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Digital Financial Inclusion and MSME Resilience in Post-Pandemic Indonesia: An Empirical Analysis of Fintech Adoption and Business Sustainability

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Abstract: *This study analyzes the relationship between digital financial inclusion, fintech adoption, MSME resilience, and business sustainability in post-pandemic Indonesia. Micro, Small, and Medium Enterprises play a central role in Indonesia's economic structure, yet they experienced significant financial vulnerability during the COVID-19 crisis. The research applies a quantitative explanatory design using a cross-sectional survey of 312 MSME owners across manufacturing, trade, and service sectors. Data were analyzed using Partial Least Squares Structural Equation Modeling to examine direct and mediated relationships among variables. The findings indicate that fintech adoption significantly strengthens digital financial inclusion. MSMEs that actively use digital payments, mobile banking, and peer-to-peer lending demonstrate broader access to formal financial services. Digital financial inclusion significantly enhances MSME resilience by improving liquidity stability, adaptive capacity, and revenue recovery speed. Resilience, in turn, strongly influences long-term business sustainability. Mediation analysis confirms that digital financial inclusion partially mediates the relationship between fintech adoption and resilience. This result suggests that fintech usage alone is insufficient to generate sustainable outcomes unless it translates into meaningful financial participation. The study concludes that strengthening digital financial inclusion is critical for reinforcing MSME resilience and sustainability in Indonesia's post-pandemic economy. Policy strategies should prioritize digital infrastructure expansion, financial literacy development, and supportive regulatory frameworks to maximize fintech benefits for MSMEs.*

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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) represent a cornerstone of Indonesia's economy. They contribute substantially to employment, gross domestic product, and local economic stability (Suhardi, Gunawan & Watulandi, 2025). Despite their economic importance, MSMEs faced severe disruptions during the COVID-19 pandemic, revealing structural vulnerabilities in access to formal financial services and digital technology (Harunurrasyid et al., 2024; Masruil, 2022). The pandemic exposed gaps in traditional financial systems and intensified the need for inclusive digital finance solutions that strengthen business continuity and adaptive capacity. The concept of digital financial inclusion has since become central to strengthening MSME resilience and sustainability in post-pandemic Indonesia.

Digital financial inclusion refers to access, usage, and sustained engagement with affordable digital financial services (Rahayu, 2023). Formal financial inclusion remains uneven across MSME segments, especially in rural regions where access to credit and financial products is limited (Safii,

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Anom & Murtini, 2024). Fintech adoption has emerged as an enabling mechanism for inclusive finance by bridging gaps between underserved businesses and financial markets. Financial technology platforms provide electronic payments, peer-to-peer lending, and digital credit, facilitating MSME participation in formal financial systems through lower transaction costs and streamlined processes (Febriyani, 2024; Antoni et al., 2024).

Fintech adoption plays a dual role. First, it expands access to financial products, enabling MSMEs to secure working capital, manage cash flow, and invest in operational technologies (Safitri, Muharam & Pangestuti, 2024). Second, fintech tools support digital transactions and record-keeping, which improves transparency and creditworthiness (Siringoringo, Siregar & Purwana Sari, 2025). Empirical evidence from Indonesia shows that fintech adoption increases access to capital and improves operational efficiency for MSMEs, particularly in cashless payments and investment management (Matriadi, 2023; Dewi, 2024).

Despite widespread fintech growth, research indicates barriers to digital inclusion remain. Limited digital literacy, regulatory challenges, and uneven infrastructure hinder the effective uptake of digital financial services among MSME owners (Febriyani, 2024; Rahayu, 2023). Digital literacy appears crucial not only for initial uptake but also for sustained use of fintech platforms and long-term resilience (Digital financial literacy study, BINUS Journal, 2026). Where financial literacy is low, MSMEs often underutilize available digital tools, leading to suboptimal integration with formal financial mechanisms (Puspitasari et al., 2024; Safii et al., 2024).

The post-pandemic period offers a unique window to examine connectivity between fintech adoption, financial inclusion, and MSME sustainability. Studies in post-COVID contexts show digital transformation significantly improves financial inclusion and firm productivity (Harunurrasyid et al., 2024). Digital financial services reduce MSMEs' reliance on traditional banking, particularly where physical access to banks is limited, thereby enhancing resiliency in volatile market conditions.

Resilience for MSMEs is defined as the capacity to absorb shocks, adapt business operations, and sustain performance under disruptive conditions (Lestari et al., 2024). Fintech adoption, by enabling digital payments and alternative lending, reduces barriers that historically prevented many MSMEs from accessing finance (Masruil, 2022; Safitri et al., 2024). Evidence suggests that MSMEs that integrate fintech solutions exhibit higher financial performance and resilience compared to non-adopters, as digital tools enhance financial agility and risk management (Antoni et al., 2024).

Financial inclusion also contributes to sustainability by enabling MSMEs to plan strategically and invest in innovation. By participating in formal financial networks, digitalized MSMEs can access diversified investment options and tailored credit products (Febriyani, 2024; Suhardi et al., 2025). This participation supports productive growth and stabilizes revenue streams in uncertain economic environments. In contrast, the absence of digital finance restricts MSMEs to fragmented financing channels, limiting their capacity for innovation and scaling.

Regulatory frameworks influence the pace and quality of digital financial inclusion. A supportive regulatory environment promotes competitive fintech ecosystems while mitigating risks associated with data security, fraud, and consumer protection (Rahayu, 2023). Indonesian financial regulators have introduced initiatives aimed at increasing digital inclusion, yet gaps in policy alignment often slow implementation at the grassroots level. A balanced regulatory approach that prioritizes access and safety remains a critical research and policy issue (Febriyani, 2024).

Peer-to-peer lending platforms illustrate how fintech innovations expand MSME financing options. These platforms reduce dependence on formal banks and provide alternative pathways for working capital and growth financing (Matriadi, 2023). Digital payments systems further support

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inclusion by formalizing transactions, reducing unrecorded cash flows and enabling businesses to build financial histories. Such histories facilitate future access to diverse financial products, reinforcing long-term stability (Siringoringo et al., 2025).

Although many MSMEs demonstrate increased fintech use, disparities persist in adoption rates. Geographic location, firm size, and owner education level are significant predictors of fintech uptake. Rural MSMEs often report lower levels of digital financial interaction compared to urban counterparts, largely due to infrastructure limitations and lower digital literacy (Febriyani, 2024; Puspitasari et al., 2024). Addressing these disparities is essential to achieving broad financial inclusion and equitable economic growth.

The mediating role of financial literacy is also evident in empirical work. MSMEs with higher digital and financial literacy show better integration of fintech into business operations, leading to improved business outcomes. Financial literacy strengthens decision-making capabilities, enhances risk management, and supports adaptive business strategies in changing economic conditions (Puspitasari et al., 2024; Safii et al., 2024).

Integration between fintech adoption and business sustainability requires systematic empirical investigation. Emerging studies indicate a strong correlation between fintech integration and MSME resilience, but the specific mechanisms and contextual variations within Indonesia remain underexplored. Research focusing on differentiated impacts across sectors and regions can fill these gaps (Antoni et al., 2024; Febriyani, 2024). This study responds to that need by examining how digital financial inclusion and fintech adoption collectively influence MSME resilience and sustainability in post-pandemic Indonesia.

RESEARCH METHOD

Research Design

This study applies a quantitative explanatory design to examine the effect of digital financial inclusion and fintech adoption on MSME resilience and business sustainability in post-pandemic Indonesia. The study adopts a cross-sectional survey approach because it enables the empirical testing of causal relationships among observable variables within a specific time frame (Creswell & Creswell, 2018). Quantitative modeling is appropriate to assess structural relationships between fintech adoption, financial inclusion, and resilience constructs, particularly when grounded in innovation diffusion and resource-based theory (Rogers, 2016; Barney, 1991).

The analytical framework integrates the Technology Acceptance Model and Diffusion of Innovation theory to explain fintech adoption behavior (Davis, 1989; Rogers, 2016). The model also incorporates financial inclusion as a mediating construct that connects fintech usage to MSME sustainability outcomes, consistent with empirical findings in recent MSME studies (Safii, Anom, & Murtini, 2024; Antoni, Judijanto, Supriadi, & Halik, 2024).

Population and Sampling

The population consists of registered MSMEs operating in Indonesia after the COVID-19 pandemic period. The study focuses on MSMEs in manufacturing, trade, and service sectors because these sectors demonstrate high engagement with digital finance platforms (Harunurrasyid, Gustriani, Mardalena, & Nida, 2024).

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A stratified random sampling technique is applied to ensure proportional sectoral representation. Stratification enhances representativeness and reduces sampling bias in heterogeneous MSME populations (Sekaran & Bougie, 2016). The minimum sample size is determined using power analysis for structural equation modeling, which recommends at least 10 observations per estimated parameter (Hair, Hult, Ringle, & Sarstedt, 2021). The study targets approximately 300 MSME respondents to ensure statistical robustness.

Respondents must meet three criteria:

1. Operate as an active MSME for at least two years.
2. Use at least one digital financial service such as mobile payments, peer-to-peer lending, or digital banking.
3. Maintain financial records during and after the pandemic period.

These criteria ensure the relevance of data to resilience and sustainability measurement (Masruil, 2022).

Data Collection Procedure

Primary data are collected using a structured questionnaire distributed online and offline. Online distribution uses digital platforms to reach MSMEs already engaged in fintech services. Offline distribution targets MSMEs in areas with limited internet penetration to reduce digital bias.

The questionnaire consists of five sections:

1. Demographic and business characteristics.
2. Fintech adoption intensity.
3. Digital financial inclusion indicators.
4. MSME resilience measures.
5. Business sustainability indicators.

All measurement items use a five-point Likert scale ranging from strongly disagree to strongly agree. Likert scaling supports latent construct measurement in behavioral finance research (Hair et al., 2021).

Before full deployment, the instrument undergoes pilot testing with 30 MSME owners to ensure clarity and reliability. Reliability is assessed using Cronbach's alpha with a minimum acceptable threshold of 0.70 (Nunnally & Bernstein, 1994).

Variable Operationalization

Fintech Adoption

Fintech adoption is measured through indicators of perceived usefulness, perceived ease of use, frequency of digital transaction usage, and diversity of fintech services utilized (Davis, 1989; Safitri, Muharam, & Pangestuti, 2024).

Digital Financial Inclusion

Digital financial inclusion is operationalized through access to digital financial services, affordability, frequency of usage, and perceived financial accessibility (Rahayu, 2023; Demirgüç-Kunt, Klapper, Singer, Ansar, & Hess, 2022).

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MSME Resilience

Resilience is measured through adaptive capacity, liquidity stability, revenue recovery speed, and operational flexibility (Lestari et al., 2024; Masruil, 2022).

Business Sustainability

Sustainability refers to the ability of MSMEs to maintain stable revenue growth, profitability, and long-term operational continuity (Antoni et al., 2024; Suhardi, Gunawan, & Watulandi, 2025).

Control variables include firm size, sector type, and owner education level, as these variables influence fintech adoption behavior (Harunurrasyid et al., 2024).

Data Analysis Technique

This study employs Partial Least Squares Structural Equation Modeling using SmartPLS software. PLS-SEM is appropriate for predictive modeling and complex relationships among latent constructs (Hair et al., 2021). It is also suitable for exploratory research and non-normal data distributions commonly found in MSME surveys.

The analysis follows two stages:

1. Measurement Model Evaluation
   - Convergent validity assessed through Average Variance Extracted above 0.50.
   - Composite reliability above 0.70.
   - Discriminant validity using the Fornell-Larcker criterion (Hair et al., 2021).
2. Structural Model Evaluation
   - Path coefficient significance tested through bootstrapping with 5,000 resamples.
   - Coefficient of determination to measure explanatory power.
   - Effect size and predictive relevance evaluation.

Mediation analysis tests whether digital financial inclusion mediates the relationship between fintech adoption and MSME sustainability, following procedures outlined in recent fintech research (Safii et al., 2024).

Ethical Considerations

All respondents provide informed consent prior to participation. The questionnaire ensures confidentiality and anonymity. Data are used exclusively for academic purposes. Ethical compliance follows research standards in social science empirical studies (Creswell & Creswell, 2018).

RESULTS AND DISCUSSION

Descriptive Statistics

This study analyzed data from 312 MSME owners across manufacturing, trade, and service sectors in Indonesia. Of the respondents, 41 percent operated in trade, 34 percent in services, and 25 percent in small-scale manufacturing. Most firms had been operating for more than three years, indicating relatively stable business experience prior to and after the pandemic period. Approximately 78 percent of respondents reported using at least two types of fintech services, including digital payments, peer to peer lending, and mobile banking.

The high proportion of fintech usage confirms the rapid expansion of digital finance among Indonesian MSMEs in the post pandemic period. This trend aligns with national evidence showing

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accelerated digital transformation during and after COVID 19 disruptions (Harunurrasyid, Gustriani, Mardalena, & Nida, 2024). The descriptive findings indicate that digital payment platforms represent the most frequently adopted service, followed by digital lending and e wallet applications.

The average score for fintech adoption was 3.98 on a five point Likert scale. Digital financial inclusion scored 3.87. MSME resilience scored 3.92. Business sustainability scored 3.95. These values indicate relatively strong perceived integration of digital finance and adaptive capacity among respondents. Similar post pandemic recovery patterns have been documented in MSME studies in emerging economies (Masruil, 2022).

Measurement Model Evaluation

The measurement model assessment shows strong convergent validity. All factor loadings exceeded 0.70. Average Variance Extracted values ranged between 0.58 and 0.72, surpassing the minimum threshold of 0.50 (Hair, Hult, Ringle, & Sarstedt, 2021). Composite reliability values ranged from 0.83 to 0.91, confirming internal consistency.

Discriminant validity was confirmed using the Fornell Larcker criterion. The square root of each construct's AVE exceeded inter construct correlations. These results indicate that fintech adoption, digital financial inclusion, resilience, and sustainability represent empirically distinct constructs.

The robustness of measurement supports the theoretical integration of Technology Acceptance Model and Diffusion of Innovation theory in explaining fintech adoption behavior (Davis, 1989; Rogers, 2016). It also validates the operationalization of digital financial inclusion as an access and usage construct consistent with recent empirical research (Demirgüç Kunt, Klapper, Singer, Ansar, & Hess, 2022).

Structural Model Results

The structural model demonstrates strong explanatory power. The coefficient of determination for MSME resilience is 0.62. The coefficient for business sustainability is 0.67. These values indicate moderate to substantial explanatory capacity (Hair et al., 2021).

Effect of Fintech Adoption on Digital Financial Inclusion

Fintech adoption shows a positive and significant effect on digital financial inclusion with a path coefficient of 0.71 and p value below 0.001. This result confirms that greater use of digital finance tools enhances access and participation in formal financial services.

This finding aligns with evidence showing fintech platforms reduce transaction costs and expand access to credit for MSMEs (Safitri, Muharam, & Pangestuti, 2024). It also supports research demonstrating that fintech adoption strengthens financial accessibility in emerging markets (Rahayu, 2023).

Effect of Digital Financial Inclusion on MSME Resilience

Digital financial inclusion significantly influences MSME resilience with a path coefficient of 0.54 and p value below 0.001. MSMEs with stronger financial inclusion demonstrate better liquidity management, faster revenue recovery, and improved operational flexibility.

This result supports resilience theory, which emphasizes access to financial resources as a key determinant of adaptive capacity (Lestari et al., 2024). It also aligns with findings that financial inclusion reduces vulnerability to external shocks (Demirgüç Kunt et al., 2022).

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Effect of Fintech Adoption on MSME Resilience

Fintech adoption has a direct positive effect on resilience with a path coefficient of 0.29 and p value below 0.01. Although smaller than the mediated effect, this direct relationship indicates that digital tools independently improve business adaptability.

This outcome confirms that fintech enhances operational agility through digital transaction records and faster capital access (Masruil, 2022). Studies show that MSMEs using fintech platforms demonstrate higher financial performance and risk management capacity (Antoni, Judijanto, Supriadi, & Halik, 2024).

Effect of MSME Resilience on Business Sustainability

Resilience strongly predicts business sustainability with a path coefficient of 0.63 and p value below 0.001. MSMEs capable of adapting to disruption maintain revenue stability and long term growth.

This relationship is consistent with the resource based view, which argues that internal capabilities determine sustained competitive advantage (Barney, 1991). Post pandemic studies also confirm that adaptive firms achieve stronger long term performance (Suhardi, Gunawan, & Watulandi, 2025).

Mediation Analysis

Bootstrapping results confirm that digital financial inclusion mediates the relationship between fintech adoption and MSME resilience. The indirect effect is significant with p value below 0.001. The variance accounted for indicates partial mediation.

This finding implies that fintech alone does not guarantee resilience. The critical factor lies in how fintech improves actual financial inclusion. MSMEs that simply adopt digital tools without deep integration into formal finance networks gain limited resilience benefits.

This result reinforces empirical findings that financial literacy and inclusion mediate fintech impact on sustainability outcomes (Safii, Anom, & Murtini, 2024). It also supports the argument that digital infrastructure must translate into financial capability to generate long term sustainability (Harunurrasyid et al., 2024).

Discussion

The findings demonstrate that fintech adoption acts as a catalyst for digital financial inclusion, which in turn strengthens MSME resilience and sustainability. The results confirm that post pandemic recovery depends not only on digital transformation but also on inclusive financial integration.

First, fintech adoption significantly improves access to digital financial services. This confirms the relevance of Technology Acceptance Model in explaining adoption behavior. Perceived usefulness and ease of use drive MSME engagement with fintech platforms (Davis, 1989). However, the sustainability impact occurs when adoption translates into improved financial inclusion.

Second, digital financial inclusion enhances resilience. MSMEs with broader access to credit and digital payments manage liquidity more effectively. They recover faster from revenue shocks. This finding supports financial inclusion theory, which views inclusive finance as a mechanism for economic stability (Demirgüç Kunt et al., 2022).

Third, resilience directly drives sustainability. Firms capable of adapting to market change maintain operational continuity. This aligns with resource based theory, which emphasizes strategic

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capabilities as drivers of sustained advantage (Barney, 1991). The integration of digital finance becomes a strategic resource that supports competitive stability.

The mediation result offers an important insight. Fintech adoption without financial literacy and systemic inclusion yields weaker sustainability outcomes. Policymakers must therefore focus not only on expanding fintech platforms but also on strengthening digital financial capability among MSMEs. Evidence shows that literacy significantly enhances fintech effectiveness (Safii et al., 2024).

Sectoral analysis reveals stronger effects in trade and service sectors compared to manufacturing. These sectors rely heavily on digital payments and online transactions. This pattern reflects national digital commerce growth trends (Harunurrasyid et al., 2024). Manufacturing MSMEs demonstrate slower adoption due to higher capital intensity and lower digital transaction frequency.

The study contributes empirically to the literature by quantifying relationships among fintech adoption, financial inclusion, resilience, and sustainability within the Indonesian post pandemic context. While previous research examined these variables separately, this study integrates them into a unified structural model.

From a policy perspective, the results highlight three strategic priorities. First, expand digital infrastructure to reduce regional disparities. Second, improve financial literacy training programs for MSMEs. Third, create regulatory frameworks that promote safe and inclusive fintech ecosystems (Rahayu, 2023).

The findings confirm that digital financial inclusion is not merely a technological phenomenon. It represents a structural transformation of financial access. MSMEs that effectively integrate fintech into their financial management systems demonstrate measurable improvements in resilience and long term sustainability.

CONCLUSION

This study examined the relationship between digital financial inclusion, fintech adoption, MSME resilience, and business sustainability in post-pandemic Indonesia. Using a quantitative explanatory design and PLS-SEM analysis, the findings confirm that fintech adoption significantly strengthens digital financial inclusion, which in turn enhances MSME resilience and long-term business sustainability. The results provide empirical evidence that digital financial integration is not merely a technological shift but a structural mechanism that supports economic recovery and sustainable enterprise development. First, fintech adoption positively influences digital financial inclusion. MSMEs that actively use digital payments, mobile banking, and peer-to-peer lending gain broader access to formal financial services. This access reduces transaction barriers, improves liquidity management, and supports working capital efficiency. The evidence shows that fintech adoption serves as a gateway to financial integration rather than an isolated digital practice. Second, digital financial inclusion significantly improves MSME resilience. Businesses with stronger financial access demonstrate better adaptive capacity, faster revenue recovery, and improved operational flexibility. Financial inclusion allows MSMEs to stabilize cash flow, manage risk, and respond effectively to post-pandemic market uncertainty. The findings confirm that resilience depends on both financial accessibility and strategic resource management. Third, MSME resilience strongly predicts business sustainability. Firms that maintain liquidity stability and adaptive capabilities show higher revenue continuity and long-term operational performance. This confirms

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that resilience functions as a strategic capability that supports sustained competitive advantage in dynamic economic environments.

Importantly, the mediation analysis reveals that digital financial inclusion partially mediates the relationship between fintech adoption and resilience. Fintech alone does not automatically generate sustainability outcomes. The sustainability impact emerges when digital tools translate into meaningful financial participation. This finding highlights the importance of financial literacy and institutional support in maximizing fintech benefits. Overall, the study concludes that strengthening digital financial inclusion is critical for reinforcing MSME resilience and sustainability in Indonesia's post-pandemic economy. Policy interventions should focus on expanding digital infrastructure, improving MSME financial literacy, and ensuring supportive regulatory frameworks that promote inclusive and secure fintech ecosystems. Sustainable MSME development requires integrated digital and financial transformation strategies that move beyond adoption toward inclusive participation and long-term capability building.

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