

## Financial Inclusion and Sustainable Economic Performance of Rural MSMEs: Evidence from Indonesia

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### Abstrak

This study examines the effect of digital financial inclusion on the sustainable economic performance of rural micro, small, and medium enterprises (MSMEs) in Indonesia. Despite the rapid growth of digital financial services, rural MSMEs face challenges accessing formal financial systems, which may hinder their sustainability. Using a quantitative approach, data were collected from 78 MSME owners in Deli Serdang Regency, North Sumatra, and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that digital financial inclusion positively impacts sustainable economic performance, suggesting that better access to digital financial services enhances financial management, operational efficiency, and business resilience. These findings emphasize the importance of digital financial systems in supporting MSME sustainability, especially in rural areas where access to traditional financial services is limited. The study contributes to the literature by providing empirical evidence on the role of digital financial inclusion in promoting sustainable outcomes in rural contexts. Practically, it suggests that policymakers and financial institutions should strengthen digital financial ecosystems by improving infrastructure, accessibility, and support programs to enhance MSME sustainability.

**Key Words: Digital Financial Inclusion, Sustainable Economic Performance, Rural Areas, PLS-SEM**

## INTRODUCTION

In recent years, the rapid development of digital technologies has significantly transformed the global economic landscape and reshaped how businesses operate, compete, and sustain their performance. Digital platforms, mobile applications, and financial technologies have reduced geographical barriers, accelerated transactions, and enabled more efficient business processes across sectors (Ferreira et al., 2022; Nambisan et al., 2019). For micro, small, and medium enterprises (MSMEs), particularly in developing countries, digital transformation provides opportunities to access financial services, expand market reach, and improve operational efficiency (Zhang et al., 2023). However, the benefits of digitalization are not equally distributed, especially in rural areas where structural and institutional constraints remain prominent.

Rural MSMEs often face limited access to formal financial institutions, inadequate financial infrastructure, and lower exposure to digital financial services (Demirgüç-Kunt et al., 2022; Liu et al., 2024) (Beck et al., 2007; Demirgüç-Kunt et al., 2022). These conditions create significant barriers for entrepreneurs in accessing credit, saving instruments, insurance, and other financial services that are essential for business development. In this context, digital financial inclusion becomes a critical factor in bridging the gap between financial services and underserved rural populations. Digital financial inclusion refers to the accessibility and usage of formal financial services through digital platforms such as mobile banking, e-wallets, fintech lending, and other digital payment systems (Ozili, 2021, 2025)(Napitupulu, 2025). By reducing transaction costs and overcoming geographical limitations, digital financial inclusion enables rural entrepreneurs to participate more actively in the formal financial system.

In addition to structural constraints, rural MSMEs also face significant challenges related to financial accessibility and affordability, which limit their ability to expand and sustain their businesses (Demirgüç-Kunt et al., 2022; World Bank, 2022)(Khairani, Tantri, et al., 2025). Traditional financial



systems often require physical presence, complex administrative procedures, and collateral requirements that are difficult for rural entrepreneurs to fulfill (Sahay et al., 2020)(Nurhidayah et al., 2025). As a result, many MSMEs rely on informal financial sources that are less secure and insufficient to support long-term business growth. These limitations increase business vulnerability and restrict opportunities for scaling.

The emergence of digital financial services provides a potential solution to these challenges by offering more inclusive and flexible access to financial resources (Koch & Siering, 2017)(Al Ghunaimi et al., 2025). Through digital platforms, MSMEs can conduct transactions more efficiently, access financial services without geographical barriers, and manage their finances in real time. In addition, digital financial systems help reduce transaction costs, improve financial transparency, and support better financial decision-making (Gumilar et al., 2024; Kero & Bogale, 2023). However, despite these advantages, the utilization of digital financial services among rural MSMEs remains uneven due to limited infrastructure, low awareness, and trust issues (Tambunan et al., 2025). Therefore, examining the role of digital financial inclusion in enhancing sustainable economic performance becomes increasingly important (Sari, 2026).

The importance of digital financial inclusion extends beyond access, as it plays a strategic role in improving the economic performance of MSMEs. Access to digital financial services allows entrepreneurs to manage cash flows more efficiently, obtain financing for business expansion, and conduct transactions in a more transparent and secure manner (Allen et al., 2016; World Bank, 2022). These improvements contribute to enhanced productivity, better financial decision-making, and increased business resilience (Kantor et al., 2025). In rural contexts, where informal financial practices are still dominant, digital financial inclusion serves as a pathway toward more structured and sustainable financial management.

Sustainable economic performance of MSMEs is not only reflected in short-term profitability but also in the ability of businesses to maintain stability, adapt to changes, and grow over time (Agbaje, 2025; Choung et al., 2023). Digital financial inclusion supports this sustainability by providing continuous access to financial resources, enabling better risk management, and facilitating long-term investment decisions. Empirical studies suggest that financial inclusion contributes positively to business performance, particularly by improving access to capital and enhancing financial behavior (Sahay et al., 2020)(Napitupulu, 2025). However, in many developing economies, including rural areas, the level of financial inclusion remains uneven, limiting its potential impact on sustainable economic outcomes.

Despite the growing attention to financial inclusion, existing literature often focuses on traditional financial inclusion and tends to overlook the role of digital financial inclusion in shaping MSME performance (Sun & Zhang, 2024). Moreover, empirical evidence examining the relationship between digital financial inclusion and sustainable economic performance in rural MSMEs remains limited and fragmented (Fitriansyah & Nuryakin, 2021). This gap is particularly important, as rural entrepreneurs are among the most financially excluded groups, yet they stand to benefit significantly from digital financial services.

Therefore, this study aims to examine the effect of digital financial inclusion on the sustainable economic performance of rural MSMEs. By focusing on rural business actors, this research provides a more contextualized understanding of how digital financial access can drive economic sustainability. The findings are expected to contribute to the literature on digital finance and MSME development, while also offering practical insights for policymakers and financial institutions in promoting inclusive and sustainable economic growth through digital financial systems.

## **THEORETICAL REVIEW**

### **Digital Financial Inclusion**

Digital financial inclusion has become a critical component in promoting equitable economic development, particularly in developing countries where access to formal financial services remains uneven. It refers to the accessibility, availability, and usage of formal financial services delivered through digital platforms, including mobile banking, e-wallets, fintech lending, and digital payment systems (Ozili, 2021)(Demirgüç-Kunt et al., 2022)(Chaniago et al., 2025). By leveraging digital

technology, financial services can reach previously underserved populations, especially in rural areas where traditional banking infrastructure is limited (Hou et al., 2025).

From a theoretical perspective, digital financial inclusion is grounded in the Financial Inclusion Theory, which emphasizes that access to financial services plays a fundamental role in enhancing economic participation, reducing inequality, and fostering inclusive growth (Leyshon & Thrift, 1996)(Nasib et al., 2025)(Amalia et al., 2025). Digitalization further strengthens this concept by lowering transaction costs, increasing efficiency, and expanding financial access beyond physical limitations. As a result, digital financial inclusion not only improves accessibility but also enhances the quality and usability of financial services.

For MSMEs, particularly those operating in rural areas, digital financial inclusion offers significant benefits. Access to digital financial services enables entrepreneurs to perform financial transactions more efficiently, manage liquidity, and access financing for business expansion (Beck et al., 2007; Suri & Jack, 2016)(Sari, 2026). Moreover, digital platforms facilitate greater transparency and financial record-keeping, which are essential for improving financial discipline and accountability. Empirical studies suggest that improved financial inclusion contributes positively to business performance by enabling better financial management and increasing access to capital (Allen et al., 2016; Demirgüç-Kunt et al., 2022).

However, despite these advantages, the level of digital financial inclusion among rural MSMEs remains relatively low due to factors such as limited digital infrastructure, low financial awareness, and trust issues in digital systems (Ozili, 2021, 2025)(Nurhidayah et al., 2025). This indicates that while digital financial inclusion has strong potential to enhance business performance, its impact depends on the extent to which entrepreneurs are able to access and utilize digital financial services effectively.

### **Sustainable Economic Performance**

Sustainable economic performance refers to the ability of MSMEs to maintain stable growth, resilience, and long-term viability, rather than focusing solely on short-term profitability (Choung et al., 2023; Nugraha et al., 2022). It encompasses multiple dimensions, including income stability, business continuity, adaptability to environmental changes, and the capacity to withstand economic shocks. In this context, sustainable performance reflects not only financial success but also the durability and resilience of business operations over time.

The concept of sustainable economic performance is closely linked to the broader framework of sustainable development, where economic activities are expected to generate long-term value without compromising future stability (OECD, 2021). For MSMEs, achieving sustainability requires the ability to adapt to technological changes, respond to market dynamics, and efficiently manage available resources. Businesses that are able to integrate financial and operational strategies effectively are more likely to achieve long-term success and competitiveness (Moschovopoulou & Papavassiliou-Alexiou, 2025).

Access to financial services plays a crucial role in supporting sustainable economic performance. Financial resources enable MSMEs to invest in productive activities, expand operations, and manage risks more effectively. In this regard, digital financial inclusion serves as an important enabler by providing continuous access to financial services that support business growth and resilience (World Bank, 2022). Through digital platforms, MSMEs can reduce transaction costs, improve financial transparency, and enhance their ability to make strategic decisions.

In rural contexts, sustainable economic performance of MSMEs is particularly important as these enterprises often serve as the backbone of local economies and community livelihoods. Strengthening the sustainability of rural MSMEs not only improves individual business outcomes but also contributes to broader economic development (Khairani, Tantri, et al., 2025). Therefore, understanding the role of digital financial inclusion in driving sustainable economic performance is essential for developing effective policies and strategies that support inclusive and sustainable economic growth (Dwipayani Bhastary et al., 2025).

Sustainable economic performance refers to the ability of MSMEs to maintain stable business growth, resilience, and long-term viability rather than merely achieving short-term financial gains

(Choung et al., 2023)(Nugraha et al., 2022). It encompasses several dimensions, including income stability, business continuity, adaptability to environmental change, and the ability to withstand economic shocks. In this sense, sustainable performance reflects the overall health of a business and its capacity to survive in increasingly dynamic and competitive markets (Moschovopoulou & Papavassiliou-Alexiou, 2025).

Studies indicate that MSMEs with strong internal capabilities, such as sound financial management and effective utilization of digital technology, are more likely to achieve sustainable economic performance (Lusardi et al., 2021). Digital tools enable entrepreneurs to monitor their financial conditions more accurately, manage risks more effectively, and make strategic decisions based on reliable information (Hou et al., 2025). In rural contexts, where MSMEs often serve as the backbone of local economies, sustainable economic performance is particularly important for supporting community livelihoods and long-term development (OECD, 2021, 2023). Digital transformation provides opportunities for rural enterprises to strengthen their sustainability by improving access to finance, expanding customer reach, and enhancing business efficiency (Hu et al., 2023).

## METHODOLOGY

This study employed a quantitative research approach using a survey method as the primary data collection technique. The research was conducted in rural areas of Deli Serdang Regency, North Sumatra, Indonesia, focusing on micro, small, and medium enterprises (MSMEs) engaged in village-based economic activities. This setting was selected because rural MSMEs represent a vital component of local economic development, yet they often face significant constraints in accessing formal financial services and digital infrastructure.

The target population consisted of MSME owners or managers operating in rural areas. A purposive sampling technique was applied to ensure that respondents met specific criteria relevant to the research objectives. The inclusion criteria required participants to (1) operate a micro or small business in a rural area, (2) have experience in using or accessing financial services, particularly digital financial services, and (3) be willing to participate in the survey. Based on these criteria, a total of 78 respondents were selected as the research sample. This sample size is considered adequate for analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM), which is suitable for studies with relatively small samples.

Primary data were collected through structured questionnaires developed based on theoretical constructs and indicators derived from prior studies on digital financial inclusion and MSME performance (Beck et al., 2007; OECD, 2021; Ozili, 2021). All measurement items were assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Digital financial inclusion was operationalized using eight reflective indicators capturing three main dimensions: access, usage, and perceived benefits of digital financial services. These indicators include the ability of MSME actors to access digital financial platforms such as mobile banking and e-wallets, the frequency of using digital payment systems (Khairani, Silaban, et al., 2025), and the ease of accessing these services when needed. In addition, the measurement reflects the extent to which digital financial services support financial management, facilitate business transactions, and contribute to business growth. The construct also considers respondents' confidence in using digital financial services and their perception of the affordability and accessibility of such services for business activities.

Sustainable economic performance was measured using seven reflective indicators representing business stability, resilience, and long-term sustainability. These indicators include income stability over time, the ability of the business to survive during economic challenges, and evidence of continuous growth. Furthermore, the measurement captures the adaptability of MSMEs to changes in the market environment, the ability to manage business risks effectively, and the perceived long-term sustainability of the business. It also reflects the contribution of the business to improving the economic well-being of the entrepreneur's household.

The data were analyzed using Structural Equation Modeling (SEM) with the Partial Least Squares (PLS) approach, supported by SmartPLS software. This method was selected due to its ability

to analyze relationships between latent variables and its suitability for exploratory research with relatively small sample sizes, without requiring strict assumptions of normal data distribution (Hair et al., 2021).

The analysis was conducted in two main stages. First, the measurement model (outer model) was evaluated to assess the validity and reliability of the constructs. Convergent validity was examined using indicator loadings and Average Variance Extracted (AVE), while reliability was assessed using Composite Reliability and Cronbach’s Alpha. Second, the structural model (inner model) was evaluated to test the hypothesized relationship between digital financial inclusion and sustainable economic performance. The significance of the path coefficient was assessed using bootstrapping procedures, with t-statistics and p-values used to determine the acceptance of the hypothesis. Furthermore, PLS-SEM is particularly appropriate for this study as it enables simultaneous analysis of latent constructs measured by multiple indicators, thereby providing more robust and reliable results even in relatively simple structural models (Hair et al., 2021) (Hair et al., 2021; Sarstedt et al., 2020)

## RESULTS and DISCUSSION

### RESULTS

#### Measurement Model Assessment

The measurement model assessment was conducted to evaluate the validity and reliability of the constructs used in this study, specifically digital financial inclusion and sustainable economic performance. The evaluation criteria included factor loadings, Cronbach’s alpha, composite reliability (CR), and average variance extracted (AVE).

The results indicate that all measurement items have outer loading values exceeding the recommended threshold of 0.70, demonstrating that each indicator is strongly associated with its respective construct. This confirms that all items are valid and capable of accurately measuring digital financial inclusion and sustainable economic performance.

In terms of reliability, both Cronbach’s alpha and composite reliability values exceed the acceptable threshold of 0.70, which suggests a high level of internal consistency among the indicators. These results reinforce the reliability of the measurement model used in this study. Additionally, the AVE values for all constructs are greater than the threshold of 0.50, confirming that the constructs meet the criteria for convergent validity, further supporting the robustness of the model.

Overall, the findings indicate that the measurement model is both valid and reliable, making it an appropriate tool for further analysis in the structural model. This provides confidence that the model can be used to examine the relationships between the constructs and support subsequent conclusions.

#### Structural Model Evaluation

The structural model was evaluated to examine the relationship between digital financial inclusion and sustainable economic performance of rural MSMEs. The results of hypothesis testing are presented in Table 1.

**Table 1. Convergent Validity**

Variabel	Kode	Outer Loading	Cronbach’s Alpha	Composite Reliability	AVE
Digital Financial Inclusion (X)	DF1	0.812	0.659	0.659	0.659
	DF2	0.845			
	DF3	0.831			
	DF4	0.867			
	DF5	0.854			
	DF6	0.838			
	DF7	0.82			

Sustainable Economic Performance (Y)	SEP1	0.826	0.925	0.939	0.689
	SEP2	0.851			
	SEP3	0.843			
	SEP4	0.869			
	SEP5	0.858			
	SEP6	0.837			
	SEP7	0.829			
	SEP8	0.829			

The table illustrates the outcomes of the convergent validity evaluation for the two key constructs in this study: digital financial inclusion and sustainable economic performance. The results show that all indicators have outer loading values above 0.70, indicating that each item is appropriate and effectively reflects its corresponding construct.

In addition, both Cronbach’s Alpha and Composite Reliability values for all variables exceed the recommended threshold of 0.70, demonstrating strong internal consistency and reliability of the measurement instrument. Furthermore, the Average Variance Extracted (AVE) values for each construct are greater than 0.50, which confirms that the constructs possess adequate convergent validity.

Taken together, these findings indicate that the measurement model applied in this study is valid, reliable, and appropriate for further analysis of the structural model.

**Structural Model Evaluation**

The structural model was evaluated to examine the relationship between digital financial inclusion and sustainable economic performance of rural MSMEs. The results of hypothesis testing are presented in Table 2.

**Table 2. Hypothesis Testing**

Relationship between variables	Path Coefficient (β)	t-value	p-value	Decision
Digital Financial Inclusion → Sustainable Economic Performance	0.421	3.255	0.001	Significant

The table presents the results of hypothesis testing for the relationship between digital financial inclusion and sustainable economic performance. The findings indicate that digital financial inclusion has a positive and significant effect on sustainable economic performance, as evidenced by a t-value of 3.255, which exceeds the critical threshold of 1.96, and a p-value of 0.001, which is below the significance level of 0.05.

These results confirm that the proposed hypothesis is accepted. This implies that higher levels of digital financial inclusion contribute significantly to improving the sustainable economic performance of rural MSMEs. The ability of MSMEs to access and utilize digital financial services enhances their financial management, operational efficiency, and resilience, which are essential for achieving long-term business sustainability.

**DISCUSSIONS**

The results of this study indicate that digital financial inclusion has a positive and significant effect on the sustainable economic performance of rural MSMEs. This finding suggests that greater access to and utilization of digital financial services enable MSMEs to improve their business performance in a more sustainable manner.

This result is consistent with the Financial Inclusion Theory, which emphasizes that access to financial services enhances economic participation and reduces financial constraints (Khairani, Tantonio, et al., 2025; Khairani, Tantri, et al., 2025; Leyshon & Thrift, 1996). In the digital era, this concept is strengthened by the development of financial technologies that expand access through

more efficient and scalable platforms (Demirgüç-Kunt et al., 2022; Ozili, 2021). Digital financial inclusion enables MSMEs to overcome traditional barriers such as geographical limitations and high transaction costs, thereby supporting more inclusive economic participation.

Furthermore, recent empirical studies confirm that digital financial inclusion significantly contributes to MSME performance by improving access to capital, enhancing financial management, and increasing operational efficiency (Ferreira et al., 2022; Sahay et al., 2020). The use of digital financial services allows MSMEs to conduct faster transactions, improve financial transparency, and make more accurate financial decisions, which are essential for achieving long-term sustainability.

In rural contexts, digital financial inclusion plays an even more critical role. Rural MSMEs often face structural barriers such as limited access to formal financial institutions and inadequate infrastructure (Khairani, Octora, et al., 2025). Digital financial services provide an alternative pathway that allows MSMEs to access financial resources without physical constraints, thereby improving their resilience and business continuity (Bu et al., 2024; World Bank, 2022; Xi & Wang, 2023).

Moreover, recent studies highlight that the effective utilization of digital financial services is a key determinant of business sustainability. MSMEs that actively use digital financial platforms tend to exhibit higher efficiency, better adaptability, and stronger long-term performance (Sun & Zhang, 2024)(Khairani, Silaban, et al., 2025). This indicates that digital financial inclusion not only improves access but also influences how entrepreneurs manage and develop their businesses.

From a managerial perspective, these findings emphasize the importance of strengthening digital financial inclusion through integrated policies and practical interventions. Governments and financial institutions should prioritize expanding digital infrastructure, improving accessibility, and enhancing trust in digital financial systems. In addition, targeted programs such as digital financial training and inclusive fintech services are essential to increase adoption among rural MSMEs.

Overall, this study confirms that digital financial inclusion serves as a key driver of sustainable economic performance, particularly in rural areas where MSMEs play a vital role in local economic development.

## CONCLUSION

Based on the results of this study, it can be concluded that digital financial inclusion plays a significant role in improving the sustainable economic performance of rural MSMEs. The findings indicate that greater access to and utilization of digital financial services enable MSMEs to manage their financial activities more effectively, improve operational efficiency, and strengthen their long-term business resilience.

Based on these findings, it is recommended that governments and policymakers strengthen digital financial inclusion by expanding digital financial infrastructure, particularly in rural areas. Efforts should focus on improving access to digital payment systems, mobile banking, and fintech services that are affordable and user-friendly for MSMEs. Additionally, financial institutions need to develop more inclusive digital financial products and enhance their service delivery through simple, accessible, and secure digital platforms. Training programs and assistance related to the use of digital financial services should also be intensified to ensure that MSMEs not only have access but are also able to utilize these services effectively.

This study has several limitations. First, the sample size is relatively limited and focused on specific rural MSMEs, which may restrict the generalizability of the findings to broader contexts. Second, this study employs a quantitative approach using SEM-PLS, which may not fully capture the deeper behavioral and contextual aspects of MSMEs in adopting digital financial services. Therefore, future research is recommended to expand the sample size and coverage area, incorporate longitudinal approaches to observe changes over time, and include additional variables such as digital financial literacy, technology adoption, and financial behavior to enrich the research model.

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