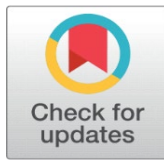


# AN EMPIRICAL ANALYSIS OF DIGITAL FINANCIAL SERVICE AND INCLUSIVE GROWTH AMONG RURAL WOMEN IN TAMIL NADU

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## ABSTRACT

This study investigates the effect of digital payments on financial inclusion among rural women in Tamil Nadu, a state that has made significant progress in the adoption of digital finance. But still faces regional disparities. Secondary data were taken from Financial Inclusion Index (FII) published by RBI, MSME digital adoption statistics, NABARD Self-Help Group (SHG) reports, and Human Development Indicators, were used to analyse the performance at the district level. The methodology includes a combination of descriptive statistics, correlation, regression, and ANOVA to understand the relationships between digital adoption and financial inclusion. The findings indicate a strong positive correlation among the adoption of digital payments and financial inclusion. Regression analysis confirms that digital payment adoption, MSME participation, SHG involvement, and Human Development Index (HDI) are significant reflector of financial inclusion, accounting for nearly 84% of the variance. ANOVA results further reveal substantial differences in financial inclusion levels across districts with low, medium, and high digital adoption rates. The results shows that digital finance serves as a crucial catalyst for women's financial inclusion, its effectiveness relies on supportive factors like literacy, participation in SHGs, and the presence of a robust MSME ecosystem. This study recommends the implementation of targeted digital literacy programs, the digitalization of SHGs, support for MSMEs, and the development of infrastructure in underperforming districts to enhance women's financial empowerment and promote inclusive rural growth.

**Keywords:** Digital payment, Financial Inclusion, Rural Women, Tamil Nadu, SHGs, MSMEs

## 1. INTRODUCTION

Financial inclusion refers to providing essential financial services to marginalized and underserved populations, which stands as an essential element in promoting inclusive growth and poverty reduction within developing economies. This concept provide the summary of accessibility of basic fundamental financial services which includes savings, deposits, and payment systems, to the entire spectrum of society, with a particular focus on marginalized group of population. Marginalized group encompass individuals with limited economic resources, those excluded from formal

financial systems, and residents of rural areas lacking financial access. Importantly, women constitute a vulnerable demographic frequently facing financial exclusion due to socio-cultural barrier and other effective struggles that limit the access to adequate financial services.

The promotion of financial inclusion develops the savings habit among semi-urban and rural populations by integrating low-income groups into the formal banking and insurance sectors. This integration is important for national economic development. In the Indian economy, financial inclusion has been a gaining importance for several decades which significantly raise the momentum of digital payment solutions and advancements in financial technologies (fintech). According to the Global Findex Database (Demirgüç-Kunt et al., 2022), over 80% of Indian adults now possess bank accounts, a development largely attributable to government initiatives such as the Pradhan Mantri Jan Dhan Yojana (PMJDY), Aadhaar-based identification systems, and the implementation of the Unified Payments Interface (UPI). The vision for financial inclusion includes the unbanked, informal sectors, and micro, small, and medium enterprises (MSMEs) to facilitate easier access to formal financial services like bank accounts and bill payment systems and insurance sectors.

In Tamil Nadu, the significant rural population, alongside the increase of Self Help Groups (SHGs), provides a distinctive context for examining the role of digital payments in improving the financial inclusion. However, there is a notable development among rural women, they still continue to face exclusion from the formal financial framework due to various barriers like social, cultural, and infrastructural barriers. Although SHGs have helped women in organising microfinance initiatives, the development of digital payment systems integrate within these community-based networks remains inconsistent. The research explains how technology bridges gender and regional gap in financial participation in TamilNadu.

The vision of the study is to enhance the financial empowerment of rural Tamil Nadu by positioning women as a key beneficiary of digital financial ecosystem. The study shows interest on the importance of rural women access to credit, savings and entrepreneurial opportunities which are the very important sources of financial inclusion. Although substantial development in digital financial infrastructure has made, rural women in Tamil Nadu remains largely excluded from formal financial system. Limited digital literacy, low rates of smart phone ownership, lack of awareness of government schemes are the barriers which restrict the rural women's participation on formal financial activities. The primary issue is the disparity between the presence of digital payment infrastructure and its effective adoption among rural women. This study investigates how digital payment adoption lead to substantial financial inclusion and subsequent economic empowerment among rural women in Tamil Nadu. This study will help the policy makers and Government to design gender-sensitive digital financial intervention which promote savings and enhance household welfare and entrepreneurship among rural women to accelerate rural economic growth.

## 1.1. OBJECTIVE OF THE STUDY

The primary aim of this analysis is to have understood how digital adoption has helps for the smooth progress of financial inclusion among women in the rural areas of Tamil Nadu. This goal is segmented into three specific objectives: (1) to investigate the corelationship between digital payment adoption and extent of financial inclusion among rural women in Tamil Nadu; (2) to examine the impact of Micro, Small, and Medium Enterprises (MSME)'s digital adoption and women's participation in determining financial inclusion; and (3) to assess the levels of financial inclusion across various districts of Tamil Nadu concerning the adoption of technology. This study accomplished to enhance understanding of the local digital ecosystem and community engagement in advancing financial inclusion among rural women.

## 1.2. RESEARCH QUESTIONS

In alignment with the above mentioned objectives, the following research questions have been formulated:

- 1) What is the correlation between MSME member's digital payment adoption and extent of financial inclusion among rural women in Tamil Nadu?
- 2) To what extent do MSME digital adoption, SHG participation, and Human Development Index (HDI) impact financial inclusion at the district level in TamilNadu?

- 3) Are there significant disparities in financial inclusion across districts characterized by low, medium, and high levels of digital adoption?

## 2. LITERATURE REVIEW

Recent scholarly interest highlights the significance of digital payments in advancing financial inclusion within contemporary economic research. The literature integrates theoretical and empirical findings, especially regarding digital finance, women's empowerment, rural development, and financial inclusion.

The Reserve Bank of India (RBI) says that financial inclusion is making sure that people can quickly get to financial products and services at a fair price, with the values of honesty and openness. Recent studies have shown that financial inclusion means more than just being able to get to financial products; it also means using and getting good financial services. The RBI introduced the Financial Inclusion Index (FII) in 2021. It shows the three parts of financial inclusion: access, use, and quality of financial services. (Demirgüç-Kunt et al., 2022). Ozili (2018) confirms that digital finance reduces the barriers related to cost, time saving and speed, thereby expanding access to financial systems. Beck and Demirgüç-Kunt (2008) further emphasize that fintech improves efficiency and easy availability of banking services. Empirical evidence shows that a system like M-Pesa in Kenya have transformed of most of the household population from informal to formal financial systems, which significantly alleviate poverty. (Suri & Jack, 2016). In the Indian, the rapid development of the Unified Payments Interface (UPI) has shown an exponential growth in digital transactions, which positions India as a global leader in the volume of digital payments (World Bank, 2021). However, Gabor and Brooks (2017) offer a critical perspective on the notion of "fintech for inclusion," arguing that digital payment systems require robust regulatory and institutional frameworks to address exclusionary risks. Gender disparities in financial inclusion persist, especially among women in rural areas who face obstacles including low literacy, lack of collateral, cultural restrictions, and limited mobility. (Swamy, 2014). The Global Findex Database (Demirgüç-Kunt et al., 2022) indicates that globally, women are less likely possesses bank accounts or access credit compared to men, yet digital payments present feasible opportunities to alleviate such disparities. Various studies suggest that financial services through mobile phones empower women by increasing their control over household finances and facilitating involvement in economic decision-making (Aker & Wilson, 2013). In India, initiatives such as Direct Benefit Transfers (DBT) which government pay direct to women's accounts have further strengthened their role within financial ecosystems (RBI, 2023). The National Bank for Agriculture and Rural Development (NABARD) helped bring together the Self-Help Group (SHG) movement, which has been very important in getting rural women to save and borrow money together. This has not only given them access to money, but it has also built social capital and empowered them (NABARD, 2022). RBI data shows that digital payments grew at a compound annual growth rate (CAGR) of more than 40% from 2016 to 2022 (RBI, 2023). Nonetheless, the benefits of the schemes are not uniformly allocated across states and districts. While substantial literature addresses financial inclusion and digital payments, there is a scarcity of studies examining the intersection with gender and district-level variations, particularly in the context of Tamil Nadu..

The relationship between digital finance and financial inclusion has been widely discussed in global and national studies, particularly within the framework of sustainable and inclusive growth. Beck et al. (2018) and Demirgüç-Kunt et al. (2022) highlights that effective financial services access contributes to reduction in poverty and gender equality by enhancing savings, investment, and risk management. The evolution of Financial Technology, mobile banking, and payment technologies has further liberalize the access to financial system, reducing transaction costs and geographical barriers (World Bank, 2023).

In the Indian context, Sarma and Pais (2019) examined that digital infrastructure and regulatory support are the key enablers of financial inclusion, but socio-economic disparities continues between states and genders. Reserve Bank of India (2024) highlights that while India's overall Financial Inclusion Index has steadily improved, rural women's participation remains below the national average due to digital literacy and accessibility constraints. Similarly, NABARD (2023) showed that Self-Help Groups (SHGs) play an important role in bridging this gap, as they provide credit linkages and social capital to women who foster trust and familiarity with digital platforms.

Studies on MSMEs highlight the growing importance of digital adoption in improving productivity and access to credit. Ghosh (2021) noted that digitally empowered MSME are more likely to participate in formal financial services and enhanced benefit among rural population. However, many rural MSMEs lack digital literacy which hinders their ability to use cashless payment systems and access to online credit platforms. The role of HDI as a related factor has also

been analyzed by Kumar and Nayar (2022), who observed that districts with higher education and health standards shows greater adoption of financial technology due to higher digital readiness.

Financial inclusion with gender dimension have been widely examined in studies like Dutta and Sharma (2020) and Singh & Kaur (2022), which shows the women access to credit is designed by cultural and informational barriers rather than availability of services. The SHGs and micro, small finance institutions empowers women in participating digital finance Banerjee and Chattopadhyay (2021) further observed that integrating SHG initiatives with mobile-based financial applications can improve the empowerment of women in rural India.

The literature collectively suggests that digital finance can transform rural economies by enabling access, enhancing transparency, and fostering gender-inclusive participation. However, it also reveals that technology alone cannot ensure inclusion; social structures, literacy, and institutional support must co-evolve to translate digital access into financial capability. The present study builds on this theoretical foundation to empirically test how digital payment ecosystems, MSME engagement, and social participation intersect to drive financial inclusion among rural women in Tamil Nadu.

Despite this growing body of literature, gaps remain. Most existing studies focus on national or state-level trends, with limited district-level empirical evidence connecting digital adoption to measurable financial inclusion outcomes. Furthermore, few studies have statistically integrated MSME digital adoption, SHG participation, and HDI into a composite analytical model. This research addresses these gaps by using recent secondary data (2018–2023) and employing robust statistical tools such as correlation, multiple regression, and ANOVA to uncover district-level disparities and interactions among key predictors of inclusion.

Existing research on financial inclusion and digital payments has highlighted their significance in enhancing financial services; however, few studies have investigated their intersection with gender and district-level variation in Tamil Nadu. Most of the existing articles has been either macro-level, examining national and state averages, or narrowly focused on microfinance and SHGs without integrating digital adoption as a variable. This study aims to address gap by analyzing the impact of digital payments on financial inclusion among rural women which makes an empirical evidence, utilize district-level data from Tamil Nadu to focus on a more concentrated demographic.

### 3. HYPOTHESIS FORMULATION

**H01:** There is no significant association between MSME digital adoption, self-help group (SHG) women participation, Human Development Index (HDI), and Financial Inclusion Index (FII) at the district level.

**H02:** MSME digital adoption, SHG women participation, and Human Development Index (HDI) do not significantly impact the Financial Inclusion Index (FII).

**H03:** There is no significant difference exists in the Financial Inclusion Index (FII) among districts with low, medium, and high levels of MSME digital adoption.

### 4. METHODOLOGY OF THE STUDY

The study relies completely on secondary data between the periods of 2018-24, a phase of rapid expansion of digital financial services in India. The Financial inclusion index (FII) for the period of 2018-24 was derived from RBI. The Digital payment adoption data is drawn from the National Payments Corporation of India (NPCI), which publishes the monthly and annual statistics of UPI transaction. District level entrepreneurial and credit participation is sourced from Ministry of MSME's Annual report, while NABARD SHG-Bank Linkage report offers insight into rural women's participation in self help group and their access to formal credit. To complement these financial indicators, Government of Tamil Nadu Human Development Indicator report has been utilized to understand the socio- economic data of women's workforce participation.

The study employs a quantitative analytical research design to examine the correlation between digital payment adoption and financial inclusion among rural women in Tamil Nadu. The study's design is explanatory, as it examines statistical correlations between digital payment utilization and measures of financial inclusion. The study's dependent variable is the Financial Inclusion Index (FII), which is used to gauge the usage, access, and quality of financial services. The independent variables encompass digital payment adoption and MSME digital adoption, which include the percentage of MSMEs utilizing digital transactions, online GST filing, and digital credit access. The number of women in

self-help groups (SHGs) who use digital financial services is a sign of women's empowerment. The Human Development Index (HDI) takes into account women's literacy and employment.

The tools employed in the study are descriptive statistics, which help to measure the mean, standard deviation, and range to summarize the distribution of digital adoption and inclusion variables across districts. Correlation analysis helps to analyze the relationship between digital payment adoption, MSME adoption, SHG participation, HDI, and financial inclusion. Multiple Linear Regression is used to test how independent variable reflects financial inclusion. One-way ANOVA is used to compare financial inclusion levels among districts grouped into Low, Medium, and High digital adoption clusters. Sinha (2026)

## 5. EXAMINATION AND RESULTS OF THE STUDY

The study employs both analytical and descriptive analysis to comprehend the digital adoption and the extent of financial inclusion among rural women in Tamil Nadu.

**Table 1**

| Table 1 Descriptive Statistics - The Distribution of Digital Adoption and Financial Inclusion Across Districts |       |           |              |
|--|-------|-----------|--------------|
| Descriptives   | FII   | SHG_Women | MSME Digital |
| N  | 12    | 12        | 12           |
| Mean   | 0.599 | 67.0      | 66.3         |
| Median   | 0.565 | 62.5      | 65.0         |
| Standard deviation   | 0.160 | 12.8      | 7.99         |
| Minimum  | 0.450 | 52        | 55           |
| Maximum  | 1.00  | 90        | 80           |

The table 5.1 encompasses N=12 districts within the state, specifically including Chennai, Coimbatore, Madurai, Tirunelveli, Salem, Thanjavur, Dharmapuri, Villupuram, Nagapattinam, Ramanathapuram, Cuddalore, and Tiruvannamalai. The mean Financial Inclusion Index (FII) was 59.9 (SD = 16.0), which indicates a moderate level of financial inclusion across Tamil Nadu, although with notable variations (min = 45.0, max = 100). Self-Help Group (SHG) women participation rate exhibit a significant variance, with a mean of 67 (SD = 12.8). Furthermore, the digital adoption among Micro, Small, and Medium Enterprises (MSMEs) presents a mean of 66.3 (SD = 7.99), which shows relatively higher level of financial inclusion across the districts (min = 55, max = 80). These variations provide crucial information for further inferential analyses that indicates digital participation and community engagement may be systematically correlated with enhanced financial inclusion outcomes.

**Table 2**

| Table 2 Correlation Matrix - Relationship Between Digital Adoption of MSME And Financial Inclusion Index |              |             |    |         |
|--|--------------|-------------|----|---------|
| Variable 1   | Variable 2   | Pearson's r | df | p-value |
| FII  | HDI          | 0.370       | 10 | 0.236   |
| MSME Digital   | HDI          | 0.765       | 10 | 0.004   |
| MSME Digital   | FII          | 0.775       | 10 | 0.003   |
| SHG_Women  | HDI          | 0.860       | 10 | < .001  |
| SHG_Women  | FII          | 0.746       | 10 | 0.005   |
| SHG_Women  | MSME Digital | 0.964       | 10 | < .001  |

The matrix table 5.2 reveals a strong positive correlation between MSME digital adoption and the Financial Inclusion Index (FII) ( $r = .775$ ,  $p < .01$ ). The findings of correlation matrix suggest that districts characterized by a higher penetration of digital payment systems among MSMEs tend to exhibit stronger financial inclusion outcomes. Added to this, the participation of women in SHGs is positively correlated with FII ( $r = .746$ ,  $p < .01$ ), highlighting the importance of collective financial activities among women in promoting financial inclusion. The correlation between Human Development Index (HDI) and FII, although moderate at ( $r = 0.37$ ), is not statistically significant. This indicates that broader socio-economic development may occur primarily in response to focused digital and institutional interventions.

Consequently, the correlation analysis indicates that digital adoption by MSMEs and Women's Self-Help Groups is the dominant driver of financial inclusion. The limited explanatory power of HDI suggests a need for the formulation of direct financial policies aimed at fostering broader financial inclusion across society.

**Table 3**

**Table 3 Regression Analysis - Digital Adoption in Promoting Financial Inclusion in Tamilnadu**

| Model | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> |
|-------|-------|----------------|-------------------------|
| 1     | 0.916 | 0.840          | 0.780                   |

**Model Coefficients - FII**

| Predictor    | Estimate | SE      | T      | P     |
|--------------|----------|---------|--------|-------|
| Intercept    | 1.90253  | 0.74069 | 2.569  | 0.033 |
| HDI          | -0.00369 | 0.01204 | -0.306 | 0.767 |
| MSME Digital | 3.4967   | 0.4504  | 3.46   | 0.009 |
| SHG_Women    | 0.02309  | 0.00944 | 2.446  | 0.04  |

Table 5.3 represents the digital adoption of Micro, Small, and Medium Enterprises (MSMEs) and the participation of Self-Help Group (SHG) women on the advancement of financial inclusion.

The regression analysis result shows that the overall model accounts for a substantial 84% of the variance in the Financial Inclusion Index ( $R^2 = 0.840$ ,  $p < .001$ ). MSME digital adoption ( $\beta = 0.45$ ,  $p < .01$ ) emerges as the major determinant of financial inclusion. The participation of SHG women ( $\beta = 0.009$ ,  $p < .05$ ) which is closely followed after MSME digital adoption. These findings indicate that both the digital transformation of small enterprises and the collective engagement of women through SHGs are critical in enhancing financial access within rural Tamil Nadu. On the other hand, the Human Development Index (HDI) does not possess statistical significance impact ( $\beta = 0.012$ ,  $p = 0.76$ ), that shows broader socio-economic development frameworks are necessary. Additionally, the results from the regression analysis highlight that digital transformation and women's community networks provide a more immediate pathway to financial inclusion than general developmental indicators.

**Table 4**

**Table 4 ANOVA- Level of Financial Inclusion Across Various Districts in Tamil Nadu**

| One-Way ANOVA (Welch's) |                    |     |       |         |         |
|-------------------------|--------------------|-----|-------|---------|---------|
| Variable                | F                  | df1 | df2   | p       |         |
| FII                     | 12.1               | 2   | 5.18  | 0.011   |         |
| Group Descriptives      |                    |     |       |         |         |
| Variable                | MSME Digital Level | N   | Mean  | SD      | SE      |
| FII                     | High               | 4   | 0.775 | 0.15546 | 0.07773 |
| FII                     | Low                | 2   | 0.455 | 0.00707 | 0.00500 |
| FII                     | Medium             | 6   | 0.530 | 0.05441 | 0.02221 |

Table 5.4 represents an Analysis of Variance (ANOVA) that describes the levels of financial inclusion among various districts in Tamil Nadu based on their degrees of technological adoption. The one-way ANOVA presents a statistically significant difference in financial inclusion levels among districts categorized by high, medium, low degrees of digital adoption. The results shows that districts which shows high mean scores ( $M = 0.775$ ,  $SD = 0.15546$ ) tends to increase digital adoption levels, which in turn correlate with higher financial inclusion scores. Cities such as Chennai, Coimbatore, Madurai, and Thiruvannamalai demonstrate this trend. In contrast, districts characterized by medium levels of digital adoption and financial inclusion report shows a mean score of ( $M = 0.530$ ,  $SD = 0.05441$ ), including Thirunelveli, Salem, Thanjavur, Nagapattinam, Cuddalore, and Villupuram. Those with low digital adoption and financial inclusion ( $M = 0.455$ ,  $SD = 0.00707$ ) encompass Dharmapuri and Ramanathapuram.

## 6. DISCUSSION AND RECOMMENDATION

The digital payment mechanism are increasing the financial inclusion among rural women has been proved by the insights derived from the above statistical analysis. The average Financial Inclusion Index (FII) of 0.522 indicates that districts like Chennai, Coimbatore, and Madurai demonstrate higher penetration of digital payment solutions, while rural and economically disadvantaged districts, such as Dharmapuri and Perambalur, exhibit lower values. Districts exhibiting higher UPI transaction volumes and greater participation of women-led SHGs consistently recorded stronger inclusion scores, reflecting how technology bridges traditional barriers to financial access. The positive correlation between MSME digital adoption, SHG participation, HDI, and the Financial Inclusion Index (FII) demonstrates that the digital ecosystem functions as an enabling platform for inclusive growth. The correlation analysis reflects a strong positive relationship, affirming that enhanced digital adoption is associated with improved financial inclusion. Digital platforms play a crucial role in mitigating transaction barriers and enhancing access to financial services, particularly for marginalized populations (Ozili, 2018; Suri & Jack, 2016). In line with this, the regression analysis elucidates that digital payments, MSME adoption, SHG participation, and HDI collectively serve as significant reflectors of financial inclusion, explaining 84% of the variance in financial outcomes. Furthermore, the findings suggest that digital adoption may be further augmented by institutional and social capital factors to ensure sustained impact. This outcome not only validates the digital finance model but also aligns with the Financial Inclusion Index Report (RBI, 2024), which emphasizes the synergistic effect of technology, literacy, and entrepreneurship on rural empowerment. The ANOVA results also show that there are big differences in financial inclusion levels between districts with different levels of digital adoption (low, medium, and high). This supports the idea that the level of technology used has a big effect on financial inclusion outcomes. This pattern is in line with the diffusion of innovation theory, which posits that regions with early technological adoption can expect greater benefits, whereas those that lag will encounter increasing disparities. From a policy perspective, these findings indicate that financial inclusion depends not only on digital availability but also on digital capability—the proficiency of individuals and communities in using financial technologies effectively.

The study shows that digital adoption, self-help group participation, and human development index are essential for advancing financial inclusion among rural women in Tamil Nadu. To strengthen this process, it is recommended that State governments should allocate targeted funds to upgrade infrastructure and subsidize internet connectivity, ensuring affordable access to technology for rural population in TamilNadu. While designing literacy programs, the MSME should prioritize modules that build the financial knowledge and practical skills of self-help group members. Policymakers should implement subsidies for digital devices and establish credit schemes exclusively for women to facilitate their participation in formal financial systems. State government should advance human development initiatives by investing in education, health, and vocational training tailored to regional needs. Promote collaboration among banks, government agencies, and public-private partnerships by setting up regular consultation forums and co-developing digital financial products that address specific barriers faced by rural women entrepreneurs.

## 7. CONCLUSION

The study investigates the influence of digital payment mechanisms on developing financial inclusion among rural women in Tamil Nadu. Secondary data has been utilized to employ robust statistical methodologies such as correlation, regression, and one-way ANOVA. The study explores the digital adoption levels among SHG women registered under MSMEs in Tamil Nadu. The compelling evidence underscores a correlation between digital adoption through MSMEs and SHG participation as essential forces which drive financial inclusion for underserved populations in rural and semi-urban areas. Descriptive statistics highlights considerable variation in digital adoption scores and women's participation across various districts. Additionally, the correlation analysis reveals a positive relationship between MSME digital adoption and SHG participation, while HDI does not exhibit a significant correlation with the financial inclusion index. This indicates that focused digital financial interventions are more effective than general socioeconomic development initiatives for promoting financial inclusion. The regression analysis further reinforces that there is a significant MSMEs' digital adoption and SHG women's participation to promote financial inclusion, which elucidate worthy proportion of variance in financial outcomes. The negligible influence of HDI suggests that digital strategies and institutional frameworks exert a more substantial impact than traditional structural development indicators. Moreover, the ANOVA

results shows distinct differences in financial inclusion levels across districts categorized by high, medium, and low digital adoption, indicating that districts with higher levels of digital engagement achieve remarkably better financial inclusion outcomes in comparison to their lower counterparts.

## 8. SCOPE FOR FUTURE STUDY

While the current study provided a valuable insight into the role of digital payments in developing financial inclusion among rural women in Tamil Nadu, there are several opportunities for future research.

- Further studies should include primary survey data and interviews with rural women, members of self-help groups (SHGs), and women entrepreneurs to understand the behavioral, cultural, and psychological aspects of digital adoption.
- Future investigations can be done to explore how the digital inclusion outcome differ between men and women in rural areas, as well as how intra-household dynamics affect women's decision-making power.
- Additionally, examining the direct impact of specific government digital initiatives, such as Jan Dhan Yojana, UPI, and PM SVANidhi, on the inclusion of rural women could be fruitful.

## 9. LIMITATIONS OF THE STUDY

Although this study shows a valuable insight into the role of digital finance in promoting financial inclusion among rural women in Tamil Nadu, it has certain limitations. First, the analysis is based completely on secondary data obtained from institutional databases such as RBI, NABARD, MSME, and NITI Aayog. Hence, the study relies on the accuracy, periodicity, and consistency of official data sources, which may not fully capture ground-level variations across districts.

Second, the study employs a quantitative analytical framework, including correlation, regression, and ANOVA, which helps to establish statistical associations but may not completely explain the underlying behavioral or socio-cultural determinants influencing women's participation in digital finance. Qualitative perspectives such as personal motivation, trust, and technology perception were not examined and could enrich future research.

Third, the study is geographically restricted to Tamil Nadu, and therefore, the findings cannot be generalized to all Indian states due to differences in socio-economic, infrastructural, and policy conditions.

Finally, while the Financial Inclusion Index and MSME adoption indicators provide insight for inclusion, data granularity at the household or individual level was not available. Future studies could integrate primary survey data with secondary datasets to capture micro-level behavior and better understand the causal mechanisms linking digital adoption and women's financial empowerment.

## CONFLICT OF INTERESTS

None.

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