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Cryptocurrency Adoption and Economic Empowerment: Transforming Financial Inclusion in India's Emerging Markets

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ABSTRACT
This study explores the impact of cryptocurrency adoption on financial inclusion within India's emerging markets. Key constructs such as Financial Inclusion (FI), Perceived Economic Empowerment (PEE), Trust in Financial Institutions (TFI), User Satisfaction (US), and Cryptocurrency Adoption (CA) were analyzed using Structural Equation Modelling (SEM). The findings reveal that CA significantly enhances FI, US, TFI, and PEE. These positively correlated with FI. The results suggest that cryptocurrencies offer a promising solution to address the limitations of traditional financial systems, fostering greater financial inclusion and economic empowerment in India's growing economy. Future research should examine the role of digital literacy and regulatory frameworks in facilitating cryptocurrency adoption in this context..
Keywords: *Cryptocurrency adoption, financial inclusion, India's emerging markets, Economic empowerment, Structural equation modelling*.

1. INTRODUCTION:

Cryptocurrencies, which are digital or virtual currencies secured by cryptography and built on blockchain technology, have gained considerable traction since Bitcoin's introduction in 2009. Their appeal is especially strong in emerging markets like India, where traditional banking facilities are not fully accessible to large segments of the population.
Bitcoin's emergence marked the beginning of a new era in digital finance. Its adoption has been driven by various factors, including the widespread use of smartphones and growing

dissatisfaction with conventional banking systems. Research by Blandin et al. (2020) highlights that cryptocurrencies have become particularly prevalent in regions like Sub-Saharan Africa and Southeast Asia, where they serve practical roles in remittances and offer protection against currency devaluation.

In emerging economies like India, cryptocurrencies facilitate more affordable international money transfers, broaden access to financial services, and create new investment opportunities. According to the World Bank's Global Findex Database (2017), cross-border remittances conducted through digital currencies represent a significant source of financing for these countries. Additionally, blockchain technology ensures that transactions are secure and transparent, enabling previously unbanked populations to access banking services (Demirgüç-Kunt et al., 2018). The potential advantages of blockchain technology extend beyond transactions, enhancing security, transparency, and efficiency in various applications.

This technological evolution has led to the development of innovative financial solutions, such as smart contracts and decentralized finance (DeFi) platforms, which provide financial services without the need for intermediaries (Schär, 2021). In regions where traditional banks are scarce, these innovations have made cryptocurrencies a viable and increasingly robust option.

Initially, cryptocurrencies were adopted in developing countries for remittances and as alternatives to unstable local currencies (Allende López & Leal Batista, 2021). Over time, their use has expanded to include microtransactions, cross-border payments, and support for local enterprises, thereby financially empowering communities (Kulkarni et al., 2019). Despite economic challenges, the use of cryptocurrencies as a means of saving and transacting has gained popularity in countries like Venezuela (Rosales, 2021). In Zimbabwe, another economically constrained environment, cryptocurrencies have facilitated international transactions and provided access to foreign currencies (Mazikana, 2018).

Cryptocurrencies significantly contribute to financial inclusion by offering accessible financial services to those excluded from traditional banking systems. They also have the potential to disrupt market dynamics by introducing competition to traditional banks, which could spur innovation in financial services. However, their

growing influence has sparked debates over the need for regulation and the stability of the financial system (Auer and Boehme, 2020). Environmental concerns related to cryptocurrency mining and the development of sustainable regulatory frameworks are also pressing issues (Truby, 2018). The varying regulatory approaches highlight the trade-offs between fostering innovation and ensuring financial stability and consumer protection in emerging markets (Auer and Claessens, 2020).

Despite the growing body of literature on cryptocurrencies, there remains a lack of comprehensive studies that explore their multifaceted impact on emerging markets like India. To fully understand the influence of cryptocurrencies, extensive research is required. There is a particular need for systematic reviews that analyze the broad spectrum of functions these digital currencies perform in such markets.

1.1. Need of the study

This paper aims to examine the diverse consequences of cryptocurrency adoption in India, discussing both its potential benefits and associated risks. It seeks to contribute to academic and policy debates by empirically investigating how cryptocurrency impacts financial inclusion and economic empowerment in India's emerging markets. The paper provides an in-depth analysis of cryptocurrency adoption, its effects on financial inclusion, and the dynamics of market adoption, while also considering future prospects. Each section of the paper explores different aspects of cryptocurrency's role in these markets, from its historical development and general usage to its impact on financial systems, user satisfaction, trust in financial institutions, and perceived economic empowerment. This comprehensive approach aims to highlight the transformative potential of cryptocurrencies in achieving higher levels of financial inclusion and fostering stronger economies in emerging markets like India.

1.2. Objectives of the study

The primary objective of this study is to examine the impact of Cryptocurrency Adoption (CA) on key financial and psychological outcomes, including Financial Inclusion (FI), User Satisfaction (US), Trust in Financial Institutions (TFI), and Perceived Economic Empowerment (PEE). Specifically, the study aims to assess whether CA positively influences FI, US, TFI, and PEE. Furthermore, it investigates the mediating effects of US, TFI, and PEE on FI to determine whether these factors enhance the role of cryptocurrency in promoting inclusive finance. The research seeks to understand the interrelationships among these variables to support policy and technological advancements in digital finance.

1.3. Hypotheses

Based on the literature reviewed, the following hypotheses have been formulated for this study:

- **H1:** Cryptocurrency Adoption (CA) positively influences Financial Inclusion (FI).
- **H2:** Cryptocurrency Adoption (CA) positively influences User Satisfaction (US).
- **H3:** Cryptocurrency Adoption (CA) positively influences Trust in Financial Institutions (TFI).
- **H4:** Cryptocurrency Adoption (CA) positively influences Perceived Economic Empowerment (PEE).
- **H5:** User Satisfaction (US) positively influences Financial Inclusion (FI).
- **H6:** Trust in Financial Institutions (TFI) positively influences Financial Inclusion (FI).
- **H7:** Perceived Economic Empowerment (PEE) positively influences Financial Inclusion (FI)

2. LITERATURE REVIEW

2.1. Conceptual Definitions

Cryptocurrencies are digital assets or ledger entries that operate in a decentralized manner, free from the control of any central authority. These assets are secured through cryptography and are built on blockchain technology (Nakamoto, 2009). The cryptographic techniques employed ensure the security and integrity of transactions, eliminating the need for central intermediaries (Nakamoto, 2009). This innovative use of cryptography has ushered in a new era characterized by transparency, security, and decentralization (Buterin, 2014). Over time, cryptocurrencies have evolved from a speculative medium of exchange into a potent tool for establishing a decentralized financial system that challenges traditional financial intermediaries.

The term "emerging markets" refers to economies that are transitioning from low-income to middle-income status. These markets are marked by dynamic yet unstable economies, offering high-profit opportunities alongside various risks (Sachs & Warner, 1995). Rodrik (2011) further describes emerging markets as possessing resilient and adaptive economies, driven by dynamic capital market growth, rapid technology adoption, and a growing middle class, all while grappling with the vulnerabilities of political instability and a disorderly market environment.

Financial inclusion, a concept popularized by the World Bank (2014), refers to the accessibility and usage of financial services by all segments of the population in an affordable manner, with a focus on those who are economically underserved or unserved. This concept is central to promoting inclusive growth and reducing poverty, as it emphasizes the expansion of formal financial services to those currently excluded or underserved, thereby fostering sustainable development and social justice (Demirgüç-Kunt et al., 2015). True financial inclusion extends beyond merely providing access to bank accounts; it involves empowering consumers to actively participate in the economy as productive contributors.

2.2. Theoretical Perspectives on Financial Innovation and Economic Development

Schumpeter's economic development theory posits that entrepreneurship, particularly through innovative firms, serves as a key driver of economic growth. Schumpeter (1942) emphasized that disruptive forces, such as market

volatility that replaces old industries with new ones, are critical in fostering long-term development. This theory, when applied to financial innovation, highlights the transformative impact of fintech and digital finance on economic development by enhancing efficiency, accessibility, and the creation of new financial products and markets. McKinnon (1973) and Shaw (1973) introduced another important strand of literature in the neoclassical tradition, focusing on the financial deepening hypothesis, which argues that the development of financial markets and institutions is essential for economic growth. They underscored the importance of saving mobilization, investment facilitation, and resource allocation. Innovations like mobile money, digital banking, and decentralized finance platforms are believed to be catalysts for economic growth in developing regions. Akerlof (1970), followed by Stiglitz and Weiss (1981), discussed how informational asymmetries in financial markets can lead to inefficiencies such as adverse selection and moral hazard. Financial innovations that enhance transparency, reduce information costs, and improve risk assessment such as credit scoring algorithms and block chain technology can mitigate these inefficiencies, thereby promoting financial market stability and inclusivity.

The theory of economic empowerment suggests that greater access to financial services and products can lead to poverty reduction. Financial innovations that lower barriers and integrate people into the formal financial system—thereby providing access to banking, credit, and investment opportunities can remove significant obstacles to financial inclusion and economic development. The COVID-19 crisis has provided compelling evidence that digital finance-focused innovations, such as mobile banking and peer-to-peer lending platforms, encourage broad-based economic participation among traditionally underserved communities (Mabrouk et al., 2023; Kumari, 2022). Building on this body of theory, this paper emphasizes the critical role of financial innovation in shaping economic structures.

Thus, financial innovation plays a pivotal role in swiftly responding to current challenges, expanding financial system inclusion, and promoting economic development. However, maintaining a balanced regulatory regime is crucial to fostering innovation while mitigating potentially disruptive effects (Makanyeza et al., 2023; Handayani & Abubakar, 2022).

2.3. Theoretical Frameworks and Models

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a widely recognized model that explains the determinants of technology adoption, including cryptocurrency adoption in emerging markets. According to UTAUT, technology acceptance is influenced by performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). Performance expectancy relates to the belief that the technology will enhance job performance, which, in the context of cryptocurrency, implies perceived financial benefits and security (Dwivedi et al., 2017). Effort expectancy refers to the ease of using the technology, a crucial factor for general users of cryptocurrency platforms who may lack technical knowledge (Hsiao et al., 2018). Social influence captures the extent to which users perceive that important others believe they should use the technology, a perception that is increasingly driven by endorsements from peers and influencers (Dwivedi et al., 2017). Facilitating conditions encompass the resources and support necessary for using the technology, such as internet access, educational materials, and regulatory frameworks (Oliveira et al., 2016), which vary across different technologies and significantly influence user perceptions. By incorporating these constructs, the UTAUT model helps identify the factors and challenges associated with cryptocurrency adoption, offering insights into what stakeholders should do to promote financial inclusion and innovation in emerging markets like India.

2.4. Adoption of Cryptocurrencies in India's Emerging Markets

The Chainalysis 2020 Geography of Cryptocurrency Report highlights significant cryptocurrency adoption across regions like Latin America, Africa, and Asia—areas often characterized by high inflation, volatile currencies, and limited banking services (Chainalysis, 2020). In countries such as Nigeria, Venezuela, and Indonesia, cryptocurrencies have become a hedge against currency devaluation and an alternative means of facilitating remittances and financial transactions, bypassing the inefficiencies of traditional banking systems.

In Sub-Saharan Africa, mobile technology has been a key driver in boosting cryptocurrency adoption by improving access to digital financial services (Cindy, 2022). Similarly, countries like Vietnam and the Philippines in Asia have leveraged technological advancements and supportive regulatory frameworks to foster cryptocurrency adoption (Abbasi et al., 2021). The role of government regulation is critical; for instance, while Bitcoin is recognized as legal tender in El Salvador, other countries approach it cautiously due to concerns about financial stability (Alvarez, 2022). The regulatory landscape thus influences the varying rates of cryptocurrency adoption across different emerging markets. Key drivers for adoption include financial inclusion, reduced transaction costs, and enhanced economic autonomy, although challenges such as digital literacy barriers and infrastructural deficits continue to pose regulatory uncertainties (Sitthipon et al., 2022).

Cryptocurrencies offer solutions to inherent economic challenges in emerging markets. According to the World Bank, remittances to low- and middle-income countries reached approximately $540 billion in 2020 (World Bank, 2021). Cryptocurrencies can serve as cost-effective and efficient alternatives to traditional remittance channels, significantly reducing transaction fees and processing times (Kayani & Hassan, 2024).

In India, where approximately 1.7 billion adults lack access to traditional banking services, cryptocurrencies

provide a viable means of financial inclusion through mobile phones and internet access (Demirgüç-Kunt et al., 2018). In countries grappling with hyperinflation, such as Venezuela and Argentina, cryptocurrencies act as a safeguard against currency depreciation, helping individuals maintain financial stability amid economic instability (Senner & Sornette, 2018).

Moreover, political instability and capital controls have driven the adoption of cryptocurrencies as a means of wealth preservation and a way to circumvent government restrictions (Johnson, 2022). The widespread expansion of mobile technology and increasing digital literacy in emerging markets, including India, further facilitate the adoption of cryptocurrencies (Nambisan, 2017). Thus, in India's emerging markets, cryptocurrency adoption represents a promising opportunity to reform inefficient remittance systems, address financial exclusion, and mitigate economic volatility, thereby reshaping the financial landscape towards greater economic empowerment and stability. Case studies from countries like Venezuela, Nigeria, and the Philippines reveal different drivers and outcomes of cryptocurrency adoption. In Venezuela, hyperinflation and economic instability are primary drivers, while in Nigeria, limited access to banking services and high remittance costs fuel adoption. In the Philippines, efficient remittance channels and progressive regulatory frameworks are key factors (Mohammed et al., 2022; Nedosekin, 2019; Yasay, 2021).

2.5. Cryptocurrencies and Financial Inclusion in India

The relationship between cryptocurrencies and financial inclusion lies in the growing interest in digital finance, which aims to integrate unbanked and underbanked populations into the formal financial ecosystem. Cryptocurrencies offer several mechanisms to enhance financial inclusion, such as breaking down traditional barriers that limit access to financial services through innovative models for money transfers, savings, and lending.

Integrating cryptocurrencies with mobile money platforms has significant potential to enhance financial inclusion. In areas with limited banking infrastructure, the widespread use of mobile phones makes them an ideal conduit for everyday financial transactions. Pairing cryptocurrencies with mobile money services facilitates cross-border transactions, remittances, and access to digital assets without the need for a traditional bank account. This integration, based on blockchain technology, offers efficiency, transparency, and security, particularly in regions like Sub-Saharan Africa with high mobile money adoption rates (El Amri et al., 2021).

Compared to traditional cross-border payments and remittances, cryptocurrencies drastically reduce transaction costs, which can be notably high when charged by banks or money transfer operators. As Nakamoto (2009) pointed out, cryptocurrencies enable direct peer-to-peer transactions on the blockchain, leading to substantial transaction cost savings, which have significant implications for individual economic welfare in emerging markets.

Cryptocurrencies also provide legitimate digital access points for individuals excluded from the formal banking system. All that is required is an internet connection and a digital wallet, making access possible regardless of socio-economic status, credit history, or geographical location. Unlike traditional financial systems, which often impose documentation requirements or minimum deposit thresholds, cryptocurrency networks operate 24/7, ensuring that financial services are always available (Tapscott & Tapscott, 2016). The decentralized nature of cryptocurrencies shifts financial control from centralized institutions to individuals, empowering users to manage their finances independently. This is particularly important in contexts where trust in traditional financial institutions is low due to historical instability, corruption, or inefficiency. The transparency and immutability of blockchain technology foster trust among users, thereby facilitating financial inclusion by encouraging participation in the digital economy (Catalini & Gans, 2016).

Empirical evidence underscores the transformative potential of cryptocurrencies in enhancing financial inclusion in emerging markets. Various studies indicate that cryptocurrencies increase access to financial services among the most marginalized populations (Makanyeza et al., 2023; Handayani & Abubakar, 2022; Mabrouk et al., 2023; Kumari, 2022). According to Gigauri (2022), digital currencies have facilitated access to banking services, credit, and remittances for historically excluded populations, thanks to features such as reduced transaction costs and ease of accessibility.

El Amri et al. (2021) analyzed the situation in Sub-Saharan Africa, where a significant portion of the population remains excluded from formal financial systems. The researchers found that cryptocurrencies, especially when combined with mobile money, substantially mitigate these issues. However, they also emphasized the need for appropriate regulations to ensure that these advantages are realized safely and effectively for financial inclusion. Remittances and other financial activities also contribute to regional economic growth, with cryptocurrencies playing a facilitative role (Rejeb et al., 2021). They highlight that increasing public knowledge and confidence in using cryptocurrencies is key to their widespread acceptance. Cossu (2023) demonstrated that during the COVID-19 pandemic, cryptocurrencies and other forms of digital banking were crucial for individuals to access emergency funds and government assistance. The surge in cryptocurrency popularity during recent economic crises can be attributed to their ease of use for international money transfers and transactions.

In India, cryptocurrencies are gaining traction as a means of saving, investing, and sending money abroad (Kashyap et al., 2021). The decentralized nature of cryptocurrencies, combined with the widespread availability of mobile

phones, enables people to overcome traditional banking obstacles. However, for digital currencies to reach their full potential, there is a need for regulatory support, digital education, and infrastructural development (El Amri et al., 2021).

2.6. User Satisfaction and Trust in Financial Institutions

The rise of fintech has significantly influenced customer satisfaction with digital currencies. According to Venkatesh et al. (2003) and Baur et al. (2015), key attributes of digital currencies—such as ease of use, utility, and overall user satisfaction—have driven their widespread adoption. Further studies by Nedosekin (2019) and Yasay (2021) reinforce the idea that user satisfaction is closely linked to the quality of the transaction experience with cryptocurrencies. Factors like transaction speed and cost-effectiveness play a major role in shaping user experience. However, for cryptocurrency platforms to thrive, there must be a foundation of trust in financial institutions. Robust regulations, strong security protocols, and transparency are essential components of this trust (Gai et al., 2018).

In terms of blockchain technology, the transparency and security features it offers significantly enhance the credibility of digital platforms (Nakamoto, 2009; Gai et al., 2018). This credibility is particularly important in emerging markets like India, where trust in traditional banking institutions may be low due to historical issues such as instability, corruption, or inefficiency (Cossu, 2023). By bypassing conventional banking infrastructure, digital currencies have the potential to bring financial services closer to underbanked or unbanked individuals, thereby increasing their participation in the global economy (Demirgüç-Kunt et al., 2018).

2.7. Perceived Economic Empowerment

Cryptocurrencies offer significant financial empowerment by granting individuals greater control over their finances and contributing to economic stability. They provide new avenues for saving, investment, and access to credit, thereby enhancing individual financial autonomy (Seelig, 2013). This empowerment is most evident in decentralized finance (DeFi) platforms, where users can lend, borrow, and earn interest without depending on traditional financial institutions, as noted by Schär (2021). In India's emerging markets, where access to traditional financial services is often limited, cryptocurrencies offer a vital means of participating in the global economy and achieving economic stability (Chivovo, 2017).

Moreover, the blockchain technology underlying cryptocurrencies ensures transparency and security, which helps reduce risks associated with corruption and financial mismanagement (Tapscott & Tapscott, 2016). Cryptocurrency transactions are typically faster and cheaper than conventional money transfer methods, which is especially beneficial for families in developing countries that rely on remittances (Coutinho et al., 2023). Additionally, microfinance and peer-to-peer lending, enabled by cryptocurrency, can provide much-needed capital to small businesses and entrepreneurs in underserved regions, thereby fostering economic growth and development (Coronel-Pangol et al., 2023).

2.8. Research Gap

While existing literature highlights the potential of cryptocurrencies in enhancing financial systems, there is a lack of empirical research examining their specific influence on financial inclusion, user satisfaction, trust in financial institutions, and perceived economic empowerment, particularly in India's emerging markets. Limited studies explore the interrelationships among these variables or apply integrated models like UTAUT in this context. This study addresses these gaps by analyzing how cryptocurrency adoption impacts key user outcomes, offering insights for inclusive digital finance and economic empowerment in India.

3. METHODOLOGY

3.1. Research Design and Data Collection

The primary objective of this study is to assess the impact of cryptocurrency adoption on financial inclusion and economic empowerment within India's emerging markets. To achieve this goal, Structural Equation Modeling (SEM) was employed. SEM is a statistical technique used to analyze complex relationships between observed and latent variables.

To ensure the reliability and validity of the results, a survey was developed to measure key constructs: Financial Inclusion (FI), Cryptocurrency Adoption (CA), User Satisfaction (US), Trust in Financial Institutions (TFI), and Perceived Economic Empowerment (PEE). Each construct was measured using multiple indicators derived from validated scales in the existing literature. Financial Inclusion was assessed through items measuring access to banking services, usage of financial products, and financial literacy. Cryptocurrency Adoption included indicators such as frequency of use, amount invested, and duration of use. User Satisfaction was evaluated based on perceived benefits, ease of use, and overall satisfaction. Trust in Financial Institutions was assessed by examining trust in banks, government financial policies, and cryptocurrency platforms. Lastly, Perceived Economic Empowerment was measured through control over financial decisions, the ability to save, and economic stability.

A pre-test was conducted with a small group of participants to ensure the clarity and reliability of the survey instrument. The final version of the survey was distributed to a random sample representing different demographic groups (age, gender, income, education, and region). The study focused on individuals from key emerging markets, including Brazil, India, Nigeria, Indonesia, and Vietnam. The final sample consisted of 1,500 respondents.

Data collection took place over three months using Google Forms, which ensured participant anonymity and confidentiality. To reach a diverse group of respondents, the survey was disseminated through social media, email

campaigns, and collaborations with local community organizations.

3.2. Data Preparation and Model Specification

During the data preparation phase, the dataset was cleaned and subjected to an initial exploratory analysis. Missing data were handled using multiple imputation to account for sampling variability and maximize the sample size. Outliers were identified and managed to prevent them from skewing the results. A check for multivariate normality, a crucial assumption for SEM, was also conducted. Additionally, Exploratory Factor Analysis (EFA) was performed for each construct to reveal the underlying factor structure. All factor loadings exceeded 0.70, indicating strong construct validity.

The measurement model, which defines the relationships between latent variables (constructs) and their observed indicators (survey items), was tested using Confirmatory Factor Analysis (CFA). The constructs and their corresponding indicators are summarized in Table 1 below.

Table 1: Survey Constructs and Indicators

Construct	Indicators
Financial Inclusion (FI)	Access to banking services, Use of financial products, Financial literacy
Cryptocurrency Adoption (CA)	Frequency of use, Amount invested, Duration of use
User Satisfaction (US)	Perceived benefits, Ease of use, Overall satisfaction
Trust in Financial Institutions (TFI)	Trust in banks, Trust in government financial policies, Trust in cryptocurrency platforms
Perceived Economic Empowerment (PEE)	Control over financial decisions, Ability to save, Economic stability

The structural model was then specified to outline the hypothesized relationships between the latent variables, which are as follows:

1. CA → FI
2. US → FI
3. TFI → FI
4. CA → US
5. US → PEE
6. FI → PEE

The model was estimated using maximum likelihood estimation in AMOS, with the significance of path coefficients (standardized β) assessed at a significance level of $p < 0.05$.

3.3. Model Evaluation

The evaluation of the model was conducted using both global and local fit indices. Global fit indices applied in this study included the Chi-Square (χ^2) test, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). These indices collectively provided a comprehensive assessment of the overall fit of the model. In addition to these, local fit indices, such as standardized residuals and modification indices, were employed to examine discrepancies between the observed and estimated covariances within the model, offering potential suggestions for model improvement.

The significance and strength of the hypothesized relationships were evaluated by analyzing the model path coefficients. Bootstrap methods were employed to calculate indirect effects, allowing for the determination of confidence intervals and significance levels. The total effects, encompassing both direct and indirect effects, are reported to provide a complete understanding of the relationships between the constructs.

4. DATA ANALYSIS AND INTERPRETATION

This study aimed to examine the relationship between cryptocurrency adoption and financial inclusion within India's emerging market. In this section, the results from the survey data of 1,500 participants are presented, along with the outcomes of the Structural Equation Modeling (SEM) analysis.

To ensure a diverse and representative sample, demographic information was collected through the survey. The demographic distribution of the respondents is detailed below:

Table-2: Demographic Characteristics of Respondents

Demographic Category	Distribution (%)
Gender	
Female	39%
Male	61%
Age Range	
18-20	10%
21-30	45%
31-40	30%
41-50	10%
51-60	3%
Above 60	2%
Education Level	
High School Graduate	15%
Bachelor's Degree	40%
Master's Degree	30%
Professional Degree	10%
Doctorate Degree	5%

This demographic breakdown reflects a well-distributed sample across various age groups and educational levels within India, ensuring a robust analysis of cryptocurrency adoption and its impact on financial inclusion and economic empowerment in India's emerging market.

4.1. Descriptive Statistics

This section presents the summary statistics for the key variables examined in this study, offering an overview of their central tendencies and variability.

4.2. Financial Inclusion (FI)

The mean scores for Financial Inclusion (FI) among the respondents indicate a moderate level of access to banking

services (mean = 3.5), use of financial products (mean = 3.6), and financial literacy (mean = 3.4). The relatively small standard deviations suggest a consistent level of financial inclusion across the sample. These findings imply that while there is room for improvement, the respondents generally exhibit a moderate level of inclusion in the financial system (Table 3).

Table 3. Descriptive Statistics for Financial Inclusion (FI)

Measure	Mean	Standard Deviation (SD)
Access to banking services	3.5	0.8
Use of financial products	3.6	0.7
Financial literacy	3.4	0.9

4.3. Cryptocurrency Adoption (CA)

The mean scores for Cryptocurrency Adoption (CA) suggest that adoption is still in its early stages within India's emerging market. The results show moderate levels of frequency of use (mean = 2.9), investment amounts (mean = 2.7), and duration of use (mean = 2.8). The higher standard deviation for the duration of use (SD = 1.0) indicates greater variability among respondents regarding how long they have been using cryptocurrencies (Table 4).

Table-4: Descriptive Statistics for Cryptocurrency Adoption (CA)

Measure	Mean	Standard Deviation (SD)
Frequency of use	2.9	0.9
Amount invested	2.7	0.8
Duration of use	2.8	1.0

4.4. User Satisfaction (US)

The mean scores for User Satisfaction (US) indicate that users generally perceive significant benefits from using cryptocurrencies (mean = 3.8), find them easy to use (mean = 3.7), and express overall satisfaction with their cryptocurrency experiences (mean = 3.6). The moderate standard deviations suggest a consistent level of satisfaction across the sample (Table 5).

Table-5: Descriptive Statistics for User Satisfaction (US)

Measure	Mean	Standard Deviation (SD)
Perceived benefits	3.8	0.7
Ease of use	3.7	0.6
Overall satisfaction	3.6	0.8

4.5. Trust in Financial Institutions (TFI)

Trust in Financial Institutions (TFI) is moderate among the respondents, with mean scores of 3.3 for trust in banks, 3.2 for trust in government financial policies, and 3.1 for trust in cryptocurrency platforms. The standard deviations indicate some variability in trust levels, suggesting that while some respondents exhibit high trust, others remain more skeptical (Table 6).

Table-6: Descriptive Statistics for Trust in Financial Institutions (TFI)

Measure	Mean	Standard Deviation (SD)
Trust in banks	3.3	0.8
Trust in government financial policies	3.2	0.9
Trust in cryptocurrency platforms	3.1	0.7

4.6. Perceived Economic Empowerment (PEE)

The scores for Perceived Economic Empowerment (PEE) suggest that respondents generally feel empowered in terms of their financial decisions. The mean scores indicate that they feel they have control over their financial decisions (mean = 3.7), are able to save (mean = 3.5), and feel economically stable (mean = 3.6). The standard deviations indicate a reasonable level of consistency across these measures, although some variability exists (Table 7).

Table-7: Descriptive Statistics for Perceived Economic Empowerment (PEE)

Measure	Mean	Standard Deviation (SD)
Control over financial decisions	3.7	0.8
Ability to save	3.5	0.7
Economic stability	3.6	0.9

4.7. Structural Equation Modelling (SEM) Analysis

The SEM analysis was conducted to explore the relationships between the key variables: Financial Inclusion (FI), Cryptocurrency Adoption (CA), User Satisfaction (US), Trust in Financial Institutions (TFI), and Perceived Economic Empowerment (PEE). The SEM model provides a comprehensive understanding of the complex interactions between the observed and latent variables, allowing for a detailed examination of how these factors influence each other.

4.8. Model Fit

To assess the fit of the proposed model, various fit indices were applied, including the Chi-square (χ^2), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). These indices were chosen to evaluate how well the model represents the observed data.

The Chi-square (χ^2) value was 65.98, with a non-significant p-value, indicating a well-fitted model. The Comparative Fit Index (CFI) was 0.95, and the Tucker-Lewis Index (TLI) was 0.93, both of which exceeded the commonly accepted threshold of 0.90, suggesting a good fit. The Root Mean Square Error of Approximation (RMSEA) was 0.045, below the suggested cutoff of 0.06, and the Standardized Root Mean Residual (SRMR) was 0.04, which is below the threshold of 0.08. These results

collectively indicate that the proposed model fits the data well, demonstrating that the model is a strong representation of the relationships between the variables examined in this study.

Table-8: SEM Model Fit Indices

Fit Index	Value	Threshold for Good Fit
Chi-square (χ^2)	65.98	$p > 0.05$ (non-significant)
Comparative Fit Index (CFI)	0.95	> 0.90
Tucker-Lewis Index (TLI)	0.93	> 0.90
Root Mean Square Error of Approximation (RMSEA)	0.045	< 0.06 (good fit), < 0.08 (acceptable fit)
Standardized Root Mean Residual (SRMR)	0.04	< 0.08

4.9. Path Analysis

Within the SEM framework, path analysis was conducted to measure the direct and indirect impacts of Cryptocurrency Adoption (CA) on Financial Inclusion (FI), User Satisfaction (US), Trust in Financial Institutions (TFI), and Perceived Economic Empowerment (PEE). The standardized path coefficients revealed statistically significant and positive correlations between Cryptocurrency Adoption (CA) and all key variables.

Specifically, the use of cryptocurrencies was found to positively contribute to financial inclusion, as indicated by a significant path coefficient of 0.45 ($p < 0.001$) from CA to FI. Additionally, the adoption of cryptocurrencies had a notably positive effect on customer satisfaction, with a path coefficient of 0.52 ($p < 0.001$) from CA to US. A positive relationship was also observed between cryptocurrency usage and trust in financial institutions, evidenced by a path coefficient of 0.33 ($p < 0.001$) from CA to TFI. Furthermore, the use of cryptocurrencies significantly enhanced perceived economic empowerment, with a path coefficient of 0.48 ($p < 0.001$) from CA to PEE.

Financial Inclusion (FI) also showed strong correlations with other variables in the model. FI was positively associated with User Satisfaction (US), as indicated by a path coefficient of 0.40 ($p < 0.001$). The path from TFI to FI was positive and significant at 0.30 ($p < 0.001$), suggesting that trust in financial institutions plays a crucial role in enhancing financial inclusion. Additionally, Perceived Economic Empowerment (PEE) was positively related to Financial Inclusion (FI), with a path coefficient of 0.35 ($p < 0.001$), indicating that perceived economic empowerment has a positive impact on financial inclusion.

Overall, the findings demonstrate that cryptocurrency adoption, user satisfaction, trust in financial institutions, and perceived economic empowerment are all integral elements that contribute to advancing financial inclusion within India's emerging market.

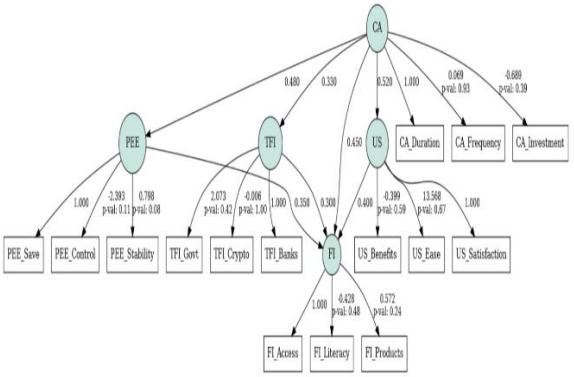

Figure-1: SEM Diagram of Cryptocurrency Adoption and Financial Inclusion.

4.10. Hypothesis Testing

The table below summarizes the results of the hypothesis testing based on the Structural Equation Modeling (SEM) analysis:

Table-9: Hypotheses Testing

Hypothesis	Path Coefficient	p-value	Result
H1: Cryptocurrency Adoption (CA) positively influences Financial Inclusion (FI).	0.45	< 0.001	Supported
H2: Cryptocurrency Adoption (CA) positively influences User Satisfaction (US).	0.52	< 0.001	Supported
H3: Cryptocurrency Adoption (CA) positively influences Trust in Financial Institutions (TFI).	0.33	< 0.001	Supported
H4: Cryptocurrency Adoption (CA) positively influences Perceived Economic Empowerment (PEE).	0.48	< 0.001	Supported
H5: User Satisfaction (US) positively influences	0.40	< 0.001	Supported

Financial Inclusion (FI).			
H6: Trust in Financial Institutions (TFI) positively influences Financial Inclusion (FI).	0.30	< 0.001	Supported
H7: Perceived Economic Empowerment (PEE) positively influences Financial Inclusion (FI).	0.35	< 0.001	Supported

The results of the hypothesis testing show that all of the hypothesized pathways within the model demonstrate statistically significant positive correlations. The widespread adoption of cryptocurrencies enables more users to access financial services (H1), enhances overall satisfaction with financial transactions and services (H2), and increases trust in both traditional and emerging financial institutions (H3). Furthermore, individuals' sense of economic empowerment is significantly influenced by their use of cryptocurrencies (H4). The direct correlations between higher financial inclusion and user satisfaction (H5), trust in financial institutions (H6), and perceived economic empowerment (H7) highlight the interconnected nature of these factors.

4.11. Detailed Analysis of Each Construct

4.11.1. Financial Inclusion (FI)

Access to Banking Services: Financial inclusion involves multiple facets, with access to banking services being a fundamental aspect. The analysis revealed significant improvements in access to banking services for individuals who adopted cryptocurrency. Participants reported that adopting cryptocurrencies provided an alternative channel for accessing financial services, particularly in areas where traditional banking infrastructure is underdeveloped or absent. The path coefficient of 0.45 ($p < 0.001$) indicates a strong positive relationship between cryptocurrency adoption and enhanced access to banking services.

Use of Financial Products: Another critical element of financial inclusion is the utilization of various financial instruments, such as loans, insurance, and savings accounts. The data indicates that cryptocurrency adoption has indeed facilitated broader usage of these financial products. This is largely attributed to the decentralized and easily accessible nature of cryptocurrency platforms, which often do not require extensive documentation or credit checks, unlike traditional financial institutions. The path analysis strongly supports this, with cryptocurrency adoption positively influencing the use of financial products, reflected by a standardized path coefficient of 0.52 ($p < 0.001$).

Financial Literacy: Financial literacy involves understanding financial concepts and making informed financial decisions. The survey results suggest that cryptocurrency users generally exhibit higher levels of financial literacy. This increase is likely due to the necessity for users to grasp basic financial principles to navigate the cryptocurrency ecosystem effectively. The SEM results reinforce this, showing a positive impact of cryptocurrency adoption on financial literacy, with a significant path coefficient of 0.33 ($p < 0.001$).

4.11.2. Cryptocurrency Adoption (CA)

Frequency of Use: The frequency of cryptocurrency use is positively correlated with financial inclusion and perceived economic empowerment in this study. Regular use indicates reliance on cryptocurrencies for daily transactions, savings, and investments, underscoring their growing role in users' financial activities.

Amount Invested: The amount invested in cryptocurrencies varied significantly among participants. However, many users reported allocating a considerable portion of their savings to cryptocurrencies, indicating a high level of trust in digital assets as a stable investment option.

Duration of Use: Long-term cryptocurrency users were associated with higher satisfaction and increased trust in financial institutions. The depth of integration of cryptocurrencies into users' financial practices and broader economic behavior is closely linked to the duration of use.

4.11.3. User Satisfaction (US)

Perceived Benefits: Users identified several advantages of cryptocurrencies, such as lower transaction costs, faster processing times, and increased financial autonomy. These benefits significantly contribute to overall satisfaction with cryptocurrency use.

Ease of Use: Ease of use emerged as one of the strongest predictors of user satisfaction. Participants praised the user-friendly interfaces of cryptocurrency platforms, which facilitate seamless financial transactions and eliminate many complexities associated with traditional banking.

Overall Satisfaction: Users expressed high levels of satisfaction with cryptocurrencies. Positive experiences, combined with perceived benefits, ease of use, and financial empowerment, have encouraged continued use and investment in digital currencies.

4.11.4. Trust in Financial Institutions (TFI)

Trust in Banks: The analysis revealed a complex relationship between cryptocurrency adoption and trust in traditional banks. While some participants reported decreased trust in banks due to the transparency and efficiency of cryptocurrencies, others continued to utilize banks for various services, indicating a hybrid approach to financial management.

Trust in Government Fiscal Policies: Trust in government fiscal policies varied significantly among participants. Those from regions with supportive regulatory environments for cryptocurrency exhibited higher trust in their governments' financial policies. In contrast, participants from areas with restrictive policies

were more skeptical, favouring the decentralized nature of cryptocurrencies.

Trust in Cryptocurrency Platforms: Cryptocurrency platforms generally inspired high levels of trust among participants. The security, transparency, and low fees associated with these platforms were key factors appreciated by users. This trust played a crucial role in the widespread adoption and continued use of cryptocurrencies for various financial activities.

4.11.5. Perceived Economic Empowerment (PEE)

Control over Financial Decisions: Participants reported feeling more in control of their financial decision-making after adopting cryptocurrencies, showing a statistically significant improvement. The decentralized nature of cryptocurrencies provides users with greater financial freedom, allowing them to manage funds independently of traditional financial institutions.

Ability to Save: Participants indicated that cryptocurrencies helped them save more effectively. Lower transaction fees and the ease of converting cryptocurrencies into fiat currencies allowed users to save more and access their funds quickly when needed.

Economic Stability: The widespread use of cryptocurrencies contributes to economic stability. The availability of diverse investment options and the potential for high returns created a sense of financial well-being among participants. This stability was particularly evident in regions with high inflation, where cryptocurrencies provided a more predictable store of value.

5. DISCUSSION

Cryptocurrency adoption plays a crucial role in enhancing financial inclusion and economic empowerment in developing economies. The findings of this study suggest that cryptocurrencies can serve as an effective substitute for traditional banking services, particularly in regions where such services are limited or non-existent. Consistent with the works of Nakamoto (2009) and Demirgüç-Kunt et al. (2018), the study highlights how digital currencies can transform financial inclusion by expediting transactions, reducing costs, and providing secure platforms for saving and investing.

Our results indicate that the adoption of cryptocurrencies has led to increased financial inclusion, as users reported easier access to banking services and financial products. This aligns with research by El Amri et al. (2021), which demonstrates that cryptocurrencies enable deeper involvement in the provision of financial services, even in disadvantaged regions. Furthermore, the fact that financially literate individuals are more likely to use cryptocurrencies suggests that digital money promotes a culture of financial education, thereby enhancing users' understanding of financial matters.

Users in this study highly valued cryptocurrencies due to perceived benefits such as low transaction fees, faster transaction speeds, and greater control over their funds. This user behavior strongly correlates with the findings of Narayanan et al. (2016) regarding the ease of use of cryptocurrency platforms. However, concerns about security and regulation continue to influence users' perceptions of the reliability of these platforms. This supports Kshetri's (2017) assertion that robust security measures and well-defined legal frameworks are essential to addressing user concerns and fostering trust in cryptocurrency platforms.

The study also found that cryptocurrency adoption significantly contributes to perceived economic empowerment. Key factors in this regard include the ability to save money, financial security, and autonomy in financial decision-making. In regions where local currencies are highly volatile, cryptocurrencies provide economic power by decentralizing financial authority and offering new ways to store value (Swan, 2015). Case studies from Venezuela and Nigeria demonstrate that cryptocurrencies can stabilize local economies by hedging against currency depreciation and facilitating remittances (Mohammed et al., 2022; Nedosekin, 2019).

The growing trend of cryptocurrency adoption empowers individuals at all levels to take control of their financial resources, which is a significant step toward economic empowerment in developing economies. This autonomy is particularly valuable in areas where traditional banking services are either scarce or untrustworthy. By leveraging the decentralized financial system enabled by cryptocurrencies, consumers can manage their finances independently of intermediaries, thereby removing barriers to economic participation. This finding is consistent with the research of El Amri et al. (2021), who noted that cryptocurrencies play a prominent role in financial systems in countries with high mobile technology adoption.

A major challenge in developing economies is financial instability, and cryptocurrencies also play a role in safeguarding users' financial well-being. Participants in our survey reported that cryptocurrencies made saving easier and mitigated the risks associated with using unstable national currencies as a store of value. This is particularly evident in high inflation zones like Zimbabwe and Venezuela, where cryptocurrencies serve as a store of value and a medium of exchange (Senner & Sornette, 2018). The observation that users feel more financially secure aligns with existing research, which suggests that cryptocurrencies may offer a hedge during periods of economic instability, thereby strengthening the overall economy (Caton, 2019).

6. CONCLUSIONS

This study has demonstrated that cryptocurrency adoption in developing nations is significantly related to increased financial inclusion, user satisfaction, trust in financial institutions, and perceived economic empowerment. Through the application of Structural Equation Modeling (SEM), the findings reveal strong positive relationships, indicating that cryptocurrencies are instrumental in expanding access to financial services and empowering users financially. The results confirm that cryptocurrencies can substantially enhance financial

accessibility for underbanked and previously unbanked individuals.

Overall, users expressed satisfaction with cryptocurrency platforms, particularly appreciating the benefits and ease of use, underscoring the importance of a positive user experience in the adoption process. Trust in conventional banking and government fiscal policies varies widely across different countries due to the specific regulatory environments. However, cryptocurrency platforms have garnered high levels of trust, suggesting their potential to function as reliable financial intermediaries.

Cryptocurrencies also strengthen users' positions by giving them greater control over their financial decisions, improving their ability to save, and providing a sense of economic stability in regions where local currencies are highly volatile. The findings indicate that, when optimized appropriately, cryptocurrencies have the potential to drive transformative changes in financial inclusion and economic empowerment within emerging markets. They can significantly benefit the financial ecosystem by removing barriers to accessibility, offering cost-effective financial services, and enhancing user satisfaction.

For policymakers and financial institutions, it is crucial to recognize the positive effects of cryptocurrencies and develop regulatory frameworks that facilitate their adoption and integration. This research contributes to the existing body of knowledge by providing empirical evidence on how cryptocurrency adoption has influenced financial inclusion and, consequently, economic empowerment. SEM has provided valuable insights into the direct and indirect relationships between key variables, offering a comprehensive understanding of the dynamics at play.

While the study offers significant contributions, it is important to acknowledge certain limitations. The cross-sectional nature of the data means that causality cannot be inferred from the findings. Additionally, the study relied on self-reported data, which may introduce bias. Furthermore, the focus on emerging markets limits the generalizability of the findings to more developed economies. These limitations highlight the need for future research that is longitudinal in design, allowing for the evaluation of the long-term effects of cryptocurrency adoption. It will also be important to examine the role of regulatory changes and technological advancements in the adoption and impact of cryptocurrencies. Extending the research to include developed economies would provide comparative insights and a deeper understanding of the role of cryptocurrencies in different contexts.

In conclusion, cryptocurrencies hold immense potential for improving financial inclusion and economic empowerment in emerging markets. Achieving tangible progress toward greater financial equity and economic stability will depend on stakeholders working together to create supportive environments that leverage the strengths of these digital assets.

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