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The Dual Impact of Blockchain Adoption: Enhancing Financial Performance and Microeconomic Stability with Emerging Challenges

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Abstract

Research aims: This study examines the impact of blockchain adoption on the microeconomic stability of micro, small, and medium enterprises (MSMEs), with financial performance and access to financial services as mediating variables.

Design/Methodology/Approach: The analysis employed Partial Least Squares Structural Equation Modeling (PLS-SEM) using data from 200 MSME owners in Indonesia who have integrated blockchain technology into their operations. The constructs, blockchain adoption, financial performance, access to financial services, and microeconomic stability, were measured through a structured questionnaire based on validated indicators from prior research.

Research findings: The findings reveal that blockchain adoption significantly enhances financial performance and microeconomic stability. Financial performance strengthens the direct effect of blockchain adoption on stability, while access to financial services positively mediates the relationship between blockchain use and economic stability. Interestingly, an adverse indirect effect through financial performance was observed, suggesting potential implementation-related or contextual risks that merit further investigation.

Theoretical Contribution/Originality: This research comprehensively explains MSMEs' blockchain adoption behavior and economic implications by integrating the Technology Acceptance Model (TAM) and the Resource-Based View (RBV) framework.

Practitioners/Policy Implications: To promote inclusive adoption, policymakers and MSME stakeholders should prioritize secure and user-friendly blockchain systems, expand access to digital financial services, and develop adaptive regulatory frameworks. Strategic adoption should weigh both efficiency gains and potential challenges, including systemic risks, technological volatility, and unequal benefit distribution.

Research Limitations/Implications: The study's scope is limited to MSMEs in Indonesia; future research should explore cross-regional and sectoral comparisons, long-term impacts, regulatory variations, and adoption dynamics across diverse contexts.

Keywords: blockchain adoption; financial performance; access to financial; microeconomic stability; emerging challenges

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Introduction

Blockchain, the foundational technology behind virtual and digital currencies such as Bitcoin and Ethereum, has profoundly disrupted the

global economic landscape (Shahzad et al., 2024). Its prominence surged during the COVID-19 pandemic, attracting heightened attention from media outlets, regulatory bodies, institutional and retail investors, and the academic community (Ozdurak et al., 2022). Offering advantages such as enhanced transactional efficiency, cost reduction, and improved transparency, blockchain's immutable and publicly accessible ledger fosters unprecedented levels of trust, positioning it as a potential cornerstone of the modern financial system. Al-Maskari et al. (2024) highlight that organizational and technological enablers must be strengthened to ensure successful blockchain adoption and implementation. For micro, small, and medium-sized enterprises (MSMEs), which serve as the economic backbone of many nations, blockchain has emerged as a transformative force, enabling integration into global supply chains through greater operational efficiency, transparency, and risk mitigation. (Shahzad et al., 2024) emphasize that innovations such as asset tokenization, green blockchain, and decentralized finance (DeFi) can support inclusive business models while enhancing microeconomic stability. DeFi, for instance, allows MSMEs to access previously unattainable financial services, while asset tokenization enables the monetization of illiquid assets. Similarly, Al-Swidi et al. (2024) demonstrate that blockchain adoption can reshape MSME operations and competitiveness.

Empirical evidence further suggests that blockchain adoption, particularly through cryptocurrencies like Bitcoin, can be applied across diverse microenterprises Cui et al. (2024). Access to financial services significantly mediates the relationship between blockchain adoption and microeconomic stability. This mediating role is critical, as many MSMEs cannot adopt complex technologies without supportive infrastructure. As (Mbaidin et al., 2024) argue, blockchain can facilitate financial inclusion by expanding technological access channels and improving financial performance.

Relevant theoretical frameworks can contextualize the relationship between blockchain adoption, financial performance, and economic stability. Financial performance theory explains how prudent financial decision-making can strengthen business outcomes and contribute to macroeconomic stability. In contrast, microeconomic stability theory examines how MSME-level strategies affect broader economic resilience (Purwaningsih et al., 2024). Additionally, the Technology Acceptance Model (TAM) offers insights into how perceived ease of use and perceived usefulness influence the adoption of new technologies.

Blockchain adoption faces significant challenges despite its potential, including cryptocurrency price volatility, regulatory ambiguity, and scalability constraints (Hasan et al., 2024). Addressing these barriers requires coordinated efforts to enhance security protocols, develop more energy-efficient consensus mechanisms (e.g., proof-of-stake), and promote collaboration between policymakers and industry stakeholders (Li et al., 2023). Market uncertainty and the absence of clear legal frameworks also contribute to risk aversion among potential adopters. According to Sila et al., (2024), cryptocurrencies exhibit greater downside risk than traditional asset classes; however, Ciaian et al. (2024**)** note that blockchain-engaged investors often display heightened environmental and social consciousness, increasing their likelihood of supporting MSME initiatives. Green

blockchain practices, in particular, present a pathway toward mitigating the environmental footprint of blockchain technologies.

Sustainable development emphasizes balancing social welfare, economic growth, environmental protection, and responsible resource use (Sedana Putra et al., 2024a). While prior research has recognized blockchain's potential to improve efficiency and transparency within financial systems, notable research gaps remain. First, the mediating role of financial performance between blockchain adoption and microeconomic stability in MSMEs remains underexplored. Second, the influence of access to financial services as another mediating variable has received limited scholarly attention. Third, the potential effects of emerging blockchain applications, such as DeFi, asset tokenization, and green blockchain, on MSME sector stability have yet to be examined comprehensively.

Recent data further underscores the relevance of this research. Zamani (2024) reports that approximately 25% of MSMEs in certain regions have implemented blockchain technologies to enhance operational efficiency. Tangible benefits have been documented; for example, blockchain-based payment systems have reduced transaction costs by up to 30% in specific industries (Shahzad et al., 2024). By investigating how MSMEs leverage advanced blockchain tools, this study contributes to understanding their role in fostering competitiveness and supporting economic stability.

Analyzing these interrelationships can inform strategies for integrating blockchain into MSME operations to bolster firm-level and macroeconomic resilience. Given that MSMEs are increasingly positioned to benefit from emerging technologies, including artificial intelligence, the Internet of Things, and digital marketing (Sedana Putra et al, 2024b), it is critical to identify the factors that enable or hinder blockchain adoption. Technological sophistication and awareness levels may pose adoption barriers, and addressing these challenges can yield valuable insights (Fantazzini, 2023).

In summary, this study examines the impact of blockchain adoption on microeconomic stability, focusing on the mediating roles of financial performance and access to financial services. It also explores the potential of advanced blockchain applications, such as DeFi, asset tokenization, and green blockchain, in shaping MSME resilience. The analysis integrates the Technology Acceptance Model, the Resource-Based View (RBV), and decentralized finance frameworks to understand the MSME sector comprehensively.

Literature Review and Hypotheses Development

Technology Acceptance Model (TAM) and Blockchain Adoption in MSMEs

The Technology Acceptance Model (TAM) conceptualizes technology adoption as driven by two fundamental perceptions: perceived usefulness and perceived ease of use (Noor et al., 2024). Blockchain, a decentralized and tamper-resistant digital ledger, is increasingly recognized for its capacity to enhance efficiency, transparency, and security, attributes that align directly with the usefulness dimension in TAM. For micro, small, and

medium enterprises (MSMEs), these attributes can significantly improve operational performance. Empirical evidence from Yang et al. (2021), confirms that ease of use and usefulness substantially influence individuals' intentions to adopt new technologies.

The adaptability of TAM is evident in its application across diverse technological domains, including green IT, e-learning, and mobile commerce (Nguyen et al., 2024; Nagy et al., 2024), reinforcing its suitability as a theoretical framework for examining blockchain adoption. Extending this perspective, Sham et al. (2023) identified network effects and regulatory clarity as additional determinants of cryptocurrency adoption. In alignment, Shwedeh, (2024) advocated integrating regulatory considerations into TAM, particularly in contexts characterized by evolving policy environments. Moreover, Alshehri (2023) substantiated the model's predictive validity in adoption-related decision-making, further underscoring its relevance for exploring how MSMEs may leverage blockchain to optimize financial processes and bolster economic resilience.

Resource-Based View (RBV) Theory and Financial Performance as a Mediating Variable

The Resource-Based View (RBV) offers a strategic lens for examining how organizations achieve sustained competitive advantage and superior long-term performance by effectively deploying internal resources and capabilities (Mailani et al., 2024). Within the RBV framework, resources that are valuable, rare, inimitable, and non-substitutable (VRIN) constitute the foundation for enduring success, a premise particularly salient for MSMEs operating in highly competitive environments (Nikmah et al., 2021).

In the present study, RBV underpins the conceptualization of blockchain adoption as a strategic asset capable of enhancing the financial performance of MSMEs. The intrinsic attributes of blockchain, transparency, security, automation, and decentralization, facilitate operational efficiency, reduce transaction costs, and improve access to financial instruments (Sahoo & Thakur, 2023). These efficiencies translate into improved financial outcomes, which, in turn, reinforce the microeconomic stability of MSMEs.

Financial performance is positioned as a pivotal mediating variable, representing both the internal organizational benefits of blockchain adoption and the conduit through which broader economic resilience is realized. MSMEs exhibiting enhanced profitability, liquidity, and resource utilization are better positioned to absorb external shocks, achieve sustainable scaling, and contribute to a more robust microeconomic environment.

By integrating RBV with the Technology Acceptance Model (TAM), this study captures the interplay between technological adoption and strategic resource deployment. This integration underscores the role of internal capability development, facilitated by technology, as the catalyst for macro-level economic impact. RBV reinforces that financial performance is not merely an outcome but a strategic pathway toward systemic resilience.

Access to Financial Services as a Mediating Variable

Blockchain technology, particularly through Decentralized Finance (DeFi), offers micro, small, and medium enterprises (MSMEs) alternative avenues for accessing financial services that are often constrained by traditional institutional barriers (Kumar et al., 2023). Operating through smart contracts without intermediaries, DeFi provides services such as lending, savings, and investment with enhanced transparency and reduced transaction costs (Harvey & Rabetti, 2024). According to (Kumar et al., 2023), these characteristics strengthen financial inclusion and improve the operational efficiency of MSMEs.

Consequently, access to financial services is a pivotal mediating factor in the relationship between blockchain adoption and economic stability. Ciaian et al. (2024) emphasize that investors committed to sustainable innovation are more inclined to support MSMEs utilizing blockchain, thereby advancing inclusive economic growth. Enhanced access enables MSMEs to improve risk management capabilities and scale operations, contributing to microeconomic stability. Nonetheless, challenges such as market volatility, cybersecurity risks, and regulatory ambiguity (Hasan et al., 2024) necessitate targeted interventions, including promoting digital literacy, establishing robust cybersecurity frameworks, and implementing coherent policy measures to realize DeFi's potential fully.

Integrating Blockchain Solutions to Foster Microeconomic Stability

The adoption of blockchain technologies across diverse sectors, such as healthcare (Factom), finance (DattaBot, Online Pajak), supply chain management (VeChain), and real estate (Propy), has demonstrated significant potential to improve operational efficiency, transparency, and trust (Yang et al., 2021; Ramadhan & Putri, 2018; VeChain Whitepaper 1.0, 2018; Propy, 2021). Within the micro, small, and medium enterprise (MSME) sector, these capabilities translate into tangible advantages, including streamlined business processes and the minimization of transactional inefficiencies. Integrating blockchain-based innovations, such as decentralized finance (DeFi), asset tokenization, and environmentally sustainable blockchain applications, enhances the financial performance and long-term structural resilience of MSMEs. This, in turn, fosters greater microeconomic stability by supporting prudent financial management and driving digital innovation (Kumar et al., 2023; Ciaian et al., 2024). Consequently, blockchain implementation should be regarded as a technological upgrade and a strategic initiative to cultivate a robust MSME ecosystem with enduring economic benefits.

Previous Research

A growing body of literature has examined blockchain adoption across various sectors, offering valuable insights while highlighting notable limitations. Cui et al. (2024) applied a game-theoretic model to investigate blockchain implementation within China's pharmaceutical supply chain, particularly concerning consumer risk aversion toward generic drugs. Their results indicate that blockchain can yield mutually beneficial

outcomes for consumers, manufacturers, and retailers, provided consumer risk aversion remains low. However, the study did not address key considerations such as operational expenses, licensing costs, and the integration of cold chain logistics, areas that warrant further exploration.

In a survey-based study, Shahzad et al. (2024) assessed cryptocurrency adoption by distributing 551 questionnaires in Lahore, Pakistan, and obtaining 332 valid responses. The findings revealed that cryptocurrency awareness significantly influences adoption, with perceived ease of use and perceived usefulness functioning as mediating variables, and trust as a reinforcing factor. Nonetheless, the study was constrained by demographic bias (predominantly graduate respondents), limited geographic coverage, and the omission of critical variables such as governmental support and long-term adoption sustainability.

Purwaningsih et al., (2024) examined the influence of blockchain on supply chain efficiency and export performance among MSMEs in Indonesia using structured surveys and regression analysis. Their results indicate that blockchain positively impacts both efficiency and export performance, yet exerts no direct influence on financial performance. The authors underscored the need for further investigation into how blockchain's theoretical benefits translate into tangible financial outcomes, particularly concerning MSMEs' overall financial health.

A systematic review by Xie et al. (2023) explored blockchain adoption within fintech firms, concluding that it can enhance revenue streams, reduce operational costs, and strengthen competitive advantage. Nevertheless, the review emphasized the necessity of additional empirical research to assess long-term financial effects, industry-specific applications, and comparative performance across different blockchain platforms to better inform implementation strategies.

From a conceptual perspective, Swan (2017) posited blockchain as a leapfrog technology capable of advancing global financial inclusion by enabling secure digital transactions without third-party intermediaries. The study identified real-time payments, property registries, contractual agreements, and identity verification as pivotal applications. However, it also acknowledged ongoing challenges, including limited interoperability and scalability constraints. It advocated for research into standardization protocols and advanced solutions (e.g., sharding, Layer 2 technologies) to facilitate large-scale adoption. In a related but sector-specific context, Ongore & Kusa (2013) analyzed the determinants of financial performance in Kenyan commercial banks using secondary data spanning 2001–2010. Their findings demonstrate that capital adequacy, asset quality, and managerial efficiency significantly shape bank performance. However, macroeconomic factors were not incorporated, nor was the moderating role of ownership identity examined, suggesting a need for more context-sensitive investigations.

Hypothesis

Blockchain technology can enhance microeconomic stability by increasing operational efficiency, transparency, and security. Its decentralized architecture eliminates intermediaries, reduces operational costs, safeguards data integrity, and minimizes fraudulent activities, factors that contribute to economic resilience at the micro level. Carlson (2018) highlights blockchain's role in enabling secure, decentralized payment systems that reduce dependence on centralized financial institutions and mitigate systemic financial risks. Similarly, Swan (2017) underscores blockchain's ability to enhance transparency and accountability within supply chains, thereby fostering stability. By reconfiguring traditional business models, blockchain introduces efficiency gains and trust mechanisms that are particularly advantageous for MSMEs in volatile and uncertain environments.

***H_1**: The Adoption of Blockchain Technology Positively Affects Microeconomic Stability*.

Blockchain adoption is also associated with improved financial performance through reduced administrative expenses, accelerated transactions, and enhanced data security. Its decentralized design enables the secure storage and transfer of financial data, strengthening fraud prevention and operational efficiency. By streamlining financial processes, blockchain enhances transparency, accountability, and cost-effectiveness. Xie et al. (2023) found that blockchain use in fintech firms lowered transaction costs, improved cybersecurity, and reduced reliance on intermediaries, creating new revenue opportunities and enhancing competitiveness.

***H_2**: The Adoption of Blockchain Technology Positively Affects Financial Performance*.

Robust financial performance contributes to microeconomic stability by optimizing capital allocation, maintaining liquidity, and improving risk management. Effective cash flow management, credit assessment, and sustainable financing enable firms to reduce insolvency risks, absorb economic shocks, and promote long-term growth. Ongore and Kusa (2013) found that firms with sound financial practices achieve higher stability. Leal Filho et al. (2024) demonstrated that integrating sustainability into business operations improves reputation, customer loyalty, and employee satisfaction, all supporting financial performance. Similarly, Azadda et al. (2024) argue that sustainability-oriented finance strategies strengthen resilience to market volatility and environmental uncertainties, further supporting economic stability.

***H_3**: Financial Performance Positively Influences Microeconomic Stability*.

Blockchain can improve access to financial services through decentralized, transparent, and secure systems that bypass traditional banking infrastructures. In underserved or unbanked regions, blockchain enables peer-to-peer transactions, digital identity

verification, and smart contracts, thus fostering financial inclusion. Swan (2017) frames blockchain as a leapfrog technology for financial access, particularly through tools such as digital wallets and decentralized finance (DeFi), while Carlson (2018) notes its potential to lower transaction and entry costs, expanding financial opportunities for small enterprises and marginalized groups. Blockchain can democratize financial access, stimulate economic participation, and mitigate systemic inequalities by reducing reliance on intermediaries and increasing transactional trust.

H_4: The Adoption of Blockchain Technology Positively Influences Access to Financial Services.

Enhanced access to financial services strengthens microeconomic stability by enabling households and businesses to optimize resources, stabilize consumption, and invest in productive activities. Financial inclusion mobilizes savings, broadens credit availability, and promotes risk mitigation, improving resilience. Phan et al. (2020) emphasize that greater access allows MSMEs to withstand economic shocks and maintain continuity. Meanwhile, Swan (2017) notes that blockchain-based digital financial services can close financial gaps for unbanked populations, reducing income inequality and promoting inclusive growth.

H_5: *Access to Financial Services Has a Constructive Impact on Microeconomic Stability.*

Financial performance may serve as a mediating mechanism between blockchain adoption and microeconomic stability. Blockchain can enhance efficiency through real-time transaction processing, reduced administrative overheads, and immutable ledgers that prevent fraud. These operational benefits generate cost savings and revenue growth, particularly in fintech and supply chain contexts (Xie et al., 2023). Furthermore, blockchain supports risk management and regulatory compliance through automated, traceable transactions, factors essential for long-term stability (Haddad & Hornuf, 2023). As firms improve their financial performance, they are better positioned to invest in expansion, create employment, and contribute to stable local economies.

H_6: *Financial Performance Mediates the Relationship Between Blockchain Adoption and Microeconomic Stability.*

Access to financial services may also mediate the blockchain–stability relationship, influencing how effectively blockchain's benefits are realized at the grassroots level. By improving transactional efficiency, security, and transparency (Garg et al., 2023) blockchain enables MSMEs to enhance financial management, access credit, and reduce reliance on intermediaries. However, these outcomes are contingent on the availability of formal financial services. High access levels facilitate digital payments, microcredit, and DeFi, strengthening resilience and economic inclusion, while limited access can constrain

these benefits. Supportive regulatory environments are also necessary to align blockchain implementation with institutional capacity (Verbeek & Lundqvist, 2021).

***H_7**: Access to Financial Services Mediates the Relationship Between Blockchain Adoption and Microeconomic Stability.*

Research Model: Derived from the hypotheses formulated above, the research model is illustrated in Figure 1.

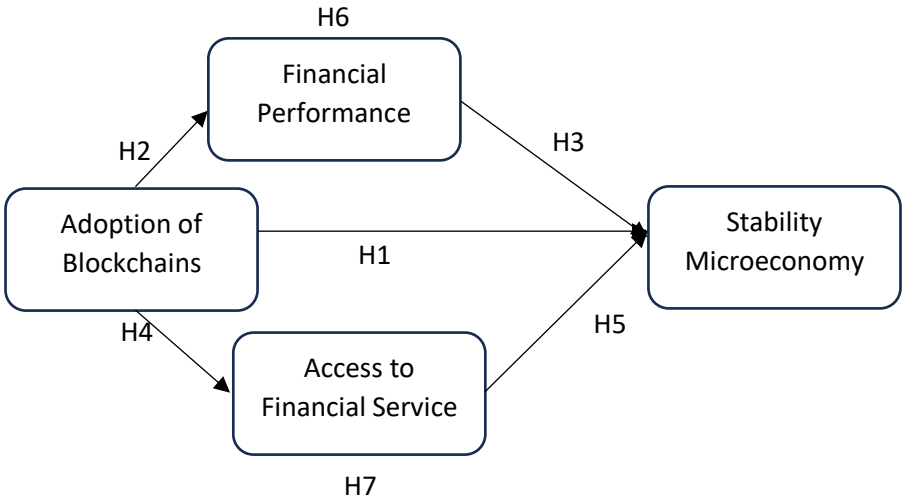

Figure 1 The Framework and Hypotheses Research Study

Research Methods

This study adopts a quantitative research design, focusing on users of the Indodax cryptocurrency exchange, Indonesia's largest and most active trading platform. Indodax offers a mature cryptocurrency ecosystem integrated with the domestic financial system. It is a suitable context for examining blockchain technology's influence on economic stability and financial behavior in the Indonesian market. The target population comprises Indodax users who (1) actively manage MSMEs, (2) have been on the platform for over one year, and (3) demonstrate clear investment intentions. These inclusion criteria ensure participants possess practical MSME management experience and familiarity with blockchain-based transactions. Purposive sampling was employed to recruit respondents meeting these requirements.

A total sample size of 200 respondents was calculated using Slovin's formula for finite populations, where the total population size is large but not precisely known: $n = N / (1 + Ne^2)$. Assuming a large but unspecified user base and applying a 7% margin of error (eee), the minimum requirement was approximately 196. The final sample of 200 respondents

meets statistical representativeness while allowing for potential non-responses or missing data.

Data were collected using a structured online questionnaire administered to eligible respondents. The instrument comprised multiple constructs, each measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree." This scaling method systematically captured participants' perceptions, attitudes, and behaviors concerning the core research variables: blockchain technology adoption, financial performance, access to financial services, and microeconomic stability. The study's primary objective is to examine the interrelationships among these constructs, with particular emphasis on the mediating role of access to financial services. Considering blockchain technology's rapid evolution and multidimensional characteristics, this methodological design is well-positioned to identify dynamic interactions between economic and financial variables. The appropriateness of using attitude-based survey instruments in social and economic research, particularly in exploring emerging technologies and their broader systemic implications, is supported by Zhang (2023).

This study analysed the data using Partial Least Squares Structural Equation Modeling (PLS-SEM) version 4, a method well-suited for exploratory research that involves complex models, second-order constructs, and latent variables (Hair, 2022). PLS-SEM facilitates examining direct and indirect relationships among variables and is particularly effective for testing mediation effects, making it an appropriate choice for the present study's hypotheses. The analytical procedure encompassed reliability and validity assessments, including Cronbach's alpha, composite reliability, and average variance extracted (AVE), along with model fit evaluation using the standardized root mean square residual (SRMR) and additional fit indices. Bootstrapping was conducted to determine the statistical significance of the path coefficients and mediating effects.

The measurement model comprised four primary constructs, each operationalized through multiple items rated on a five-point Likert scale ranging from strongly disagree to agree strongly. All items were adapted from previously validated instruments and contextualized for micro, small, and medium-sized enterprises (MSMEs) operating within the blockchain ecosystem. Specifically:

(1) Blockchain Deployment and Acceptance were measured using items related to perceived usefulness, perceived ease of use, and adoption barriers, adapted from Noor et al. (2024);
(2) Financial Performance was assessed using indicators such as profitability, cash flow, and cost efficiency, based on the scale developed by Xie et al. (2023);
(3) Access to Financial Services was measured using items reflecting the availability, accessibility, and usability of blockchain-based financial tools, adapted from Kumar et al. (2023); and
(4) Microeconomic Stability was evaluated through indicators of market resilience, purchasing power, employment, and inflation control, adapted from Swan (2017).

This methodological framework strengthens construct validity and enables the extraction of actionable insights pertinent to blockchain-enabled financial inclusion and economic stability in emerging markets.

Results and Discussion

Descriptive analysis

As shown in Table 1, the most significant proportion of respondents (38%) falls within the 25–34 and 35–44 age ranges, representing a demographic with substantial professional experience relevant to blockchain technology and MSME operations. This group is well-positioned to manage enterprises, engage in cryptocurrency or blockchain investments, and provide informed perspectives on blockchain utilization at the microeconomic level. Regarding gender distribution, 60% of respondents are male and 40% are female. Although there is a slight male majority, the distribution is relatively balanced, reflecting general patterns within the technology and investment sectors, offering a broader perspective on blockchain adoption in MSME contexts.

Table 1 profile of the respondents

Criteria	Number (n)	Percentage (%)
Age		
18-24 years	28	14
25-34 years	76	38
35-44 years	50	25
45-54 years	34	17
55+ years	12	6
Gender		
Male	120	60
Female	80	40
Education Level		
High School or Equivalent	2	1
Associate Degree (D3)	5	2.5
Bachelor's Degree (S1)	103	51.5
Master's Degree (S2)	85	42.5
Experience in MSME Management		
1-3 years	32	16
4-6 years	73	36.5
7-9 years	46	23
10 years or more	49	24.5
Investment Objectives		
Short-Term	77	38.5
Long-Term	88	44
Both Short-Term and Long-Term	35	17.5

Most participants hold advanced qualifications educationally, with 51.5% possessing a Bachelor's degree (S1) and 42.5% a Master's degree (S2). Such academic attainment indicates that respondents are both technologically literate and business-oriented,

enhancing their capacity to adopt and respond to blockchain innovations and to assess their impact on financial performance and microeconomic stability. Regarding entrepreneurial experience, 36.5% have managed MSMEs for 4–6 years and 24.5% for over 6 years, signifying deep familiarity with sector-specific challenges and opportunities. This experience strengthens their ability to evaluate blockchain's role in improving operational efficiency and financial outcomes.

Regarding investment orientation, 44% of respondents report long-term investment objectives, reflecting sustained confidence in blockchain-based assets. In comparison, 38.5% indicate short-term motives, suggesting an inclination toward rapid returns available through cryptocurrency markets. This range of investment horizons underscores a diverse strategic outlook toward blockchain applications. The sample comprises highly educated, experienced MSME managers with active engagement in blockchain usage, aligning closely with the research objectives of examining blockchain adoption's effects on financial performance and microeconomic stability.

Reliability and Validity Test

According to the results presented in Table 2, most indicators recorded an outer loading value of ≥ 0.7, which is deemed acceptable as it indicates that the indicator contributes significantly to achieving the intended construct. Indicators with values between 0.5 and 0.7 may be retained, provided that their removal does not result in a substantial increase in Average Variance Extracted (AVE) or Composite Reliability (CR) (Khuzainey et al., 2020). The AVE values for all variables exceed the threshold of 0.5, indicating that the indicators converge appropriately to form their respective constructs. Furthermore, Cronbach's alpha and CR values for all variables are above 0.6. These results confirm that the validity and reliability criteria for measuring the study variables and items have been satisfactorily met.

Table 2 Cosntruct Reliability and Validity

Variable	Statements	Outer loading	AVE	Cronbach's alpha	Composite reliability
Access To Financial Service (Kumar et al., 2023)	Blockchain gives me easier access to financial services such as credit.	0.951	0.580	0.801	0.870
	I can conduct financial transactions without traditional banking intermediaries.	0.630			
	I use blockchain to manage savings, investments, or loans digitally.	0.834			
	Access to blockchain-based services has improved my business finance options.	0.865			
	Blockchain enables me to access financial tools at lower transaction costs.	0.895			

Table 2 Cosntruct Reliability and Validity (cont')

Variable	Statements	Outer loading	AVE	Cronbach's alpha	Composite reliability
Adoption Of Blockchains (Noor et al., 2024)	Blockchain technology improves the operational efficiency of my business.	0.966	0.685	0.851	0.854
	I find it easy to learn and use blockchain applications for business.	0.816			
	Using blockchain enhances the security of my business transactions.	0.988			
	I am willing to continue using blockchain in my MSME activities.	0.881			
	Blockchain technology helps me manage business processes more effectively.	0.912			
Financial Performance (Xie et al., 2023)	Blockchain helps reduce my business's administrative and operational costs.	0.948	0.520	0.769	0769
	Since adopting blockchain, my business has seen an increase in profitability.	0.817			
	Blockchain has improved the cash flow in my MSME.	0.906			
	My overall financial management has improved due to blockchain adoption.	0.969			
	I have experienced better cost-efficiency in financial processes.	0.624			
Stability Microeconomy (Swan, 2017)	Blockchain adoption helps my business remain stable during economic shifts.	0.946	0.593	0.784	0.784
	I feel my business is more financially resilient due to blockchain use.	0.634			
	My MSME contributes more to the local economy since adopting blockchain.	0.817			
	Blockchain strengthens my business against financial risks.	0.968			
	Using blockchain supports long-term economic sustainability for my MSME.	0.905			

Hypothesis Test

The results presented in Table 3 indicate a series of significant relationships among blockchain adoption, financial performance, access to finance, and microeconomic stability. The direct effect of blockchain adoption on microeconomic stability is 0.084, with a highly significant T-statistic of 8.356 and a P-value of 0.000, demonstrating a positive and statistically significant association. The relationship between blockchain adoption and financial performance is even stronger, with a coefficient of 0.986, an exceptionally high T-statistic of 690.438, and a P-value of 0.000, providing compelling evidence of the substantial impact of blockchain implementation on financial outcomes. Financial performance, in turn, exerts a pronounced positive influence on microeconomic stability, as reflected by a coefficient of 1.012, a T-statistic of 172.244, and a P-value of 0.000, confirming that improved financial performance enhances stability. Blockchain adoption also positively affects access to financial services, with an effect size of 0.989, a T-statistic of 958.508, and a P-value of 0.000, suggesting that blockchain plays a significant role in expanding financial accessibility. Although the effect of access to finance on microeconomic stability is comparatively minor, coefficient of 0.071, a T-statistic of 6.593, and a P-value of 0.000, it remains statistically significant and substantively relevant.

Table 3 Regression Weight Structural Equational Model.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Adoption Of Blockchains -> Stability Microeconomy	0.084	0.084	0.010	8.356	0.000
Adoption Of Blockchains -> Financial Performance	0.986	0.986	0.001	690.438	0.000
Financial Performance -> Stability Microeconomy	1.012	1.013	0.006	172.244	0.000
Adoption Of Blockchains -> Access To Financial Service	0.989	0.989	0.001	958.508	0.000
Access To Financial Service -> Stability Microeconomy	0.071	0.070	0.011	6.593	0.000
Adoption Of Blockchains -> Financial Performance -> Stability Microeconomy	0.998	0.999	0.006	176.080	0.000
Adoption Of Blockchains -> Access To Financial Service -> Stability Microeconomy	0.070	0.070	0.011	6.578	0.000

In addition to direct effects, blockchain adoption demonstrates substantial indirect effects on microeconomic stability. The mediating pathway through financial performance yields a coefficient of 0.998, a T-statistic of 176.080, and a P-value of 0.000, indicating a decisive mediating role. Similarly, the indirect pathway through access to financial services is significant, with a coefficient of 0.070, a T-statistic of 6.578, and a P-value of 0.000.

In summary, three key conclusions emerge. First, blockchain adoption enhances financial performance, which subsequently strengthens microeconomic stability. Second, blockchain adoption expands access to financial services, contributing positively to stability. Third, financial performance and access to finance serve as critical mediating mechanisms, explaining the broader impact of blockchain adoption on economic stability.

Discussion

The results of the PLS-SEM analysis demonstrate that blockchain adoption exerts a positive and statistically significant influence on microeconomic stability, both directly and indirectly, through the mediating roles of financial performance and access to financial services. These findings provide empirical support for the Technology Acceptance Model (TAM) and the Resource-Based View (RBV) theory, thereby contributing to the growing literature on the role of digital technologies in enhancing micro, small, and medium-sized enterprise (MSME) performance.

The direct causal pathway from blockchain adoption to microeconomic stability (β = 0.084, T = 8.356, $p < 0.000$) confirms that the utilization of blockchain technology strengthens economic resilience at the micro level. Consistent with TAM, this suggests that perceived usefulness and ease of use are critical determinants of adoption, which subsequently translate into tangible economic benefits (Yang et al., 2021; Alshehri, 2023). The intrinsic features of blockchain, namely transparency, cost-effectiveness, and data immutability, allow MSMEs to operate with greater efficiency and security, thereby contributing to localized economic stability (Carlson, 2018; Swan, 2017).

The powerful relationship between blockchain adoption and financial performance (β = 0.986, T = 690.438) aligns with the RBV perspective, which posits that sustainable competitive advantage arises from the effective deployment of valuable, rare, inimitable, and non-substitutable (VRIN) resources. Blockchain meets these criteria by enhancing financial transactions' speed, accuracy, and security (Sahoo & Thakur, 2023; Mailani et al., 2024). This is corroborated by Xie et al. (2023), who find that blockchain adoption in fintech significantly improves financial performance by reducing operational costs and enhancing data security.

The strong positive association between financial performance and microeconomic stability (β = 1.012, T = 172.244) underscores the foundational role of sound financial management in achieving broader economic resilience. This is consistent with the findings of Ongore and Kusa (2013) and Azadda et al. (2024), who emphasize the importance of liquidity, efficient capital utilization, and prudent risk management. Within the RBV framework, financial performance emerges as a direct outcome of leveraging strategic resources such as blockchain and is a critical mechanism for sustaining economic stability. Furthermore, blockchain adoption significantly improves access to financial services (β = 0.989, T = 958.508), reinforcing the argument that blockchain technologies enhance financial inclusion by providing viable alternatives to conventional banking systems (Harvey & Rabetti, 2024; Kumar et al., 2023). For MSMEs in underserved or unbanked

regions, blockchain facilitates access to credit, savings, and investment products through decentralized platforms.

Although smaller in magnitude, the effect of access to financial services on microeconomic stability (β = 0.071, T = 6.593) remains statistically significant. This supports the proposition that financial inclusion fosters savings, entrepreneurship, investment, and risk mitigation, core pillars of a resilient microeconomy (Phan et al., 2020; Swan, 2017). Enhanced access to finance enables MSMEs to manage market volatility, invest in innovation, and expand operations, reinforcing economic stability at the grassroots level.

The mediating effect of financial performance on the relationship between blockchain adoption and microeconomic stability is notably strong (β = 0.998, T = 176.080, p < 0.000). Under the RBV framework, this can be explained by blockchain's capacity to enhance transactional efficiency, transparency, and data integrity (Sahoo & Thakur, 2023), thereby boosting MSME profitability and operational efficiency, key drivers of economic resilience. These findings align with Xie et al. (2023) and Haddad & Hornuf (2023), who highlight blockchain's role in improving financial performance, reducing risk, and strengthening operational robustness in finance-intensive sectors.

The indirect pathway from blockchain adoption to microeconomic stability through access to financial services is also statistically significant (β = 0.070, T = 6.578, p < 0.000). However, its effect size is smaller than the financial performance pathway. This suggests that while financial inclusion remains a critical channel, its influence on stability is more modest. Nevertheless, blockchain's capacity to promote inclusion, particularly through decentralized finance (DeFi) tools, offers a practical means of overcoming structural barriers in regions with limited banking infrastructure. Smart contracts, digital wallets, and peer-to-peer lending platforms provide MSMEs with efficient, intermediary-free access to essential financial resources (Harvey & Rabetti, 2024; Kumar et al., 2023). This aligns with Swan's (2017) conceptualization of blockchain as a "leapfrog" innovation and Ciaian et al. (2024), who emphasize that enhanced financial access enables MSMEs to scale operations and withstand external economic shocks.

Conclusion

This study examined the influence of blockchain adoption on microeconomic stability among MSMEs, with financial performance and access to financial services serving as mediating variables. The empirical evidence demonstrates that blockchain adoption significantly and positively impacts both financial performance and microeconomic stability. By lowering transaction costs, improving transparency, and broadening financial inclusion, blockchain technology enhances economic resilience at the enterprise level, which, in turn, strengthens the broader microeconomic environment.

Nevertheless, the findings also reveal potential indirect challenges, including market volatility and uneven benefit distribution, which may pose risks to systemic stability. This

underscores an "efficiency–risk" paradox: while blockchain adoption promotes operational efficiency and financial inclusion, it introduces uncertainties linked to technological maturity, scalability limitations, and socio-economic disparities. As such, blockchain integration must be pursued with a balanced approach combining innovation with robust risk management.

From the Technology Acceptance Model (TAM) standpoint, the results affirm that perceived usefulness and ease of use are pivotal drivers of blockchain adoption among MSMEs. In parallel, the Resource-Based View (RBV) emphasizes the critical role of internal resources, such as managerial expertise, technological readiness, and strategic capabilities, in unlocking blockchain's potential to improve financial performance and foster economic stability. For MSMEs, strengthening internal capacities is essential to overcoming adoption barriers and realizing blockchain's benefits.

Public policies should focus on developing flexible yet secure regulatory frameworks to address these challenges and unlock blockchain's full potential. A key priority is the introduction of targeted training programs for SMEs, equipping them with the knowledge and tools necessary to adopt blockchain responsibly. Additionally, policies should encourage blockchain integration into existing financial systems, emphasizing security, scalability, and environmental sustainability. Such measures will help foster more inclusive and resilient financial ecosystems.

These findings open promising avenues for exploring the sectoral impacts of blockchain adoption, particularly its long-term effects on income inequality, employment, and microeconomic stability. Future studies should address technical barriers such as scalability and interoperability, and strategies to mitigate risks from market volatility and unequal benefit distribution. Additionally, advancing research on energy-efficient blockchain solutions could reduce environmental footprints, making the technology more sustainable. By tackling the "efficiency–risk" paradox and pursuing these research streams, subsequent studies can equip policymakers and businesses with integrated blockchain adoption strategies that maximize potential benefits while minimizing associated risks.

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