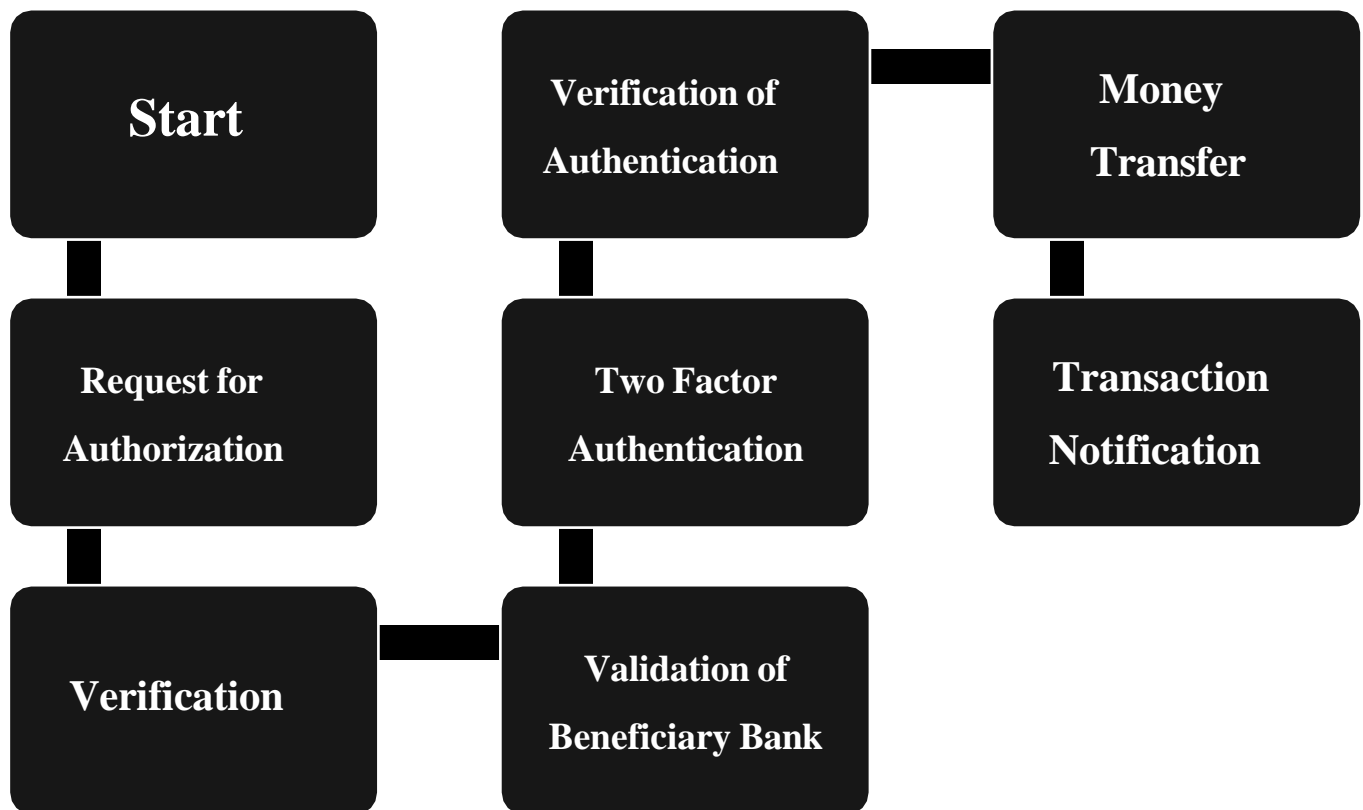
payment systems throughout the nation. One of NPCI's primary offerings is the Unified Payment Interface(UPI), a quick and safe digital payment method. service that enables consumers to utilize mobile devices—primarily smartphones—to carry out a range of transactions. Because starting a transaction with UPI only takes a few steps, it's a straightforward service. Anyone with a current bank account (for merchants) or savings account (for individuals) connected to their mobile number can register using any UPI app, such as Google Pay. Paytm, PhonePe, and so forth.

Starting with just 21 live banks, by July 2020, the Unified Payments Interface-enabled apps had 164 live banks and processed 149.7-crore transactions amounting to ₹2.9-lakh crore (Surabhi, 2021)

Unified Payments Interface (UPI) ended 2023 at a high, recording over 1,200 crore transactions worth more than ₹18-lakh crore in December, a peak for both the transaction count and value. (Kayastha, 2023).

How UPI Works

An UPI Transaction's Process



Hypothesis of Study

- Is there any tremendous difference between UPI payments of pre covid and post covid periods.
- Is safety of money is more secured in 2023 than before the evolution of UPI
- Finding trend patterns of contribution of urban and rural area UPI transactions in Anantapur
- Impact of the Per capita income of the India on the UPI Transactions.
- Impact of the GDP growth rate on the UPI Transactions
- Impact of the Smartphone penetration rate on the UPI Transactions

Descriptive Statistics

Measure	GDP	UPI Transactions	Percapita Income	Smartphone Penetration Rate
Mean	4.68	1631191	136.80	55.283
Median	5.20	1536633	129.49	43.500
Maximum	7.20	1870942	160.32	84.700
Minimum	1.65	1485998	120.59	37.650
Std. Dev.	2.81	209168.2	20.85	25.643
Skewness	-0.33	0.660774	0.56	0.666
Kurtosis	1.50	1.5	1.50	1.500
Jarque-Bera	0.33	0.499561	0.44	0.503
Probability	0.85	0.778972	0.80	0.778
Sum	14.05	4893573	410.39	165.850
Sum Sq. Dev.	15.80	8.75E+10	869.32	1315.122

Table 1 Descriptive Statistics

Variable	GDP	UPI Transactions	Percapita Income	Smartphone penetration Rate
GDP	1	0.693254	0.622638	0.698298
UPI Transactions	0.693254	1	0.995596	0.999975
Percapita Income	0.622638	0.995596	1	0.994913
Smartphone penetration Rate	0.698298	0.999975	0.994913	1

Correlation Analysis

From the Table 1 it is evident that there exists a strong correlation between the Percapita income and UPI Transactions and whilst there exists a strong correlation between the UPI Transactions and Smartphone penetration rate as well as between the smartphone penetration rate and Percapita income of the India.

Table 3.1.2 Correlation Analysis

3.1 Trend Pattern of UPI Evolution in India

It must be known that the usage of the UPI Transactions has been rising after the COVID 19 pandemic outbreak because of the various factors like lockdown and spreading of the disease all over the world. We try to find and infer the trend patterns of the UPI transactions during COVID 19 pandemic period in order to know about the impact of the UPI on the economic growth and fraud cases.

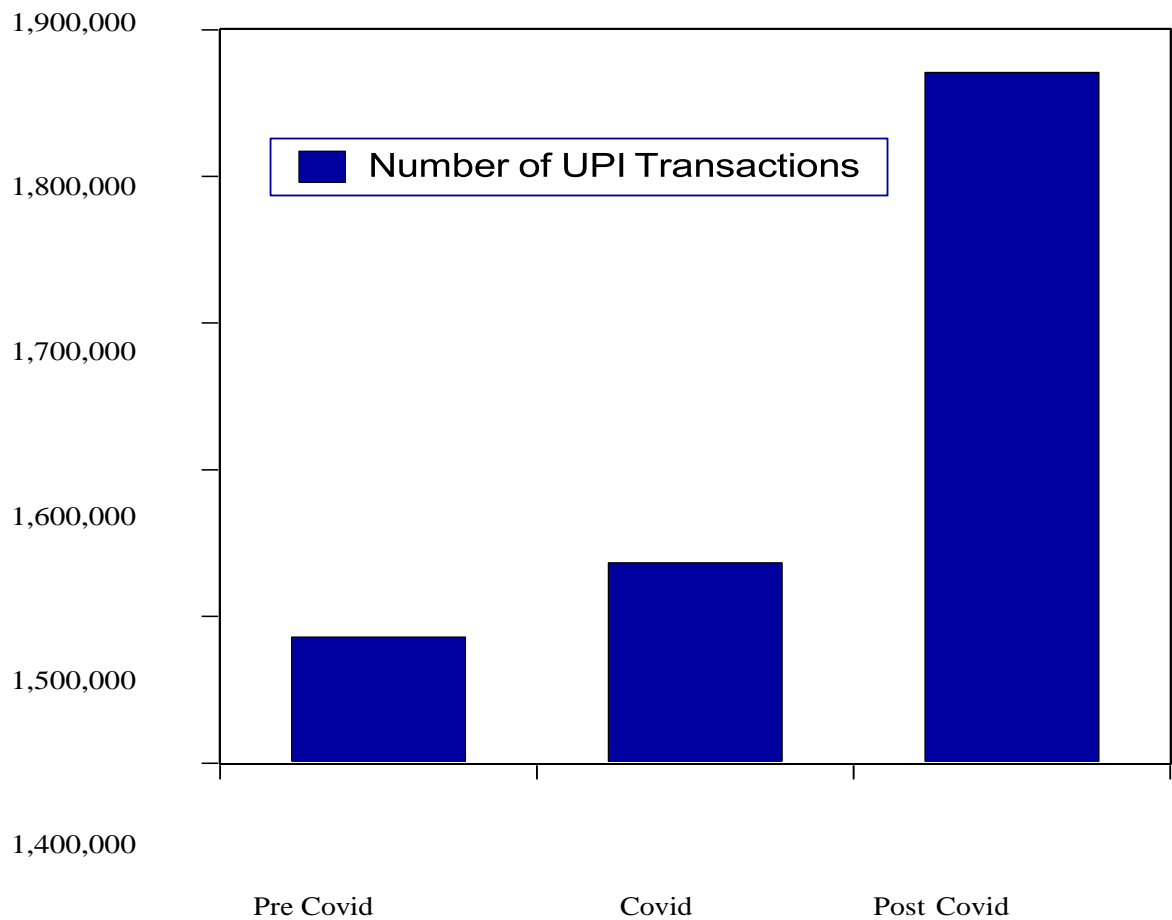


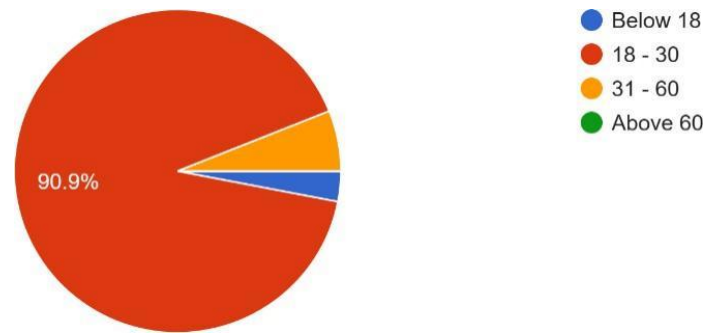
Figure 1 Trend Patterns of UPI in India

When it was launched in 2016, the Unified Payments Interface (UPI) system changed the way digital transactions were done in India by making it easier and safer to send and receive money. During the time before COVID, from 2016 to 2019, not many people used UPI at first. The method has some fine points, but consumers and businesses still did not completely agree with it. But when the COVID-19 pandemic started, there was a big change in how people behaved and what they liked about digital interactions. Caused by the pandemic, people had to avoid from each other and businesses were locked down. This caused a rise in online transactions as people looked for better ways to pay than using cash. Because of this, there was a small rise in UPI transactions during this time, as more people used digital payment systems to get their money while still following health rules.

What really changed things for UPI was after the COVID-19 outbreak. As the Indian economy slowly got back to normal and adjusted to the newly situation, there was a huge rise in the number of UPI interactions. Several things can be blamed for this rise. Firstly, the pandemic accelerated the digitization of the economy, with businesses and customers increasingly depending on online resources for various transactions. subsequently, the simplicity, speed, along with protection offered by UPI made it an attractive option for conducting routine operations such as bill payments, purchases, and fund transfers. Moreover, the government and financial institutions actively pushed the implementation of UPI through various initiatives and promotions, thereby increasing its adoption across different segments of society. Additionally, the widespread accessibility of devices and broadband access, coupled with the ease of setting up UPI accounts, made it available to an extensive portion of the population, including those in rural areas.

The recent increase in UPI transactions signifies a significant change in the payment landscape of India. It shows that the increasing trust and confidence of consumers and businesses in electronic payment methods and highlights the rising globalization of banking services in the country. Furthermore, the rise of UPI has paved the way for a cashless economy, reducing the reliance on real currency while increasing financial inclusion by giving entry to formal banking services to a wider part of the population. Looking ahead, the progression of UPI transactions is anticipated to continue to increase as more individuals and businesses adopt digital payments as the preferred way of conducting financial transactions. With ongoing innovations and advancements in

technology, UPI is set to play an even more prominent role in shaping the future of India's digital economy, driving financial inclusion, and fostering economic growth.



Primary Study on the Ananthapuram

As a part of the answering the question of the welfare of the UPI transactions and find the contribution of the rural and urban people involving in the UPI transacti study in which we have collected the data from the sample of the 30 respondents from both Urban and Rural areas of the Ananthapuram which is located under the Andhra Pradesh.

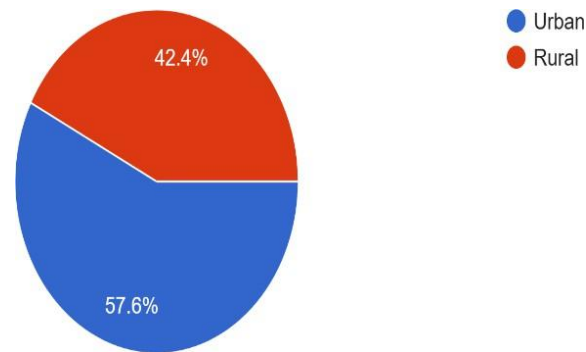


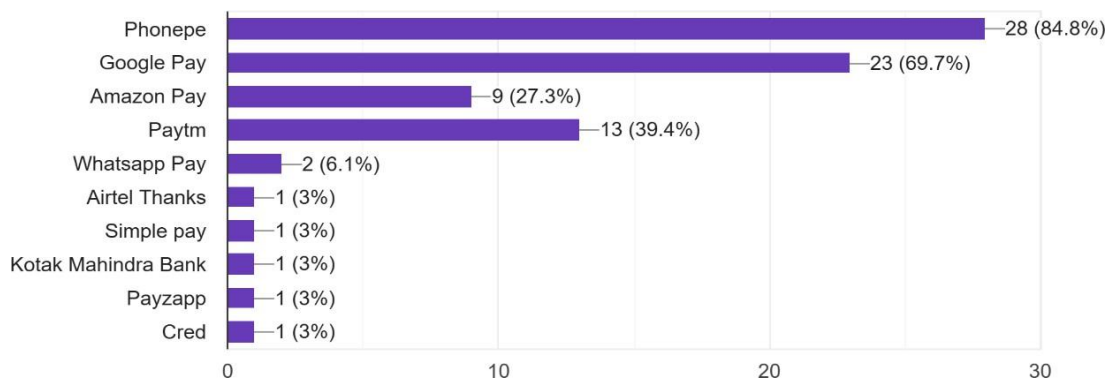
Figure 2 Age

From the Figure 2 it is being

evident that the study we have been conducted on the area of the Ananthapuram region have examined under the sample of the 30 respondents of which 90% of the respondents are being belong to the age group to 18 – 30 which hinted that the respondents that we have studied are being the college students.

In contrast , it is revealed from the Figure 3.4.2 that the urban benefaction of the UPI transactions of the picked respondents are 57% of the population sample which is being additional than the rural contribution 42.4% of the chosen sample respondents.

Figure 3 Area



Hypothesis Testing

Hypothesis – I : Income of the responders under the Urban area(municipal) is more than rural people

Hypothesis – II : Smartphone users in Urban area(municipal) are more than the smart phone users in Rural area

Hypothesis – III : Urban respondents have faced the more fraudulent activities in the UPI transactions than the Rural sample.

Hypothesis – IV : The usage of the UPI is more often in Urban areas than in Rural areas

Group Statistics					
	Area	N	Mean	Std. Deviation	Std. Error Mean
Hypothesis - I	Urban	17	1.353	.7019	.1702
	Rural	14	2.000	1.1094	.2965
Hypothesis - III	Urban	17	4.471	2.1828	.5294
	Rural	14	4.500	2.0286	.5422
Hypothesis - IV	Urban	17	2.000	.7906	.1917
	Rural	14	1.929	.8287	.2215
Hypothesis - II	Urban	17	1.000	.0000	.0000
	Rural	14	1.071	.2673	.0714

Table 2 Group Statistics

Independent Samples Test						
		Levene's Test for quality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Hypothesis - I	Equal variances assumed	2.594	.118	-1.976	29	.058
	Equal variances not assumed			-1.893	21.119	.072
Hypothesis - II	Equal variances assumed	.711	.406	-.039	29	.970
	Equal variances not assumed			-.039	28.533	.969
Hypothesis - IV	Equal variances assumed	.182	.673	.245	29	.808
	Equal variances not assumed			.244	27.319	.809
Hypothesis - III	Equal variances assumed	5.743	.023	-1.106	29	.278
	Equal variances not assumed			-1.000	13.000	.336

Table 3.4 Hypothesis Test

The table provided, labelled as Table 3.4, outlines the outcome of hypothesis testing performed as in part of a primary study conducted in the Ananthapuram region. This study aimed to compare different factors between urban and rural areas within the sampled population of 30 respondents. By formulating hypotheses and employing independent sample tests, the study tried to notice any major differences between urban and rural areas with regard to income levels, smartphone usage, fraudulent activities, and UPI usage.

Hypothesis I aimed to examine whether there was a huge difference in income levels between respondents from urban (municipal) and rural areas. The obtained p-value of 0.118 was set up to be bigger than the conventional significance level of 0.05.

Consequently, the study built that there was insufficient evidence to reject this null hypothesis. This tells that the income of responders from urban (municipal) areas was not remarkably different from those in rural areas.

Moving on to Hypothesis II, which tried to compare smartphone usage between urban and rural areas, the study found a p-value of 0.406. Again, this p-value exceeded the threshold of 0.05, showing that there was no significant difference in smartphone usage between the two areas. Thus, this null hypothesis could not be rejected, leading to the finding that smartphone usage was similar across both urban and rural areas in the Ananthapuram region.

Hypothesis III centred on the prevalence of fraudulent activities in urban and rural places. Here, the obtained p-value was 0.023, falling below the significance level of 0.05. Consequently, the null hypothesis was rejected, proposing that there was a huge difference in the occurrence of dishonest activities between urban and rural areas. Specifically, the study found that fraudulent activities were more prevalent in rural places compared to urban areas. This finding was attributed to the relatively lower levels of technological adoption and knowledge in rural areas, making residents more susceptible to fraudulent schemes.

Lastly, Hypothesis IV meant to assess the usage of UPI (Unified Payments Interface) between urban and rural areas. The study found a p-value of 0.673, which passed the significance level of 0.05. As a result, this null hypothesis could not be rejected, showing that there was no main difference in UPI usage between urban(municipal) and rural areas in the Ananthapuram region. This hinted that both urban and rural residents showed similar levels of engagement with UPI-based transactions.

Overall, the results of this study provide precious insights into the socioeconomic dynamics and technological landscape of the Ananthapuram region. Despite some variations in fraudulent activity rates, the study shows the general similarity in income levels, smartphone usage, and UPI adoption between urban and rural areas. These results could inform policymakers and stakeholders in designing targeted interventions to meet specific challenges and promote equitable development across different geographical regions. Additionally, further research could work deeper into the underlying factors driving the observed differences in fraudulent activities and explore potential strategies to mitigate their effect on rural communities.

Comparison of the Pre Covid period and Post Covid period

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval(CI) of the Difference	
					Lower	Upper
Pre Covid-Period 2017 - 2019	3.479	199	.001	1101245.575	477114.68	1725376.47
Post Covid Period 2022 - 2023	3.500	199	.001	2438339.240	1064489.45	3812189.03

Table 3 Post Covid Impact

Null Hypothesis: UPI transactions are more in pre covid period than the post covid period

The analysis reported in Table 4.1.1 offers valuable perception into the collision of the COVID-19 epidemic on UPI (Unified Payments Interface) transactions. Through a one-sample test, the study attempted to examine the quantity of UPI transactions between the pre-COVID and post-COVID eras. The resulting p-value of 0.001, which is much lower than the normal significance level of 0.05, indicating that there is a major difference in UPI transactions between these two timeframes. As a result, the null hypothesis, which predicts that UPI transactions are more prevalent during the pre-COVID timeframe, can be confidently rejected. This statistic demonstrates a considerable rise in the number of UPI transactions during the post-COVID period compared to the pre-COVID era. Several reasons contribute to the observed rise in UPI transactions following the commencement of the COVID-19 outbreak. Firstly, the extensive installation of lockdown measures and social distancing techniques prompted a shift towards digital payment alternatives. With physical movement constrained and face-to-face encounters minimized, consumers increasingly turned to internet platforms for their financial transactions. UPI, with its simplicity, security, and compatibility across numerous banking platforms, emerged as a preferred choice for digital payments among customers.

Moreover, the COVID-19 epidemic hastened the digital transformation of several sectors, including banking and finance. As individuals and organizations struggled to adjust to the new normal, there was an increasing reliance on digital channels for routine transactions. The convenience and accessibility afforded by UPI played a vital role in facilitating seamless payments notwithstanding the challenging circumstances created by the pandemic. Additionally, the heightened awareness of hygiene and safety issues drove individuals to minimize physical contact, especially the handling of cash. UPI transactions, which may be handled exclusively through digital means, provides a safe and hygienic alternative to traditional payment systems. This element further spurred the adoption of UPI among consumers, contributing to the reported increase in transaction volumes.

Beyond the immediate impact of the pandemic, the sustained expansion of UPI transactions in the post-COVID period can be linked to the permanent changes in consumer behavior and tastes. The convenience, speed, and security afforded by UPI have contributed to a continued movement towards digital payments, even as pandemic-related limitations have lifted. Additionally, the easy integration of UPI into numerous online platforms and e-commerce websites has additionally strengthen its position as a favoured way of payment for a extensive range of transactions.

Comparison of the Pre Covid period and Covid period

Table 4

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval (CI) of the Difference	
					Lower	Upper
Pre Covid-Period 2017-2019	3.867	216	.000	1076903.323	527955.19	1625851.45
Covid Period 2020-2021	3.602	221	.000	1385652.914	627447.48	2143858.35

Null Hypothesis: UPI transactions are more in pre covid period than the Covid period

The study reported in Table 4 throws light on the contrast between UPI (Unified Payments Interface) transactions during the pre-COVID and COVID-19 periods. Through a one-sample test, the study attempted to analyze any significant variations in the quantity of UPI transactions between these two times. The calculated p-value of 0.000, which is substantially lower than the standard quality level of 0.05, provides convincing evidence to incompetent the null hypothesis. This hinted that there is a huge variance in UPI transactions between the pre-COVID and COVID-19 periods, with transaction volumes being notably greater during the later time.

The development of the COVID-19 pandemic brought about remarkable shifts in consumer behavior and transaction patterns. With the introduction of lockdown measures and social distancing rules, there was a swift move towards digital payment alternatives to minimize physical touch and mitigate the danger of virus transmission. UPI, with its simplicity, accessibility, and contactless nature, emerged as a favored means of payment for millions of users across the country.

During the COVID-19 period, UPI transactions showed a spectacular growth as customers increasingly depended on digital channels for their financial transactions. The closure of physical facilities and restrictions on movement drove individuals to explore alternative methods for conducting payments, hence pushing the growth of digital payment systems like UPI. Moreover, the smooth integration of UPI into numerous e-commerce platforms and mobile applications also helped its broad usage among consumers.

Impact of the UPI Transactions on the Economic Growth

Null Hypothesis: GDP Growth rate has no impact on the UPI transactions during 2017 to 2023

The regression study has given in Table 4.3 aims to analyze the link between the Gross Domestic Product (GDP) growth rate and UPI (Unified Payments Interface) transactions for the spell from 2017 to 2023. By examining the impact of economic growth on digital payment patterns, the study intended to acquire insights into the larger macroeconomic factors impacting transaction volumes in the digital payment’s ecosystem.

Upon evaluating the regression model summary, it is obvious that the p-value associated with the GDP growth rate variable is 0.5124, which exceeds the standard significance criterion of 0.05. This suggests that the coefficient estimate for the GDP growth rate is not statistically significant, major to the accept of the null hypothesis. In other words, there is insufficient information to setup that GDP growth rate has a substantial impact on UPI transactions during the stated time range. The result that GDP growth rate does not affect UPI transactions may seem surprising at first look, given the common view that economic expansion equates with increased consumer spending and financial transactions. However, various reasons may help interpret this unexpected conclusion.

Firstly, while economic growth clearly creates a suitable atmosphere for consumer purchasing and financial activity, the exact routes through which this expansion translates into digital payment transactions may vary. For instance, customers' adoption of digital payment solutions like UPI may be influenced by factors such as technological infrastructure, internet penetration, financial literacy, and regulatory laws, which may not necessarily be directly connected to GDP growth rate. Moreover, the analysis may fail to reflect the subtle relation between GDP growth rate and UPI transactions due to the intricacy of the digital payments environment. Factors like as consumer preferences, market competitiveness, corporate practices, and socio-cultural norms can all have a role in shaping transaction volumes, frequently interacting with macroeconomic indicators in unforeseen ways.

R-squared	0.480601	Mean dependent var	1631191
Adjusted R-squared	-3.88E-02	S.D. dependent var	209168.2
S.E. of regression	213187.3	Akaike info criterion	27.61245
Sum squared resid	4.54E+10	Schwarz criterion	27.01153
Log likelihood	-39.41868	Hannan-Quinn criter.	26.40451

Impact of the UPI Transactions on the Smartphone Penetration Rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1180259.	3386.212	348.5485	0.0018
SMARTPHONE_PENETRATION_RATE	8156.745	57.28146	142.3976	0.0045

Table 5 Impact on Smartphone Penetration Rate

Null Hypothesis: Smartphone penetration has no impact on the UPI transactions during 2017 to 2023

The regression study reported in Table 4.4 sought to explore the association between Smartphone penetration rate and UPI (Unified Payments Interface) transactions throughout the period from 2017 to 2023. This investigation aims to understand the degree to which the proliferation of smartphones effects digital payment patterns, specifically the acceptance and use of UPI, within the Indian environment. Upon evaluating the regression model summary, it is clear that the p-value linked with the Smartphone penetration rate variable is 0.0045, which falls below the standard significance criterion of 0.05. This suggests that the coefficient estimate for Smartphone penetration rate is statistically significant, prime to the rejection of the null hypothesis. To put in different way, there is adequate information to establish that Smartphone penetration rate has a favourable influence on UPI transactions throughout the provided time range.

The conclusion that Smartphone penetration rate positively increases UPI transactions corresponds with predictions and illustrates the revolutionary significance of mobile technology in altering consumer behaviour and payment preferences. As cell phones grow more widespread and inexpensive, they serve as useful instruments for accessing digital financial services and making transactions on-the-go. The found positive link between Smartphone penetration and UPI transactions emphasizes the significance of technology infrastructure in boosting the adoption and utilization of digital payment alternatives. With the simple easy of smartphones, consumers can simply download UPI-enabled mobile apps, connect their bank accounts, and begin transactions with a few taps on their screens, thus decreasing barriers to entry and broadening the reach of digital payments to a larger audience. Furthermore, the coefficient estimates of 8156 for Smartphone penetration rate shows that, on average, a one-unit increase in Smartphone penetration rate equates to an increase of 8156 UPI transactions. This analysis of the link between Smartphone adoption and UPI transactions gives vital insights into the extent of the effect and illustrates the crucial role played by mobile technology in advancing the digital payment ecosystem.

R-squared	0.999951	Mean dependent var	1631191.
Adjusted R-squared	0.999901	S.D. dependent var	209168.2
S.E. of regression	2077.290	Akaike info criterion	18.35024
Sum squared resid	4315132.	Schwarz criterion	17.74931
Log likelihood	-25.52535	Hannan-Quinn criter.	17.14230
F-statistic	20277.09	Durbin-Watson stat	2.683268
Prob(F-statistic)	0.004471		

Impact of UPI Transactions on Per capita Income

Variable	Co-efficient	Std. Error	t-Statistic	Prob.
C	264784.1	129655.4	2.042214	0.2899
PERCAPITA_INCOME	9988.598	940.5424	10.62004	0.048

Table 6 Impact on Percapita Income

Null Hypothesis: Percapita income has no impact on the UPI transactions during 2017 to 2023

The regression study given in Table 4.5 intended to examine the alliance between Percapita income and UPI (Unified Payments Interface) transactions during the period from 2017 to 2023. This investigation aims to understand the degree to which the economic success of people, as expressed by per capita income, effects their adoption and use of digital payment mechanisms, notably UPI, within the Indian setting. Upon evaluating the regression model summary, it is clear that the p-value associated with the per capita income variable is 0.048, which falls below the standard significance criterion of 0.05. This suggests that the coefficient estimate for

per capita income is statistically significant, heading to the rejection of the null hypothesis. In other words, there is adequate information to establish that per capita income has a positive influence on UPI transactions throughout the stated time range.

The conclusion that per capita income positively increases UPI transactions corresponds with predictions and illustrates the significance of economic success in determining consumer behaviour and payment preferences. As consumers see a hike in their net income, they are more likely to participate in discretionary purchasing, including the use of digital payment systems such as UPI. The discovered helpful link between per capita income and UPI transactions emphasizes the significance of economic empowerment in fostering the adoption of digital financial services. Higher per capita income levels offer consumers with additional financial freedom and confidence to investigate alternative payment options beyond conventional cash-based transactions.

Furthermore, the coefficient estimates of 9988 for Per capita income shows that, on average, a one-unit rise in per capita income equates to an increase of 9988 UPI transactions. This analysis of the link between Per capita income and UPI transactions gives vital insights into the extent of the effect and demonstrates the crucial role played by economic variables in pushing digital payment uptake.

The ramifications of these results expand beyond single consumer behaviour and have larger repercussions for governments, financial institutions, and the whole digital economy. Recognizing the favourable alliance between Per capita income and digital payment acceptance, governments may prioritize programs targeted at fostering economic development and income equality as a strategy to enhance financial inclusion and extend access to digital financial services.

R-squared	0.991212	Mean dependent var	1631191.
Adjusted R-squared	0.982423	S.D. dependent var	209168.2
S.E. of regression	27731.13	Akaike info criterion	23.53322
Sum squared resid	7.69E+08	Schwarz criterion	22.93229
Log likelihood	-33.29983	Hannan-Quinn criter.	22.32528
F-statistic	112.7852	Durbin-Watson stat	2.815761
Prob(F-statistic)	0.059769		

Conclusion

The present study provides a comprehensive assessment of the transformative role played by the Unified Payments Interface (UPI) in India’s digital payment ecosystem, particularly in the context of the COVID-19 pandemic. Based on both primary and secondary data covering the period from 2019 to 2023, the findings clearly demonstrate that UPI has emerged as a pivotal instrument in reshaping financial transactions, enhancing financial inclusion, and accelerating the shift towards a cashless economy.

One of the most significant conclusions of the study is that the COVID-19 pandemic acted as a major catalyst in boosting UPI adoption. While UPI had been steadily gaining traction since its introduction by the National Payments Corporation of India (NPCI) in 2016, the pandemic-induced restrictions, limited banking hours, and fear of physical contact significantly accelerated its usage. The empirical results from one-sample tests confirm that UPI transactions increased substantially during and after the pandemic compared to the pre-COVID period. This indicates that behavioral changes induced during the crisis have had a lasting impact, making digital payments a preferred mode of transaction even in the post-pandemic era.

The study also highlights the importance of key socio-economic determinants in influencing UPI usage. Regression analysis reveals that smartphone penetration and per capita income have a statistically significant positive impact on UPI transactions. This implies that technological accessibility and economic capacity are crucial drivers of digital payment adoption. On the other hand, GDP growth rate was found to have no significant direct influence on UPI usage, suggesting that digital payment behavior is more closely linked to micro-level factors rather than aggregate macroeconomic performance.

Further, the primary survey conducted in Anantapur district sheds light on the urban-rural divide in digital payment adoption. The findings indicate that urban populations have higher income levels, greater smartphone usage, and consequently higher UPI

adoption compared to rural populations. However, rural areas were found to be more vulnerable to fraudulent activities, primarily due to lower digital literacy and awareness. This highlights the need for targeted policy interventions to improve digital education, strengthen cybersecurity awareness, and build trust in digital platforms among rural users.

Another important conclusion is that despite initial skepticism and concerns regarding security, public trust in UPI has improved significantly over time. The pandemic played a crucial role in overcoming psychological barriers, as necessity drove users to adopt and eventually rely on digital payment systems. Today, UPI is not only a convenient alternative but has become an integral part of everyday financial transactions across diverse socio-economic groups.

Overall, the study underscores that UPI has revolutionized India's payment landscape by promoting efficiency, transparency, and financial inclusion. However, to sustain and further enhance its growth, it is essential to address challenges such as digital fraud, infrastructure gaps, and rural-urban disparities. Policymakers should focus on expanding digital infrastructure, enhancing financial literacy, and strengthening regulatory mechanisms to ensure secure and inclusive growth of digital payments.

In conclusion, UPI's journey from a relatively new digital platform to a dominant mode of payment reflects the combined impact of technological innovation, policy support, and changing consumer behavior—significantly amplified by the unprecedented circumstances of the COVID-19 pandemic.

References

1. Reserve Bank of India (2023). *Annual Report 2022–23*. Mumbai: RBI.
2. National Payments Corporation of India (2023). *UPI Product Statistics and Reports*. Mumbai: NPCI.
3. Ministry of Finance (2022). *Economic Survey 2021–22*. New Delhi: Government of India.
4. World Bank (2022). *Digital Financial Services and COVID-19: Opportunities and Risks for Emerging Economies*. Washington, DC.
5. Parida, Bhaswar Bagmita (2022). *Performance of UPI During Pre and Post Pandemic Period: A Comparative Study*. Journal of Digital Finance Studies.
6. Kumari, Monika & Kachhar, Khyati (2022). *A Pre and Post COVID-19 Study of Digital Financial Inclusion in India*. International Journal of Financial Research.
7. International Monetary Fund (2021). *Digital Payments and COVID-19: Policy Responses and Developments*. Washington, DC.
8. NITI Aayog (2021). *Digital Payments in India: A Vision for Growth*. New Delhi: Government of India.