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Impact of UPI Adoption and Digital Payment Usage of Financial Inclusion: An empirical Study of Tamil Nadu State

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Peer Review Information	Abstract
<p>Submission: 25 Feb 2026 Revision: 12 March 2026 Acceptance: 28 March 2026</p>	<p>The rapid expansion of digital financial technologies has significantly transformed the financial ecosystem in India, with the Unified Payments Interface (UPI) emerging as a key driver of this transformation. This study examines the impact of UPI adoption and digital payment usage on financial inclusion, focusing on the state of Tamil Nadu. The primary objective is to analyze how digital payment systems contribute to enhancing access to financial services and promoting inclusive economic participation. The study adopts a quantitative research design based on primary data collected from 300 respondents using a structured questionnaire measured on a five-point Likert scale. The variables include UPI adoption and digital payment usage as independent variables, and financial inclusion as the dependent variable. Statistical tools such as reliability analysis, factor analysis, correlation analysis, and multiple regression analysis were applied using SPSS software. The findings reveal that both UPI adoption and digital payment usage have a significant and positive impact on financial inclusion. The reliability analysis indicates high internal consistency (Cronbach's Alpha = 0.967), while factor analysis confirms a strong construct structure with three distinct components explaining over 72% of the total variance. Correlation results demonstrate a significant positive relationship between UPI adoption ($r = 0.543$) and financial inclusion, as well as digital payment usage ($r = 0.554$) and financial inclusion. Regression analysis further confirms that digital payment usage has a slightly stronger influence compared to UPI adoption. The study concludes that digital payment systems play a crucial role in enhancing financial inclusion by improving accessibility, convenience, and efficiency of financial transactions. The findings provide valuable insights for policymakers and financial institutions to design strategies that promote digital financial adoption and bridge the gap in financial inclusion.</p>
<p>Keywords</p> <p>UPI Adoption, Digital Payment Usage, Financial Inclusion, Digital Finance, Tamil Nadu.</p>	

Introduction

The rapid advancement of digital technologies has significantly transformed the financial ecosystem across the globe, particularly in developing economies like India. Among the most prominent innovations in this transformation is the Unified Payments Interface

(UPI), which has revolutionized the way financial transactions are conducted. Introduced by the National Payments Corporation of India, UPI has emerged as a robust, real-time payment system that enables seamless peer-to-peer and peer-to-merchant transactions. This digital innovation has played a crucial role in promoting financial

inclusion by bridging the gap between formal financial systems and underserved populations. Financial inclusion, defined as the accessibility and usage of affordable financial services by all sections of society, remains a critical objective for policymakers and financial institutions. In regions like Tamil Nadu, where there exists a mix of urban advancement and rural disparities, the role of digital payment systems becomes even more significant. The integration of UPI and other digital payment platforms has enabled individuals, especially those previously excluded from the banking system, to participate actively in the financial ecosystem.

The exponential growth of UPI highlights its transformative impact. Studies indicate that UPI transactions have increased dramatically, reaching over 18.39 billion monthly transactions worth ₹24.04 trillion by mid-2025, reflecting its widespread adoption and acceptance (Vikram, 2025). This surge demonstrates how digital payment platforms have transitioned from optional tools to essential financial instruments. The convenience, speed, and low transaction costs associated with UPI have significantly altered consumer behavior, encouraging a shift from cash-based to cashless transactions. Furthermore, digital payment usage extends beyond UPI to include mobile wallets, debit/credit cards, and internet banking systems. These platforms collectively contribute to enhancing financial accessibility, improving transaction efficiency, and promoting transparency in financial activities. Research suggests that frequent usage of digital payment systems has a strong positive influence on financial inclusion, with significant empirical evidence supporting this relationship (Venkatesan, 2025). This indicates that not only adoption but also consistent usage of digital platforms plays a vital role in achieving inclusive financial growth. The COVID-19 pandemic further accelerated the adoption of digital payments, acting as a catalyst for digital transformation in the financial sector. Restrictions on physical movement and concerns over virus transmission led to an increased reliance on contactless payment methods. Consequently, digital transactions witnessed a substantial rise, strengthening the link between digital payment adoption and financial inclusion (Khalid, 2025). However, despite these advancements, challenges such as digital literacy gaps, infrastructure limitations, and cybersecurity concerns continue to hinder the equitable distribution of digital financial benefits. In rural and semi-urban areas, the adoption of UPI and digital payment systems presents both opportunities and challenges. While a significant

portion of the population has shown a preference for UPI due to its simplicity and accessibility, a considerable number still rely on traditional banking methods due to trust issues and lack of awareness (Ramya, 2025). This duality highlights the need for targeted policy interventions to ensure that digital financial services reach all segments of society effectively. Another critical aspect of digital payment adoption is its impact on economic behavior and financial decision-making. UPI has not only simplified transactions but also enhanced consumer purchasing power and spending behavior. The ease of making payments has encouraged higher consumption levels and improved participation in the digital economy (Sawhney, 2025). Additionally, digital payments have facilitated better financial tracking and transparency, contributing to improved financial management among users.

Despite the numerous benefits, the adoption of UPI and digital payment systems is not without challenges. Issues such as cybersecurity risks, fraud, lack of digital infrastructure in rural areas, and resistance to technological change continue to pose significant barriers (Singh, 2025). Moreover, demographic disparities, including differences in age, education, and income levels, influence the adoption and usage patterns of digital payment systems. Given this context, the present study aims to examine the impact of UPI adoption and digital payment usage on financial inclusion, with a specific focus on Tamil Nadu. By analyzing the relationship between these variables, the study seeks to provide empirical evidence on how digital financial tools contribute to inclusive economic development. The research also intends to identify key factors influencing adoption and usage patterns, thereby offering insights for policymakers and financial institutions to design effective strategies for enhancing financial inclusion. The integration of UPI and digital payment systems represents a significant milestone in the journey toward financial inclusion. While substantial progress has been made, achieving universal financial access requires continuous efforts to address existing challenges and leverage technological advancements. This study contributes to the growing body of literature by providing a comprehensive analysis of the role of digital payments in promoting financial inclusion in Tamil Nadu.

Literature Review

The relationship between digital payment systems, particularly UPI, and financial inclusion has been extensively examined in recent literature. Scholars have highlighted the

transformative potential of digital financial technologies in bridging the gap between formal financial institutions and underserved populations. This section reviews key studies that explore the impact of UPI adoption and digital payment usage on financial inclusion. Venkatesan (2025) conducted an empirical study in Tamil Nadu focusing on digital payment barriers, user preferences, and financial inclusion. The findings revealed a strong positive relationship between user preferences for digital payment systems and financial inclusion, with an estimated influence of 0.7158. Interestingly, the study also found that digital payment barriers had a positive impact, suggesting that challenges such as security concerns and hidden charges may drive improvements in digital systems. Furthermore, frequent usage of digital payments significantly enhanced financial inclusion, emphasizing the importance of consistent engagement with digital platforms.

Vikram (2025) provided a comprehensive analysis of UPI usage and its impact on the retail payment sector. The study highlighted the exponential growth of UPI transactions and its role in democratizing digital payments. By reducing transaction costs and increasing accessibility, UPI has enabled a broader segment of the population to participate in the financial system. The research also indicated that UPI has significantly influenced consumer purchasing behavior, contributing to increased buying power and economic participation. Ramya (2025) examined UPI-driven digital payment systems in rural India, emphasizing their role in promoting financial inclusion and sustainable economic growth. The study found that a significant proportion of rural and semi-urban populations prefer using UPI for transactions. However, it also highlighted persistent challenges, including a digital literacy gap and continued reliance on traditional banking methods. These findings underscore the need for targeted interventions to improve digital awareness and infrastructure in rural areas. Khalid (2025) analyzed the impact of the COVID-19 pandemic on digital payment adoption in India. The study revealed that the pandemic significantly accelerated the use of digital payment platforms, including UPI, mobile wallets, and AEPS. It also identified regional and demographic disparities in adoption, indicating that while digital payments have improved financial inclusion, the benefits are not uniformly distributed across all segments of society. Sawhney (2025) explored the transformative impact of UPI on consumer behavior and financial inclusion. The study found high levels of user satisfaction with UPI's convenience, speed, and security. It also highlighted a shift toward

cashless transactions and increased participation in the digital economy. Additionally, UPI was found to enhance transparency in government welfare programs and support small business operations, thereby contributing to broader economic development.

Singh (2025) examined the impact of UPI on the Indian economy, focusing on its role in financial inclusion. The study documented significant growth in UPI transactions and identified a positive correlation between UPI adoption and financial inclusion. It also highlighted challenges such as cybersecurity risks, infrastructure gaps, and digital literacy issues, which need to be addressed to ensure equitable access to digital financial services. Jose (2025) focused on the impact of UPI in rural India, demonstrating its effectiveness in integrating unbanked and underbanked populations into the formal financial system. The study emphasized the importance of low transaction costs, ease of use, and smartphone compatibility in driving adoption. It also provided qualitative insights into how UPI has transformed financial behavior among rural users. Sreevas et al. (2023) investigated the relationship between UPI utilization and financial inclusion, finding a significant positive impact. The study highlighted the role of mobile payments and QR codes in enhancing fintech adoption and expanding financial access. It also suggested that UPI, while still evolving, holds significant potential for future growth. Rastogi et al. (2021) explored the broader implications of UPI on financial inclusion and economic development. The study found that UPI enhances financial literacy, which in turn contributes to financial inclusion and economic growth. This highlights the interconnected nature of digital financial tools and socio-economic development.

Goel (2025) examined the impact of UPI on micro and small-scale enterprises (MSEs), emphasizing its role in improving transaction efficiency and promoting formalization of economic activities. The study also highlighted challenges such as cybersecurity risks and infrastructure disparities, which need to be addressed for sustainable adoption. Kumari (2025) analyzed the rise of UPI and its impact on traditional payment systems, noting that UPI accounts for a significant share of digital transactions in India. The study emphasized the reduction in transaction costs and increased accessibility, which contribute to financial inclusion.

Overall, the literature consistently demonstrates a strong positive relationship between UPI adoption, digital payment usage, and financial inclusion. However, it also highlights several challenges, including digital literacy gaps,

infrastructure limitations, and security concerns. While significant progress has been made, achieving inclusive financial growth requires continuous efforts to address these barriers. The present study builds on this existing literature by focusing specifically on Tamil Nadu and examining the combined impact of UPI adoption and digital payment usage on financial inclusion. By integrating multiple variables and employing empirical analysis, the study aims to provide a comprehensive understanding of the role of digital payments in promoting inclusive economic development.

Research Objectives

RO1: To examine the impact of UPI adoption on financial inclusion among individuals in Tamil Nadu.

RO2: To analyze the effect of digital payment usage on financial inclusion in the study area.

RO3: To evaluate the combined influence of UPI adoption and digital payment usage on enhancing financial inclusion using empirical analysis.

Research Methodology

The present study adopts a quantitative research approach to examine the impact of UPI adoption and digital payment usage on financial inclusion in Tamil Nadu. The research is descriptive and analytical in nature, aiming to establish relationships between independent and dependent variables through empirical investigation. The study is based on primary data, collected using a structured questionnaire designed on a five-point Likert scale ranging from “Strongly Disagree” (1) to “Strongly Agree” (5). The questionnaire consists of 30 items, categorized into three variables: UPI Adoption

(10 items), Digital Payment Usage (10 items), and Financial Inclusion (10 items). These items are adapted from existing literature to ensure content validity. A sample of 300 respondents is selected using a convenience sampling technique, targeting individuals who actively use digital payment systems, including UPI platforms, mobile wallets, and online banking services. The respondents include a mix of urban and semi-urban users to capture diverse perspectives on digital financial behavior. For data analysis, the study employs Statistical Package for Social Sciences (SPSS). Initially, reliability analysis (Cronbach’s Alpha) is conducted to assess the internal consistency of the measurement scale. Subsequently, factor analysis is used to validate the construct structure of the variables. Correlation analysis is applied to examine the strength and direction of relationships between variables. Finally, multiple linear regression analysis is performed to evaluate the impact of UPI adoption and digital payment usage on financial inclusion. The study ensures statistical rigor by testing hypotheses at a 5% significance level ($p < 0.05$). The findings are expected to provide meaningful insights into the role of digital payment systems in promoting financial inclusion and supporting policy formulation.

Research Hypotheses and Conceptual Framework

H1: There is a significant positive relationship between UPI Adoption and Financial Inclusion.

H2: There is a significant positive relationship between Digital Payment Usage and Financial Inclusion.

H3: UPI Adoption and Digital Payment Usage have a significant positive impact on Financial Inclusion.

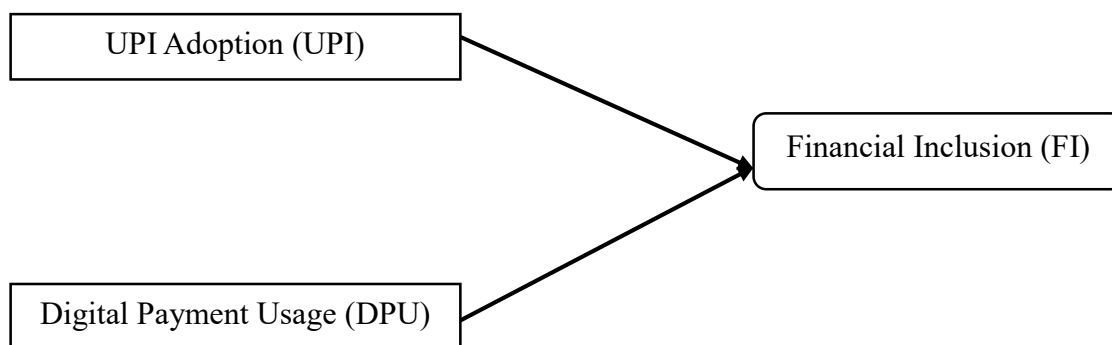


Fig. 1: Conceptual Framework

Data Analysis

1. Reliability Analysis

Case Processing Summary			
		N	%
Cases	Valid	300	100.0
	Excluded ^a	0	.0
	Total	300	100.0

a. Listwise deletion based on all variables in the procedure.

The Case Processing Summary table shows that all 300 responses were valid, with no missing or excluded cases. This indicates complete data availability and ensures that the analysis is based on a full sample, improving the reliability and accuracy of the results. The absence of missing values suggests proper data collection and minimizes bias in statistical outcomes. Since

listwise deletion was applied and no cases were excluded, the dataset is consistent and suitable for further statistical procedures such as reliability, factor, correlation, and regression analysis. Overall, this table confirms that the dataset is clean and appropriate for empirical research.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.967	.968	30

The reliability statistics table reports a Cronbach's Alpha of 0.967, which indicates excellent internal consistency among the 30 items used in the study. The standardized alpha value of 0.968 further confirms the robustness of the measurement scale. Since values above 0.7 are considered acceptable, this high value suggests that all items are highly correlated and

measure the same underlying constructs effectively. This ensures that the questionnaire is reliable for measuring UPI adoption, digital payment usage, and financial inclusion. Therefore, the dataset is suitable for further advanced statistical analyses such as factor analysis and regression modeling.

2. Factor Analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.973
Bartlett's Test of Sphericity	Approx. Chi-Square	8296.609
	df	435
	Sig.	.000

The KMO value of 0.973 indicates excellent sampling adequacy, suggesting that the data is highly suitable for factor analysis. Values above 0.9 are considered superb, confirming strong interrelationships among variables. Bartlett's Test of Sphericity is significant ($p = 0.000$), indicating that the correlation matrix is not an

identity matrix and that variables are sufficiently correlated to extract meaningful factors. These results validate the appropriateness of applying factor analysis to the dataset. Overall, this table confirms that the data structure is strong and suitable for identifying underlying factor dimensions.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.497	51.658	51.658	15.497	51.658	51.658	7.507	25.022	25.022
2	3.407	11.358	63.016	3.407	11.358	63.016	7.165	23.884	48.906

3	2.891	9.636	72.652	2.891	9.636	72.652	7.124	23.746	72.652
4	.528	1.759	74.411						
5	.483	1.609	76.020						
6	.465	1.551	77.572						
7	.454	1.512	79.084						
8	.430	1.434	80.518						
9	.399	1.331	81.849						
10	.378	1.260	83.109						
11	.377	1.256	84.365						
12	.364	1.213	85.578						
13	.338	1.127	86.705						
14	.318	1.059	87.764						
15	.317	1.057	88.821						
16	.302	1.006	89.827						
17	.289	.963	90.790						
18	.281	.936	91.727						
19	.265	.883	92.609						
20	.257	.857	93.467						
21	.240	.801	94.268						
22	.227	.758	95.026						
23	.216	.720	95.746						
24	.215	.718	96.464						
25	.198	.659	97.123						
26	.193	.643	97.766						
27	.184	.612	98.378						
28	.176	.586	98.964						
29	.163	.542	99.506						
30	.148	.494	100.000						
Extraction Method: Principal Component Analysis.									

The Total Variance Explained table shows that three components have eigenvalues greater than 1, explaining a cumulative variance of 72.652%. The first factor explains 51.658% of variance, followed by the second (11.358%) and third (9.636%). This indicates that the majority of variability in the data is captured by these three factors, representing UPI adoption, digital

payment usage, and financial inclusion. A cumulative variance above 60% is considered satisfactory in social science research, so this result confirms a strong factor structure. It suggests that the model effectively represents the underlying constructs with minimal information loss.

	Component		
	1	2	3
UPI1	.808		
UPI2	.823		
UPI3	.799		
UPI4	.799		
UPI5	.810		
UPI6	.800		
UPI7	.818		
UPI8	.768		
UPI9	.801		
UPI10	.801		
DPU1			.775
DPU2			.795
DPU3			.788

DPU4			.771
DPU5			.755
DPU6			.785
DPU7			.770
DPU8			.779
DPU9			.762
DPU10			.756
FI1		.769	
FI2		.758	
FI3		.790	
FI4		.803	
FI5		.785	
FI6		.794	
FI7		.777	
FI8		.756	
FI9		.807	
FI10		.814	
Extraction Method: Principal Component Analysis.			
Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 6 iterations.			

The rotated component matrix shows clear factor loadings after Varimax rotation. All UPI-related items load strongly on Component 1, digital payment usage items on Component 2, and financial inclusion items on Component 3, with loadings mostly above 0.75. This indicates a well-defined factor structure with no cross-loading issues. The strong loadings confirm that each set

of items measures its respective construct effectively. The rotation converged successfully, further validating the model. Overall, this table demonstrates strong construct validity and confirms that the questionnaire items are appropriately grouped into their respective variables.

3. Correlation Analysis

Correlations			
		UPI	FI
UPI	Pearson Correlation	1	.543**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	14263.637	4751.303
	Covariance	47.704	15.891
	N	300	300
FI	Pearson Correlation	.543**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	4751.303	5361.637
	Covariance	15.891	17.932
	N	300	300
**. Correlation is significant at the 0.01 level (2-tailed).			

The correlation between UPI adoption and financial inclusion is 0.543, which is positive and statistically significant ($p = 0.000$). This indicates a moderate to strong relationship, suggesting that higher UPI adoption is associated with greater financial inclusion. The significance at the 0.01 level confirms that the relationship is not due to chance. This finding supports the hypothesis that digital financial tools like UPI contribute to improved access to financial services. Thus, increased usage of UPI platforms plays a crucial role in enhancing financial participation among individuals.

Correlations			
		DPU	FI
DPU	Pearson Correlation	1	.554**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	10594.917	4178.617
	Covariance	35.435	13.975
	N	300	300
FI	Pearson Correlation	.554**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	4178.617	5361.637
	Covariance	13.975	17.932
	N	300	300

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation between digital payment usage and financial inclusion is 0.554, which is slightly stronger than UPI's correlation and is also statistically significant ($p = 0.000$). This indicates that increased usage of digital payment systems is positively associated with higher levels of financial inclusion. The results suggest that frequent engagement with digital payment platforms enhances financial accessibility and participation. The strong significance level confirms the reliability of this relationship. Overall, this finding highlights the importance of digital payment usage in promoting inclusive financial systems.

4. Multiple Linear Regression

The regression equation represents the relationship between digital financial variables and financial inclusion. Here, FI (Financial Inclusion) is the dependent variable, while UPI Adoption (UPI) and Digital Payment Usage (DPU) are independent variables influencing it. The intercept β_0 indicates the baseline level of financial inclusion when both UPI and DPU are zero. The coefficients β_1 and β_2 measure how much FI changes with a one-unit increase in UPI and DPU, respectively, holding other factors constant. The error term ϵ captures unexplained variations due to other factors not included in the model, ensuring realistic estimation.

$$FI = \beta_0 + \beta_1 (UPI) + \beta_2 (DPU) + \epsilon$$

Where:

FI = Financial Inclusion

UPI = UPI Adoption

DPU = Digital Payment Usage

β_0 = Intercept

β_1, β_2 = Regression coefficients

ϵ = Error term

Model Summary					
R	R ²	Adj. R ²	Std. Error	F	Sig.
0.613	0.375	0.371	3.358	89.171	0.000

The model summary table shows an R value of 0.613, indicating a moderate correlation between independent variables (UPI and DPU) and financial inclusion. The R² value of 0.375 implies that 37.5% of the variation in financial inclusion is explained by the model. The adjusted R² (0.371) confirms model stability. The F-statistic (89.171) is significant ($p = 0.000$), indicating that the overall regression model is statistically significant. This suggests that UPI adoption and digital payment usage jointly have a meaningful impact on financial inclusion.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2011.620	2	1005.810	89.171	.000 ^b
	Residual	3350.016	297	11.280		
	Total	5361.637	299			

a. Dependent Variable: FI
 b. Predictors: (Constant), DPU, UPI

The ANOVA table evaluates the overall significance of the regression model. The F-value of 89.171 with a significance level of 0.000

indicates that the model is statistically significant. This means that the independent variables (UPI and DPU) collectively explain a

significant portion of the variance in financial inclusion. The regression sum of squares (2011.620) is substantially higher than the residual sum, indicating a good model fit.

Therefore, the model is reliable and suitable for predicting financial inclusion based on digital payment variables.

Coefficients ^a							
Variable	B	Std. Error	Beta	t-value	Sig.	95% CI (Lower-Upper)	VIF
Constant	29.926	1.355	—	22.089	0.000	27.260 - 32.592	—
UPI	0.201	0.035	0.328	5.677	0.000	0.131 - 0.270	1.582
DPU	0.253	0.041	0.356	6.167	0.000	0.172 - 0.334	1.582

The coefficients table shows that both UPI ($\beta = 0.328$) and digital payment usage ($\beta = 0.356$) have a positive and significant impact on financial inclusion ($p = 0.000$). Digital payment usage has a slightly stronger influence compared to UPI adoption. The VIF values (1.582) indicate no

multicollinearity issues. The regression equation suggests that an increase in these variables leads to a corresponding increase in financial inclusion. Thus, both independent variables significantly contribute to improving financial accessibility and inclusion

Collinearity Diagnostics ^a						
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	UPI	DPU
1	1	2.972	1.000	.00	.00	.00
	2	.019	12.467	.47	.69	.00
	3	.009	18.349	.53	.31	.99

a. Dependent Variable: FI

The collinearity diagnostics table shows that the condition index values are below critical thresholds, and VIF values are low, indicating no multicollinearity issues among the independent variables. The variance proportions are well distributed, confirming that UPI adoption and digital payment usage are independent predictors. This ensures that the regression results are reliable and not distorted by overlapping variables. Overall, the model satisfies the assumptions of regression analysis, making the findings robust and trustworthy.

Findings & Discussion

The present study provides empirical evidence on the impact of UPI adoption and digital payment usage on financial inclusion in Tamil Nadu. The analysis is based on a structured dataset of 300 respondents and employs various statistical techniques to ensure robustness and validity of results. The reliability analysis indicates a Cronbach’s Alpha value of 0.967, which demonstrates excellent internal consistency among the 30 items used in the study. This high reliability suggests that the measurement scale is highly dependable and that all items effectively capture the underlying constructs. Such a strong reliability coefficient also ensures that the data is suitable for further

statistical analyses, including factor and regression analysis.

The factor analysis results further strengthen the validity of the study. The Kaiser-Meyer-Olkin (KMO) value of 0.973 indicates superb sampling adequacy, while Bartlett’s Test of Sphericity is significant at $p < 0.001$, confirming that the data is appropriate for factor extraction. The total variance explained shows that three components account for approximately 72.65% of the total variance, which is considered highly satisfactory in social science research. These components correspond to UPI adoption, digital payment usage, and financial inclusion, indicating a well-defined factor structure. The rotated component matrix reveals strong factor loadings for all items, with minimal cross-loadings. UPI-related items load on one factor, digital payment usage items on another, and financial inclusion items on the third. This clear separation confirms construct validity and ensures that each variable is distinctly measured. The absence of cross-loading issues indicates that respondents clearly differentiate between the constructs, enhancing the credibility of the findings.

The correlation analysis provides insights into the relationships between variables. The correlation coefficient between UPI adoption and financial inclusion is 0.543, indicating a moderate positive relationship. Similarly, digital payment

usage shows a slightly stronger correlation with financial inclusion ($r = 0.554$). Both relationships are statistically significant at the 0.01 level, suggesting that increased adoption and usage of digital payment systems are associated with higher levels of financial inclusion. These findings are consistent with previous studies, which highlight the role of digital technologies in improving access to financial services.

The regression analysis offers a deeper understanding of the impact of independent variables on financial inclusion. The model summary indicates an R value of 0.613, suggesting a moderate relationship between the variables. The R^2 value of 0.375 implies that approximately 37.5% of the variation in financial inclusion is explained by UPI adoption and digital payment usage. This indicates a reasonably strong model, considering the complexity of socio-economic factors influencing financial inclusion. The ANOVA results confirm that the regression model is statistically significant, with an F-value of 89.171 and a p-value of 0.000. This demonstrates that the model provides a good fit for the data and that the independent variables collectively have a significant impact on financial inclusion.

The coefficients table reveals that both UPI adoption and digital payment usage have positive and significant effects on financial inclusion. The standardized beta coefficient for UPI adoption is 0.328, while for digital payment usage it is 0.356. This indicates that although both variables are important, digital payment usage has a slightly stronger influence on financial inclusion. This may be attributed to the broader scope of digital payment systems, which include various platforms beyond UPI, thereby offering greater flexibility and accessibility. Another important finding is the absence of multicollinearity, as indicated by VIF values of 1.582. This suggests that the independent variables are not highly correlated with each other, ensuring the reliability of the regression results. The collinearity diagnostics further confirm that the model meets the assumptions of regression analysis.

From a practical perspective, the findings highlight the transformative role of digital payment systems in enhancing financial inclusion. UPI, with its ease of use and low transaction costs, has significantly improved access to financial services. At the same time, broader digital payment usage has facilitated greater financial participation by enabling users to perform various financial activities seamlessly. However, the study also implies that while digital payment systems are effective, they are not the sole determinants of financial inclusion. The R^2

value indicates that other factors, such as digital literacy, infrastructure, and socio-economic conditions, also play a significant role. Therefore, policymakers must adopt a holistic approach to financial inclusion by addressing these complementary factors.

Conclusion

The present study aimed to examine the impact of UPI adoption and digital payment usage on financial inclusion in Tamil Nadu. The findings provide strong empirical evidence that digital financial technologies play a significant role in promoting financial inclusion and enhancing access to financial services. One of the key conclusions of the study is that both UPI adoption and digital payment usage have a positive and significant impact on financial inclusion. The statistical analysis confirms that individuals who frequently use digital payment systems are more likely to be financially included. This highlights the importance of digital financial platforms in bridging the gap between formal financial institutions and underserved populations. The study also concludes that digital payment usage has a slightly stronger influence on financial inclusion compared to UPI adoption. This suggests that while UPI is a critical component of the digital payment ecosystem, the overall usage of various digital payment platforms contributes more significantly to financial inclusion. Therefore, efforts to promote financial inclusion should focus not only on UPI but also on encouraging the use of diverse digital payment methods. Another important conclusion is that the measurement model used in the study is highly reliable and valid. The high Cronbach's Alpha value and strong factor structure confirm that the constructs are accurately measured. This adds credibility to the findings and ensures that the results can be generalized to similar contexts. Despite the positive impact of digital payment systems, the study acknowledges that financial inclusion is influenced by multiple factors. The R^2 value indicates that a significant portion of the variation in financial inclusion is explained by variables beyond UPI adoption and digital payment usage. Factors such as digital literacy, access to technology, income levels, and infrastructure play a crucial role in determining the extent of financial inclusion.

The study also highlights the need for policy interventions to address existing challenges. While digital payment systems have improved accessibility, issues such as cybersecurity risks, lack of awareness, and resistance to technology continue to hinder their adoption. Policymakers must focus on enhancing digital literacy, strengthening cybersecurity measures, and

improving digital infrastructure, particularly in rural and semi-urban areas. Furthermore, financial institutions and fintech companies should design user-friendly platforms that cater to diverse user groups. Simplifying digital interfaces, reducing transaction costs, and providing multilingual support can significantly enhance adoption rates. Awareness campaigns and training programs can also play a vital role in educating users about the benefits and safe usage of digital payment systems. From an academic perspective, the study contributes to the existing literature by providing empirical evidence on the relationship between digital payment systems and financial inclusion. It also highlights the importance of considering multiple dimensions of digital finance when analyzing financial inclusion. In conclusion, the study underscores the transformative potential of digital payment systems in promoting financial inclusion. While significant progress has been made, achieving inclusive financial growth requires a comprehensive approach that integrates technological innovation with policy support and user education. By addressing existing challenges and leveraging digital advancements, it is possible to create a more inclusive and equitable financial ecosystem.

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