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Building Financial Resilience for Local Food MSMEs Through Cost Adaptation, Cash Flow Stability, and Energy Efficiency

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Abstract
This study aims to analyze the effects of cost adaptation, cash flow stability, and energy efficiency on the financial resilience of local food MSMEs. Financial resilience is a crucial aspect that enables MSMEs to cope with changing economic conditions, rising operational costs, and increasingly dynamic business competition. This study employed a quantitative approach, with the population consisting of all local food MSMEs in Palopo City. A total of 176 respondents were selected as the research sample. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The findings indicate that cash flow stability and energy efficiency have a positive and significant effect on financial resilience. In contrast, cost adaptation does not have a significant effect on financial resilience. These results suggest that the ability of MSMEs to maintain stable cash flow and manage energy consumption efficiently are key factors in strengthening their financial resilience. This study implies that MSME owners should improve financial management practices and operational efficiency to ensure business sustainability amid economic uncertainty.

Keywords: *Financial Resilience of MSMEs, Cost Adaptation, Cash Flow Stability, Energy Efficiency, Local Food MSMEs.*

Abstrak
Penelitian ini bertujuan untuk menganalisis pengaruh adaptasi biaya, stabilitas arus kas, dan efisiensi energi terhadap ketahanan finansial UMKM pangan lokal. Ketahanan finansial menjadi aspek penting bagi UMKM dalam menghadapi perubahan kondisi ekonomi, peningkatan biaya operasional serta persaingan usaha yang semakin dinamis. Penelitian ini menggunakan pendekatan kuantitatif dengan populasi seluruh pelaku UMKM pangan di Kota Palopo dan melibatkan 176 responden sebagai sampel penelitian. Teknik analisis data menggunakan Structural Equation Modeling – Partial Least Square (SEM-PLS). hasil penelitian menunjukkan bahwa stabilitas arus kas dan efisiensi energi berpengaruh positif dan signifikan terhadap ketahanan finansial. Sebaliknya adaptasi biaya tidak memberikan pengaruh signifikan terhadap ketahanan finansial. Temuan ini menunjukkan bahwa kemampuan UMKM dalam menjaga kestabilan arus kas serta mengelola penggunaan energi secara efisien menjadi faktor utama dalam memperkuat ketahanan finansial usaha. Penelitian ini memberikan implikasi bahwa pelaku UMKM perlu meningkatkan pengelolaan keuangan dan efisiensi operasional untuk menjaga keberlanjutan usaha di tengah ketidakpastian ekonomi.

Kata Kunci: *Ketahanan Finansial UMKM, Adaptasi Biaya, Stabilitas Arus Kas, Efisiensi Energi, UMKM Pangan Lokal.*

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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in the Indonesian economy. According to Statistics Indonesia (BPS), Indonesia has approximately 65.5 million MSMEs, contributing 61.9% of the country's Gross Domestic Product (GDP). In addition, MSMEs account for approximately 99% of all business entities and absorb around 97% of the national workforce. Based on data from the Ministry of MSMEs, the number of MSMEs in Indonesia reached 64.2 million business units by the end of 2024, contributing 61.07% to Indonesia's GDP, equivalent to IDR 8,573.89 trillion (ANTARAFOTO, 2025). Despite their substantial contribution, MSMEs continue to face significant challenges, including limited access to financial services and low levels of financial literacy (Magdalena et al., 2025). Other major challenges include low productivity, limited access to financing, uneven digital transformation, and weak market networks (Jemadu, L., 2025). These conditions indirectly affect household purchasing power and consumption patterns, which constitute the primary market for food-sector MSMEs.

Indonesia has approximately 56.56 million entrepreneurs, consisting of around 51.55 million novice entrepreneurs and approximately 5.01 million established entrepreneurs. Consequently, the national entrepreneurship ratio is projected to reach 3.14% in 2025. Although the number of MSMEs continues to grow, the sector still encounters several challenges. Approximately 68% of MSMEs generate annual revenues below IDR 50 million, while 31% of micro-enterprises earn a monthly net profit of less than IDR 1 million. Furthermore, the COVID-19 pandemic reduced MSME sales by an average of 30% (Ardiyan, 2025). These statistics indicate that most MSMEs still face limitations in maintaining cash flow stability, improving cost efficiency, and building long-term financial resilience. Sudirman et al. (2023) explained that MSME owners have been required to redesign their economic strategies to sustain their businesses. Business owners must exercise greater caution in making strategic decisions. Although small enterprises are generally considered resilient to economic crises, continuous development remains essential to ensure long-term sustainability.

Financial resilience has become a fundamental aspect of sustainable MSME development. Financial resilience extends beyond the ability to generate profits; it also encompasses the capacity to manage costs, maintain stable cash flows, and achieve operational efficiency to ensure business continuity amid economic uncertainty. Mardanugraha and Junaidi (2022) argued that in recent years, the issue of MSME financial resilience has gained increasing attention due to the impacts of the COVID-19 pandemic, inflation, rising production costs, and global economic uncertainty, all of which have threatened business sustainability, particularly in the food sector.

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Previous studies have demonstrated that financial resilience significantly influences business sustainability because MSMEs with stronger financial management capabilities are more likely to survive crises and maintain profitability (Mardanugraha & Junaidi, 2022). Business resilience has also been examined by several scholars. Widodo (2021), through interviews with 135 MSME owners across Indonesia, found that entrepreneurial characteristics, business innovation, and marketing strategies have positive and significant relationships with MSME resilience. Hidayat et al. (2020) reported that entrepreneurial orientation positively and significantly affects crisis management. Moreover, government support that assists MSMEs in managing crises can substantially enhance business resilience. Hartono et al. (2021) revealed that more than 75% of MSMEs in Yogyakarta experienced declines in marketing performance, while over 50% encountered difficulties in repaying loans due to the global crisis. Likewise, Maharani and Rita (2020) found that the ability to maintain financial stability and effectively manage cash flows represents a critical factor in strengthening MSME resilience against economic pressures and declining consumer purchasing power.

Cost adaptation refers to the ability of MSMEs to adjust their expenditure structure in response to changing economic conditions, including increases in raw material prices, production costs, inflation, and fluctuations in market demand. In food-sector MSMEs, cost adaptation largely depends on the stability of raw material prices and daily operational expenses. The ability of business owners to improve cost efficiency, prioritize production expenditures, and adjust selling prices flexibly is considered essential for strengthening financial resilience. Cowling et al. (2021) found that MSMEs capable of rapidly adjusting operational costs exhibited higher levels of financial resilience than businesses lacking cost flexibility. Their findings suggest that cost adaptation functions as an effective financial risk mitigation strategy during periods of economic uncertainty.

Cash flow stability refers to the ability of MSMEs to consistently maintain a balance between cash inflows and cash outflows to support ongoing business operations. Cash flow stability is particularly important for MSMEs with limited working capital that rely heavily on daily sales turnover. Stable cash flows enable MSMEs to fulfill operational obligations, pay suppliers on time, and maintain uninterrupted production activities without experiencing financial distress. Khaled et al. (2025) demonstrated that effective cash flow management positively influences MSME sustainability in the digital era by maintaining financial stability and enhancing the ability to cope with economic uncertainty. Similarly, Priyadi (2025) concluded that sound cash flow management improves operational efficiency and strengthens business resilience against economic pressures. Furthermore, Apon et al. (2026) emphasized that financing behavior, investment decisions, and operating cash flows play vital roles in promoting the sustainability of small and medium-sized enterprises.

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Energy efficiency refers to a firm's ability to optimize energy utilization in order to reduce operational costs without compromising production quality or capacity. Energy efficiency practices may include the adoption of energy-saving equipment, better electricity consumption management, and optimization of production processes to improve productivity while minimizing costs. Aditya et al. (2025) found that operational efficiency, including efficient energy utilization, positively contributes to business financial sustainability. Likewise, the International Energy Agency (2023) reported that MSMEs implementing energy efficiency strategies tend to demonstrate stronger economic adaptability when facing fluctuations in global energy prices.

The existing research gap highlights the need to develop a more comprehensive model of financial resilience for food-sector MSMEs by integrating cost adaptation, cash flow stability, and energy efficiency in response to increasingly dynamic economic conditions and business competition. Previous studies have primarily focused on general cost efficiency and have not specifically examined how cost adaptation can be conceptualized as a strategic component in strengthening the financial resilience of food-sector MSMEs confronted simultaneously with energy cost pressures and fluctuations in raw material prices. Moreover, earlier studies have generally treated cash flow merely as an indicator of short-term financial health rather than integrating it comprehensively as a core element of financial resilience. In addition, empirical research on energy efficiency among Indonesian MSMEs remains limited and has predominantly focused on large-scale industries. Consequently, the relationship between energy efficiency and the financial resilience of food-sector MSMEs requires further empirical investigation.

METHODOLOGY

This study employed a quantitative approach using an explanatory research design to examine the construction of financial resilience among food-sector Micro, Small, and Medium Enterprises (MSMEs) through cost adaptation, cash flow stability, and energy efficiency. According to Creswell and Creswell (2017), quantitative research is an approach for testing objective theories by examining the relationships among variables measured through research instruments and analyzed using statistical procedures. The study focused on local food-sector MSMEs in Palopo City engaged in the production of sago-based products, red rice products, local chips, traditional South Sulawesi foods, and coconut-based processed products. The study population consisted of all local food MSMEs operating in Palopo City, with a sample of 176 respondents selected using a purposive sampling technique based on the criteria that the businesses were actively operating and engaged in food production activities.

Data were collected through a structured questionnaire employing a five-point Likert scale to measure respondents' perceptions of the research variables. The cost

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adaptation construct was measured using indicators including production cost adjustment, operational cost control, raw material efficiency, selling price adjustment, and waste reduction. Cash flow stability was measured through indicators of the smoothness of cash inflows, the ability to meet short-term obligations, the availability of operational funds, business revenue stability, and daily cash management. Energy efficiency was assessed using indicators covering energy conservation, the use of energy-efficient equipment, energy cost control, production process efficiency, and optimization of business energy utilization. The financial resilience construct was measured using indicators including the ability to survive during critical periods, business profit stability, operational continuity, the ability to meet financial obligations, business sustainability, and the ability to cope with increasing costs.

The data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). According to Sarstedt et al. (2022), PLS-SEM is particularly appropriate for research focusing on prediction, theoretical model development, and the examination of latent constructs involving mediation effects and multiple exogenous variables. The analysis included evaluation of the outer model to assess construct validity and reliability, as well as the inner model to examine the structural relationships among the research variables. SEM-PLS was selected because it enables the simultaneous analysis of relationships among latent variables and is particularly suitable for predictive research models. Through this analytical approach, the study is expected to develop an empirical model explaining the financial resilience of local food-sector MSMEs in responding to fluctuations in costs, cash flow, and energy efficiency.

RESULTS AND DISCUSSION

Outer Model

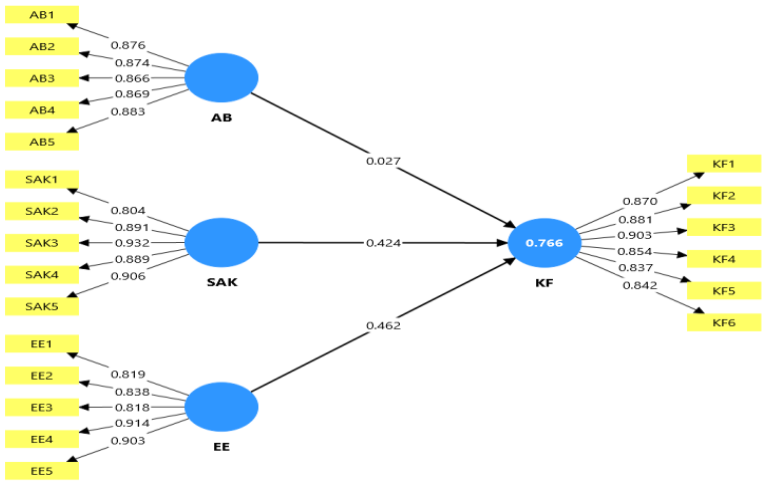

Figure 1 Outer Model

Tabel 1. Outer Loading

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Variabel	Indikator	Outer Loading	Keterangan
Cost Adaptation (X1)	AB1	0.876	Valid
	AB2	0.874	Valid
	AB3	0.866	Valid
	AB4	0.869	Valid
	AB5	0.883	Valid
Cash Flow Stability (X2)	SAK1	0.804	Valid
	SAK2	0.891	Valid
	SAK3	0.932	Valid
	SAK4	0.889	Valid
	SAK5	0.906	Valid
Energy Efficiency (X3)	EE1	0.819	Valid
	EE2	0.838	Valid
	EE3	0.818	Valid
	EE4	0.914	Valid
	EE5	0.903	Valid
Financial Resilience (Y)	KF1	0.870	Valid
	KF2	0.881	Valid
	KF3	0.903	Valid
	KF4	0.854	Valid
	KF5	0.837	Valid
	KF6	0.842	Valid

Sumber: Data diolah, 2026.

Based on the table above, all variables have factor loading values greater than 0.70, indicating that all measurement indicators are valid and meet the required indicator reliability criteria.

Tabel 2. Average Variance Extracted (AVE)

Variabel	Average Variance Extracted (AVE)
Cost Adaptation (X1)	0.764
Cash Flow Stability (X2)	0.738
Energy Efficiency (X3)	0.748
Financial Resilience (Y)	0.784

Sumber: Data diolah, 2026.

The table also shows that the Average Variance Extracted (AVE) values for all constructs exceed 0.50. Therefore, it can be concluded that all constructs satisfy convergent validity, as they exhibit factor loadings greater than 0.70 and AVE values above 0.50.

Tabel 3. Heterotrait-Monotriat Ratio of Correlations (HTMT)

	AB	SAK	EE	KF
AB				
SAK	0.858			
EE	0.823	0.842		

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KF	0.768	0.73	0.821	

Sumber: Data diolah, 2026

The Heterotrait–Monotrait Ratio (HTMT) results indicate that all HTMT values are below 0.90, demonstrating that all constructs satisfy the criteria for discriminant validity based on the HTMT assessment.

Tabel 4. Uji Reliabilitas

Variabel	Cronbach's Alpha	Composite Reliability
Cost Adaptation (X1)	0.923	0.942
Cash Flow Stability (X2)	0.930	0.948
Energy Efficiency (X3)	0.911	0.934
Financial Resilience (Y)	0.932	0.947

Sumber: Data diolah, 2026

Furthermore, the table indicates that all constructs have Cronbach's alpha and composite reliability values greater than 0.70. These results confirm that all measurement constructs are reliable and demonstrate satisfactory internal consistency.

Tabel 5. R Square

Variabel	R-square	R-square adjusted
Ketahanan Finansial (Y)	0.770	0.766

The R-square results indicate that Financial Resilience has an R^2 value of 0.770 and an adjusted R^2 value of 0.766. These findings imply that cost adaptation, cash flow stability, and energy efficiency jointly explain 76.6% of the variance in the financial resilience of food-sector MSMEs, while the remaining 23.4% is attributable to other factors not included in this study. The obtained R^2 value indicates that the proposed research model possesses strong predictive power, suggesting that the three independent variables play a significant role in enhancing the financial resilience of local food-sector MSMEs.

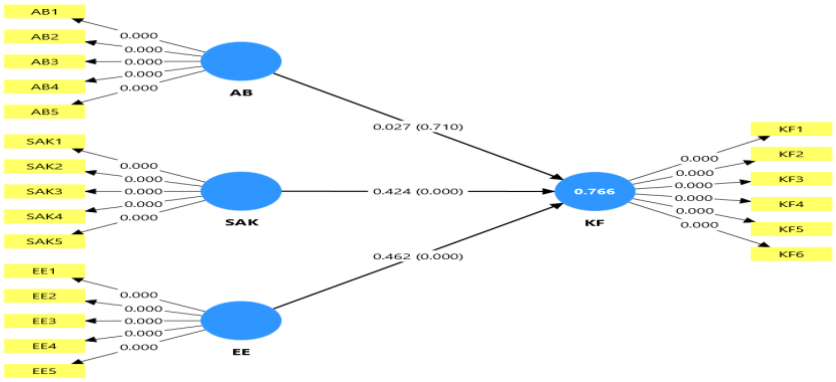

Figure 2 Inner Model

Tabel 6. Path coefficient

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Variabel	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AB -> KF	0.027	0.028	0.073	0.372	0.710
SAK -> KF	0.424	0.430	0.097	4.373	0.000
EE -> KF	0.462	0.455	0.091	5.092	0.000

source: Data diolah, 2026

1. Cost Adaptation and the Financial Resilience of Local Food-Sector MSMEs

Cost adaptation has no significant effect on financial resilience, as indicated by a path coefficient of 0.027, a t-statistic of 0.372, and a p-value of 0.710 (> 0.05). This finding suggests that the cost adjustment strategies implemented by food-sector MSMEs have not been sufficient to strengthen their financial resilience or maintain long-term financial stability. This condition may be attributed to the fact that most local food MSMEs still adopt reactive cost adaptation strategies, such as reducing production capacity, minimizing operational expenses, and substituting raw materials with less expensive alternatives when market prices increase. According to Apon et al. (2026), MSME sustainability is influenced not only by cost-control behavior but also by the ability to manage cash flows effectively and maintain business flexibility. Furthermore, Sari and Anam (2026) argued that adaptive capability alone is insufficient to strengthen business resilience unless it is supported by digital transformation and organizational flexibility. These findings indicate that the cost adaptation strategies employed by local food-sector MSMEs have not yet been integrated into broader business management practices, thereby limiting their contribution to financial resilience.

The insignificant relationship between cost adaptation and financial resilience may also be explained by limited capital, low levels of financial literacy, and the high dependence of food-sector MSMEs on fluctuations in raw material prices. Subranta et al. (2026) emphasized that cost control does not necessarily improve business sustainability when MSME owners lack sound financial planning systems. Similarly, Emanuel and Wulandari (2025) found that high production costs, when not accompanied by improvements in operational efficiency, can reduce MSME performance. Therefore, cost adaptation strategies among local food-sector MSMEs should be complemented by stronger financial management, business innovation, and more effective operational strategies to make a meaningful contribution to financial resilience.

2. Cash Flow Stability and the Financial Resilience of Local Food-Sector MSMEs

Cash flow stability has a positive and significant effect on financial resilience, with a path coefficient of 0.424, a t-statistic of 4.373, and a p-value of 0.000 (< 0.05).

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This finding indicates that the better MSMEs are at maintaining stable cash flows, the stronger their capacity to sustain long-term financial resilience. Stable cash flows enable MSMEs to meet operational needs in a timely manner, including purchasing raw materials, paying employees, and covering distribution costs, thereby ensuring business continuity even under economic pressure. Apon et al. (2026) reported that effective cash flow management is positively associated with MSME sustainability because it helps businesses maintain liquidity and improve their adaptive capacity. Likewise, Supriyanto et al. (2025) explained that systematic transaction recording, effective accounts receivable and payable management, and the adoption of digital financial tools enhance financial control and strengthen MSME sustainability. These findings suggest that cash flow stability serves as a fundamental pillar of financial resilience amid economic uncertainty and market fluctuations.

Cash flow stability also enhances the ability of MSMEs to undertake long-term business planning and minimize the risk of financial disruptions. MSMEs with stable cash flows are generally better equipped to cope with increases in raw material prices, changes in market demand, and periods of economic crisis than businesses with unstable cash flows. Apon et al. (2026) further found that effective management of operating, investment, and financing cash flows significantly contributes to MSME sustainability. Similarly, Tandean et al. (2024) concluded that effective cash flow management enables MSMEs to maintain financial stability while supporting future business expansion. In addition, Mensah et al. (2025) emphasized that sound cash flow management strengthens financial resilience through improved financial control and more effective managerial decision-making.

3. Energy Efficiency and the Financial Resilience of Local Food-Sector MSMEs

Energy efficiency has a positive and significant effect on financial resilience, with a path coefficient of 0.462, a t-statistic of 5.092, and a p-value of 0.000 (< 0.05). This finding indicates that efficient energy management enables MSMEs to reduce operational costs, thereby improving financial stability and long-term business sustainability. Among local food-sector MSMEs, implementing energy-efficient practices through optimized electricity consumption and more efficient production processes helps minimize unnecessary expenses and enhances the ability of businesses to maintain profitability. Privat and Guerrieri (2024) reported that energy efficiency enables MSMEs to reduce operational costs, improve business productivity, and strengthen corporate financial sustainability. Moreover, the adoption of energy-saving technologies and systematic energy management has become an important factor in enhancing business resilience during periods of economic uncertainty.

Lee and Hooi (2023) further explained that improvements in energy efficiency among MSMEs are influenced by entrepreneurs' knowledge, government support, and individual awareness of the importance of energy conservation. Their findings

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indicate that a better understanding of energy efficiency enables MSMEs to reduce operational costs and improve long-term business sustainability. Therefore, local food-sector MSMEs should enhance both awareness and implementation of energy-efficient practices as a strategic approach to strengthening financial resilience and ensuring sustainable business development.

CONCLUSION

This study examined the effects of cost adaptation, cash flow stability, and energy efficiency on the financial resilience of local food-sector Micro, Small, and Medium Enterprises (MSMEs) in Palopo City. The findings reveal that cost adaptation does not have a significant effect on financial resilience, indicating that reactive cost adjustment strategies alone are insufficient to strengthen the long-term financial sustainability of MSMEs. This result suggests that cost adaptation should be integrated with sound financial management, business innovation, and strategic operational planning to produce meaningful improvements in financial resilience.

In contrast, cash flow stability has a positive and significant effect on financial resilience. MSMEs with stable cash flows are better able to meet operational obligations, maintain business continuity, and withstand economic uncertainty. Likewise, energy efficiency exerts a positive and significant influence on financial resilience, demonstrating that efficient energy utilization contributes to lower operational costs, improved profitability, and stronger business sustainability. Among the examined predictors, energy efficiency exhibits the strongest effect, emphasizing its strategic role in enhancing the financial resilience of local food-sector MSMEs.

Overall, the proposed model demonstrates strong explanatory power, with cost adaptation, cash flow stability, and energy efficiency jointly explaining 76.6% of the variance in financial resilience. These findings highlight that strengthening financial resilience requires not only effective cost management but also the maintenance of stable cash flows and the adoption of energy-efficient operational practices. The study contributes to the literature by providing an empirical model of financial resilience for food-sector MSMEs and offers practical implications for business owners and policymakers in designing strategies that enhance the l

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