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Optimizing Micro, Small, and Medium Business Ecosystem Elements to Improve the Economic Competitiveness of North Sumatra

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ABSTRACT

Micro, small, and medium enterprises (MSMEs) have long been an important pillar in driving economic growth. This study aims to analyze the MSME ecosystem in relation to competitiveness in North Sumatra Province. This research uses the Vector Autoregression Error Correction model. The results show that in the short term, there is an increase in access to capital, which significantly and positively affects income. This is consistent in the long term, where there is a positive and significant effect of increased access to capital in driving the system towards long-term equilibrium. Increased adoption of internet technology has a positive and significant effect. Long-term analysis shows a positive coefficient for internet technology adoption. In the short term, not receiving guidance/training/counseling (BPP) shows a positive and significant effect. However, long-term findings show a negative and significant impact. Short-term findings show that the bank loan variable has a negative and significant impact, which is consistent with long-term findings.

Keyword: Access to capital, Internet adoption, Training, Bank loans

1. Introduction

Micro, small, and medium enterprises (MSMEs) have long been an important pillar in driving economic growth in various countries. Their strategic role is recognized not only by developed countries, but even by developing countries, including Indonesia. In Indonesia, the MSME sector makes a significant contribution by absorbing a large number of workers, increasing community consumption, and contributing to the formation of regional gross domestic product (RGDP), including in North Sumatra Province. As a form of support, the government, through the Ministry of Cooperatives and SMEs and other related institutions, has implemented various programs to strengthen the growth and development of MSMEs in various regions. Based on data from the Ministry of Cooperatives and SMEs and the final report of the Study on the Export Potential of MSMEs in Medan City (2023), in 2018, MSMEs contributed 61.07 percent to the national Gross Domestic Product (GDP). However, in the following year, namely 2019, the percentage of contribution decreased to 60.51 percent (BI, 2024).

Thus, efforts to increase MSME income are a key indicator of competitiveness. However, there are specific challenges in building an MSME ecosystem, including limited infrastructure, low access to capital from the financial services industry, low levels of entrepreneurial literacy, and a lack of cooperation between stakeholders (Hamzah, 2023), as well as very low human resource capacity (Srijani & Ardiyani, 2025) (Fidela et al., 2020). Alternative funding and access to capital markets are important for strengthening economic development in North Sumatra Province, by meeting financing needs, encouraging MSME growth, diversifying funding sources, and increasing transparency and sustainability. On the other hand, according to Arimurti (2023) , one of the problems related to MSME income growth is the adoption of the internet in the MSME digitalization process UMKM (BRIN, 2025). Internet adoption transforms traditional business models into modern ones, enabling MSMEs to expand their markets, increase efficiency, and survive in an increasingly

competitive digital economy. Without widespread and stable internet adoption, the digital transformation of MSMEs will be hampered (Novita et al., 2022). According to Pavlovic (2019) in addition to financial support, providing training to MSME players also has a positive and significant impact on business performance.

This study aims to analyze the MSME ecosystem in relation to competitiveness in North Sumatra Province. It is very important to understand the entrepreneurial ecosystem, how to build it, and the roles played by each stakeholder in creating an environment that supports MSME growth in North Sumatra Province. This study is expected to be useful in assisting MSME actors and also to provide data-based recommendations to the North Sumatra Provincial Government, Bank Indonesia, OJK, and financial service institutions, as well as other stakeholders to help improve the competitiveness of MSMEs. This study considers that access to capital participation, adoption of internet technology, the number of businesses that do not receive training and empowerment assistance, and loans are important strategies for strengthening economic competitiveness in North Sumatra Province. Although there have been many previous studies discussing MSMEs, this study fills the gap in previous research by developing an integrative conceptual model to examine how the synergy of the MSME ecosystem affects the competitiveness of MSMEs in North Sumatra Province. In addition, to provide depth of analysis, this study uses a mixed-method approach. This approach involves answering questions about whether there is an effect (quantitative) and why and how that effect occurs (qualitative).

2. Literature Review

MSMEs (Micro, Small, and Medium Enterprises)

Micro, small, and medium enterprises (MSMEs) are economic organizations that can create jobs, provide various economic services to the community, encourage economic growth and income distribution, and help achieve national stability (Apandi et al., 2024).

MSME Revenue

In general, revenue includes all receipts, both in cash and non-cash, obtained from the sale of goods and services that generate gross profit in a certain period (Titasari, 2023). . In the context of MSMEs, revenue can be used as a key financial performance measure, showing the total receipts obtained by MSMEs from their business activities, which are often used as indicators of business success and growth. Increased revenue serves as fuel to improve and maintain competitiveness in the future. Stable and high revenue makes MSMEs more bankable (eligible for loans). Larger capital from banks or investors can be used for large-scale expansion, such as building new factories or opening branches in other cities, which significantly increases scale competitiveness. If MSMEs have low income or suffer continuous losses, it will weaken their competitiveness through capital constraints, declining quality, plummeting sales, reduced profits, and the threat of bankruptcy. The higher and more stable the income, the greater the ability of MSMEs to invest, innovate, and ultimately, the stronger their competitiveness in the market.

MSME Ecosystem

Building an ecosystem is an important step in promoting the growth of Micro, Small, and Medium Enterprises (MSMEs) and enhancing local economic development. A strong ecosystem will create an environment that supports innovation, improves access to resources, and enables MSMEs to compete in a wider market. The term MSME Ecosystem refers to a comprehensive and integrated framework for collaboration. The elements of the MSME ecosystem are as follows:

1. Facilitating Access to Capital or Financing, which describes the extent to which small and medium-sized enterprises are able to obtain adequate financing support from financial institutions to support their business activities and performance (Manzoor et al., 2021). This includes access to various sources of capital from the financial services industry (IJK), including bank and non-bank financing, pawnshops, crowdfunding, venture capital, revolving funds, and bank loans. According to (Soebiantoro & Haryanti, 2024), access to capital is an external factor that can support MSME players in developing their businesses, both to add product variety and expand market reach pasar (Sriyono, 2023). The ease of obtaining capital for MSMEs is generally facilitated through government policies with the aim of providing financial support to encourage business growth.
2. Digital Technology Adoption. Internet adoption and utilization is defined as the use of computer hardware and software to access the internet and use the internet to support management, decision-making in business and operations (Alam, 2009).The adoption of the internet or digital

technology in the context of MSMEs is the extent to which small and medium-sized enterprises integrate the use of social media, big data, the Internet of Things, blockchain, or AI-based applications into their business operations as part of a digitalization strategy aimed at increasing economic value and business performance (Soomro et al., 2024)

3. Training in general is an organized activity that aims to help trainees achieve the desired level of competence or knowledge or to offer instruction and information to help them improve their performance (Saah, 2022).Training is closely related to the management of individual resources, which includes planning, organizing, guiding, controlling, and assessing (Amalia, 2018). This means that if a business wants to maximize its income, the quality and performance of its human resources also need to be maximized (Irawati, 2018). Another important option is to provide sufficient and appropriate training and education according to the needs of the business.
4. Bank loans are defined as formal financing provided by commercial banking institutions to small and medium-sized enterprises, subject to legal requirements, business relationships, and business characteristics such as size and sector in order to gain access to bank credit (Jiménez-Rico et al., 2023). Financial Services Authority (OJK) Regulation Otoritas Jasa Keuangan (OJK) No 19 year 2025 was created to address this issue, as well as Law Law Number 4 of 2023 concerning Development and Strengthening of the Financial Sector (P2SK Law) is an effort to support the government's Asta Cita agenda, one of which focuses on economic equality through easy, appropriate, fast, cheap, and inclusive financing.

3. Method

This study applies a mixed quantitative and qualitative approach, with an econometric research design using panel data (a combination of time series and cross-section) from annual data from 2017 to 2024. The dependent variable (Y) is MSME income, while the independent variables (X) are access to IJK capital, internet adoption, non-receipt of BPP, and bank loans, which are dynamic economic indicators that influence each other over a certain period of time. Data was obtained from relevant agencies from the North Sumatra Central Statistics Agency (BPS) MSME survey, regional Financial Services Authority (OJK), Bank Indonesia (BI), and the Cooperative and SME Office (for data on credit distribution, internet users, and training programs). Data was collected through literature studies, financial institution database searches, and compilation of official statistical data. This study uses the Vector Autoregression Error Correction Model (VECM). According to Shrestha & Bhatta (2018), vector autoregressive (VAR) regression was introduced by Sims (1980) as a technique that macroeconomists can use to describe the joint dynamic behavior of a set of variables. The VAR model is similar to simultaneous equation modeling, with a focus on several endogenous variables described by lag values without involving exogenous variables. According to Gujarati (2009), (Shrestha & Bhatta, 2018), the stages of the VECM model are as follows:

1. The stationarity test is the first step in testing the stationarity of all time series data variables using the Phillips-Perron (PP) test, assuming that the errors are independently and identically distributed. The ADF test adjusts DF by adding a lagged difference term to overcome serial correlation. If all variables are stationary at the level (I(0)), then the model used is Vector Autoregression (VAR). If all variables are stationary at the first order (I(1)), then proceed to the cointegration test to determine the use of VECM. This model is tested in the form:

$$\Delta y_t = \pi y_{t-1} + \beta D_{t-i} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 1)$$

Where, ε_t is I(0) and D_(t-i) is the deterministic trend component.

2. Lag Test Criteria: Selecting the appropriate lag length is important in VAR modeling. The optimal number of lags can be selected using available lag length selection criteria. The most popular criteria are the Akaike Information Criterion (AIC), Schwartz Bayesian Criterion (SBC), and Hannan Quinn Criterion (HQC).
3. Model Stability Test, used to determine the conditions for VAR(p) stability, requiring that all eigenvalues of A (AR matrix of the comparison of Y_t) be positive.
4. Cointegration Test, used to determine whether there is a stable long-term relationship between non-stationary variables at level (I(1)) using the Johansen Cointegration Test. The model is tested in the form:

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$$x_t = A_1 x_{t-1} + \beta D_{t-i} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3)$$

Where, x_t and ε_t (n.1) are vectors, A_1 is a parameter matrix

5. VECM Test, used to observe both long-term and short-term relationships between independent variables (X) and dependent variables (Y). If the variables are I (1) and there is a cointegration relationship.
6. The Impulse Response Function (IRF) test is used to analyze how variable Y responds to unexpected shocks in variable X.

Therefore, the VARECM econometric model developed in this study is:

$$\Delta Y_t = \mu_Y + \alpha_Y \varepsilon_{t-1} + \sum_{h=1}^{1} a_{1h} \Delta MSME\ Income_{t-h} + \sum_{h=1}^{1} b_{1h} \Delta Capital_{t-h} + \sum_{h=1}^{1} c_{1h} \Delta Internet\ Techology\ Adoption_{t-h} + \sum_{h=1}^{1} D_{1h} \Delta T\_GTE_{t-h} + \sum_{h=1}^{1} E_{1h} \Delta Bank\ Loans_{t-h} + u_{Yt}$$

……..……6)

Variable	Brief Operational Definition
MSME Income (Y)	Dependent variable, measured by the increase in MSME turnover or net profit within a certain period of time, in billions
Access to Capital (X1)	Number of MSMEs that obtain financial resources from banks, non-bank institutions, pawnshops, venture capital, revolving funds
Internet Adoption (X2)	Number of MSMEs that utilize digital technology and the internet for marketing, transactions, sales, and operational management
Not Participating in GTE (X3)	Number of MSMEs that do not receive guidance/training/counseling assistance in managerial, financial, and technical skills development programs provided by IJK or other parties
Bank Loans (X4)	Number of MSMEs that utilize formal credit/financing from banks.

4. Result and Discussion.

The stages of testing the VECM model conducted in this study are as follows: the first step in starting time series analysis is to perform a Phillips-Perron (PP) unit root test. If the unit root test results show that all variables analyzed are stationary, then the OLS method can be used to determine the relationship between the given variables. In Table 1.1, all variables are non-stationary at level (I(0)), with the Internet technology adoption variable having a probability level of 0.784 and a p-value <0.05. According to Gujarati (2009), the VARECM requirement is that all variables are free from unit root. Therefore, stationarity is continued at the 1st difference. At this test stage, all variables are free from the root.

Table 1.1 Stationarity test

Stasioner pada Level			Stasioner 1 df		
MSME Income	0.000	Stationary	D(MSME Income)	0.000	Stationary
Access to Capital	0.000	Stationary	D(Access to Capital)	0.000	Stationary
Internet Adoption	0.784	Not Stationary	D(Internet Adoption)	0.000	Stationary
Not Participating in GTE	0.000	Stationary	D(Not Participating in GTE)	0.000	Stationary
Bank Loans	0.000	Stationary	D(Bank Loans)	0.000	Stationary

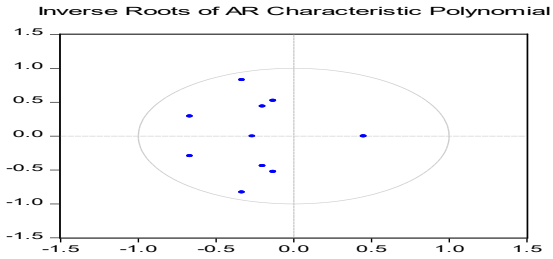
To make long-term estimates, it is necessary to test the optimal lag length criteria to eliminate autocorrelation problems in VAR systems, as shown in Table 1.2.

Table 1.2 Lag Test Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3357.984	-	8.94e+40	108.4834	108.6549	108.5507
1	-3265.583	166.9192	1.02e+40	106.3091	107.3384	106.7132

2	-8771.222	149.0985*	5.66e+41*	110.3278*	111.3849*	110.7570*

The next analysis was conducted using a maximum lag of 2. The stability of the VAR system model that had been formed needed to be tested through a stability condition check using the roots of characteristic polynomial method, as shown in Figure 1.1 below.



Graph 1.1 Stability Condition Check

Based on this graph, it can be concluded that the stability estimate of the VAR model to be used in the IRF and FEVD analysis has shown stable conditions, because all data points are within the circle. The next step is to perform cointegration analysis using the VECM method through the Johansen Test, as shown in Table 1.3 below:

Table 1.3 Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.599154	313.4919	69.81889	0.0001
At most 1 *	0.566746	197.3915	47.85613	0.0000
At most 2 *	0.445699	91.16477	29.79707	0.0000
At most 3 *	0.599154	313.4919	69.81889	0.0001

Next, we perform short-term and long-term VECM estimates, as shown in Table 1.4 below.

short-term			
Variable	**Coefisien**	**Coefficient**	**Description**
D(MSME Income)	1.0000		
D(Access to Capital)	9.4226	[1.4829]	Positive and significant impact
D(Internet Adoption)	1.9128	[2.1726]	Positive and significant impact
D(Not Participating in GTE)	4.9758	[1.9861]	Positive and significant impact
D(Bank Loans)	-1.0857	[-7.0196]	Negative and significant impact
long-term			
CointEq1	1.5959	[1.6033]	Positive and significant impact
D(MSME Income)	-0.0432	[-3.4741]	Pengaruh negatif dan signifikan
D(Access to Capital)	1.3507	[6.7468]	Positive and significant impact
D(Internet Adoption)	3.0094	[0.3188]	Positive and not significant impact
D(Not Participating in GTE)	4.0375	[1.8599]	Positive and not significant impact
D(Bank Loans)	-4.8686	[-3.9135]	Negative and significant impact

The Impulse Response Function (IRF) results from the VECM model show how the variable D(Y) (change in MSME income) responds to a one standard deviation shock (innovation) of each explanatory variable over 60 periods. The following is a critical interpretation of the response of D(Y) to shocks:

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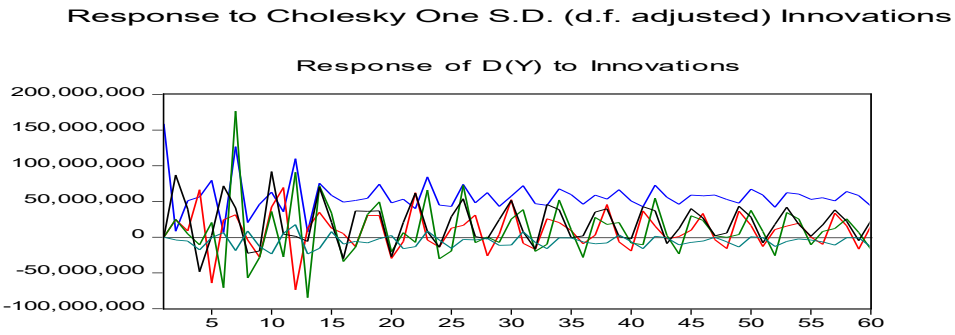

Figure 1.2 Impulse Response Function (IRF)

Based on Figure capital investment shows a significant and negative initial response, which then changes before stabilizing around the age of forty. In contrast, internet adoption produces a strong and rapid positive shock, making it the best catalyst for competitiveness. This shows that non-financial interventions are ineffective in increasing MSME income, as the response of the T_BPP variable is very small and variable. The Bank Loan variable, shown in cyan, has a moderate positive shock at the beginning, followed by moderate fluctuations, tending to stabilize around the 20-25 period. Bank Loans provide a significant positive response but not as large as the adoption of internet technology.

Findings from the VECM model in the previous analysis show that increased access to capital in the previous period significantly and positively affected MSME income in the current period (short term) and pushed the system towards long-term equilibrium. Various theoretical foundations and empirical evidence support these findings, which are an important reality in economics and small business management. MSMEs depend on external funding when internal sources are insufficient. In this case, financial capital is an important resource that enables MSMEs to acquire other strategic resources, such as better technology, high-quality raw materials, or skilled labor. Without capital, MSMEs cannot build or strengthen their resource base, making it difficult to grow and compete. These findings are consistent with those of Hadi (2025), Umma (2022), who emphasize that access to formal credit, also known as banking, remains an ongoing problem. Further studies often find a strong positive correlation between the amount of credit provided to MSMEs and increases in sales, profits, and labor absorption. These findings (Wismanjaya & Werastuti, 2022) support the conclusion that interventions to increase access to capital have a positive effect.

In the short term, the coefficient of internet technology usage has a positive and significant impact on MSME revenue. Internet usage provides a very strong boost to revenue in the short term. This makes sense because MSMEs can immediately enter the market through social media and e-commerce, increase marketing efficiency, and reduce transaction costs with the internet. However, it has no significance in the long term. The results are interesting. This means that internet adoption will become a basic necessity, rather than a competitive advantage. Similar technologies will eventually be used by all competitors, so that their impact on revenue will no longer be statistically significant compared to other important factors. The advantage will shift from mere adoption to how to use the internet innovatively. These results are in line with the theory of innovation diffusion, which states that although early adoption of technology has great advantages, these advantages will diminish as the technology spreads and is adopted by the majority of people. The findings of this study are in line with (Arimurti et al., 2023) which show that technological solutions have a significant impact on increasing the income of MSMEs. This theory is supported by the findings of (Novita et al., 2022) that digitization has a positive impact on increasing MSME income. These findings are also in line with the findings of (Ardito et al., 2024) that the adoption of the internet, such as AI and the use of big data, has a positive impact on SME income growth in Europe.

Based on the VARECM analysis results, the coefficient for not receiving BPP in the short term is positive and significant. An interesting finding is that MSMEs that did not receive assistance actually experienced an increase in income in the short term. Meanwhile, in the long term, the coefficient for not receiving BPP is insignificant and this effect disappears. This result can be explained by selection bias, as MSMEs that did not receive assistance are likely to be more established, healthy, and financially independent. As a result, they may not meet the criteria for receiving assistance, which is usually intended for micro-enterprises affected by the crisis. They did not succeed because they did not receive assistance but because of their strong business

foundation. The results show that government assistance programs in North Sumatra should not only be charitable in nature, but also intended to increase independence and scale. There may be a need to divide assistance into two categories: one for survival, and another for MSMEs that may move up the ladder to become competitive. To ensure that assistance is targeted appropriately and does not have a negative impact on the region's competitiveness in the long term, an evaluation of assistance distribution must be carried out in North Sumatra.

In the short term, the bank loan coefficient is highly negative. This is an important finding that seems counterintuitive. In the short term, an increase in bank loans actually reduces MSME income. In the long term, bank loans have a significant negative impact. Their strength declines, but this negative effect persists for a long time. Although these results do not indicate that bank loans are bad, they do point to structural problems such as high interest rates and installments. These findings support the first theory, the Trade-off Theory of Capital Structure, which suggests that poor financial conditions, interest burdens, and principal repayments that must be paid monthly by MSMEs with thin margins can significantly reduce cash flow and operating income, especially if the loans are used for unproductive purposes or if income projections are not met. Second, Disruptive Financing: Small and medium-sized businesses that receive bank loans may already be in difficult financial conditions. Therefore, these loans are only used to cover increased operating costs or losses, rather than for investments that generate new income. In other words, these loans are merely a symptom of the problem, not a solution. This finding is in line with Nugroho (2021) research, which found that although access to finance is very important, an inappropriate debt structure can disrupt the financial performance of MSMEs.

5. **Conclusion**.

This study shows that the main obstacle to the growth of MSME competitiveness in North Sumatra is limited capital. The adoption of internet technology has no significant impact in the long term, indicating that technology adoption has become a basic necessity and no longer a competitive advantage. The results show that MSMEs that did not receive BPP actually had higher income growth (significant in the short term), suggesting the existence of a selection bias issue (healthy businesses did not receive assistance) or the need for an in-depth evaluation of the effectiveness of assistance programs to encourage growth, not just survival. The results reveal a fundamental problem: the burden of excessive debt costs, including interest and installments, or loans used as distress financing.

6. Acknowledgements

Based on the above findings, stakeholders (provincial governments, Cooperative/MSME Agencies, OJK, Banks, and MSMEs) can follow these suggestions and recommendations:

- It is very important for credit recipients to obtain strong financial guidance and knowledge, with a focus on cash management, cost calculation, and using loans productively rather than consumptively. Every small and medium enterprise (SME) receives a working capital loan (KUR).
- Encourage digital advancement, starting with basic instruction such as market training and progressing to more specialized instruction such as sales data analysis, effective marketing, digital supply chain management, and branding. The goal is to maintain technological superiority in the long term.
- Encourage MSMEs to be more proactive in seeking and utilizing training opportunities and immediately adopting internet technology to improve efficiency and market reach, which are key to long-term competitiveness.
- Promoting Integrated E-Commerce Incubation: collaborating with universities and IT communities in North Sumatra to provide digital mentors who help MSMEs create high-quality content, optimize SEO and SEM, and fulfill online orders.

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