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Macroeconomic Factors Affecting the Growth of Micro and Small Industries in Indonesia

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ABSTRACT

Micro and small industries (MSIs) play a crucial role in the national economic structure but are vulnerable to macroeconomic dynamics such as fluctuations in gross domestic product (GDP), inflation, interest rates, exchange rates, exports, unemployment, and proportion of credit and tax incentives. The instability of these economic factors can directly affect the competitiveness and resilience of MSIs, making an in-depth study of their impact highly relevant. This paper navigates the relationship between GDP, tax incentives, inflation, interest rates, exchange rates, unemployment, export value, and the proportion of credit allocated to micro industries, small industries, and MSIs as a whole. Medium-term data from 2013–2023, focusing on Indonesia, were observed using linear regression. Three main findings emerged from the analysis. First, GDP and the proportion of credit had a significant positive effect on micro industries. Second, tax incentives, interest rates, export value, and the proportion of credit had a significant positive effect on small industries. Third, the proportion of credit was the only macroeconomic factor with a significant positive effect on MSIs overall. The empirical findings suggest that access to finance is a key determinant of MSIs performance, in contrast to other macroeconomic variables, which are often anomalous or contradictory. This reality highlights that limited access to credit critically hampers MSIS investment, growth, and productivity, even under relatively stable macroeconomic conditions. Moreover, in macroeconomic policy scenarios, transmission mechanisms such as inflation or interest rates do not always have an immediate or direct impact on MSIs due to their limited access to formal financial support. Future research is expected to analyse and re-examine the dynamic determinants of MSIs development using more diverse models and data extraction methods.

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■ INTRODUCTION

Micro and small industries (MSIs) in Indonesia, particularly in the manufacturing sector, continue to serve as the backbone of the national economy despite facing significant challenges amid an economic structure undergoing deindustrialization (Maksum et al., 2020). With approximately 4.35 million micro and small processing industry business units employing around 11.7 million workers, these units contribute substantially to national employment, even though wages remain considerably lower than those in medium and large industries (TIMES Indonesia, 2020). Nevertheless, their growth remains constrained by various constraints, including limited access to capital, marketing, digitalization, and raw materials (Rahman, 2025).

From a macroeconomic perspective, MSIs face several structural issues that impede their optimal contribution to national economic growth (Banerjee, 2023; Henryanto et al., 2025). Although this sector employs a substantial workforce, its productivity remains low due to limited access to technology, formal financing, and essential infrastructure, including energy and logistics. The uneven geographic distribution of MSIs, predominantly concentrated on the island of Java, also results in an imbalance in contributions to equitable

development (Karmagatri et al., 2024; Tambunan, 2021). Likewise, weak linkages between small industries and medium-to-large industrial supply chains hinder the sector's ability to maximize macroeconomic leverage, such as increasing the net domestic product (NDP). Besides, raw material inflation and exchange rate fluctuations exacerbate production cost inefficiencies, ultimately constraining aggregate real output growth in MSIs. Thus, structural reforms, including fiscal incentives, subsidized access to credit, and integration into the national industrial value chain, are urgently needed to enhance the sector's role within a conducive and sustainable macroeconomic development framework.

MSIs are an integral component of the national economic structure, including in developing countries such as Indonesia (Doktoralina et al., 2025; Takari et al., 2025). The existence and dynamics of this sector are explained by the "Economic Dualism Theory." According to Lewis (1954), the economy is divided into two sectors: the modern (formal) sector and the traditional (informal) sector. MSIs generally fall within the informal sector, as they are labor-intensive, utilize simple technology, and have limited access to capital, markets, and infrastructure. Although often considered complementary to the formal sector, MSIs play a concrete role as economic buffers and labor absorbers, particularly during times of crisis or economic downturn.

Furthermore, the "Institutional Economics Theory" approach is highly relevant in explaining the development of MSIs. This theory, popularized by North (1986) and Williamson (2010), emphasizes the crucial role of institutions, both formal, such as government regulations, and informal, such as social norms, in shaping the behavior and performance of business actors. In this context, limited access to financial institutions, legal protections, and market information is a key factor hindering MSIs' ability to grow and compete. Therefore, strengthening institutions and fostering an inclusive business ecosystem are essential to enhancing the competitiveness and sustainability of this sector in the long term.

The foundational literature examining the relationship between economic growth, taxes, inflation, interest rates, exchange rates, unemployment, export values, and credit on the development of MSIs is grounded in "Keynesian Macroeconomic Theory" and "Endogenous Growth Theory." Two theories emphasize the critical interaction between macroeconomic variables and the real sector. Economic growth stimulates greater demand for MSI products, whereas high tax rates can diminish their profits and capacity for reinvestment. Elevated inflation erodes consumers' purchasing power and raises production costs, while interest rates influence borrowing costs, a fundamental factor in small-business financing. Fluctuating exchange rates affect the prices of imported raw materials and the competitiveness of export products, while unemployment impacts labor availability and costs. Increased export values open new markets for MSI products, and accessible credit facilitates working capital and business expansion (Fernández Salguero, 2025; Fornaro & Benigno, 2018; Henryanto et al., 2025; Ibrahimov et al., 2025). Thus, the stability and effectiveness of macroeconomic policies synergistically support the sustainable growth of MSIs.

As is well known, the number of MSIs fluctuated over the period from 2013 to 2023. Although there was an overall increase from

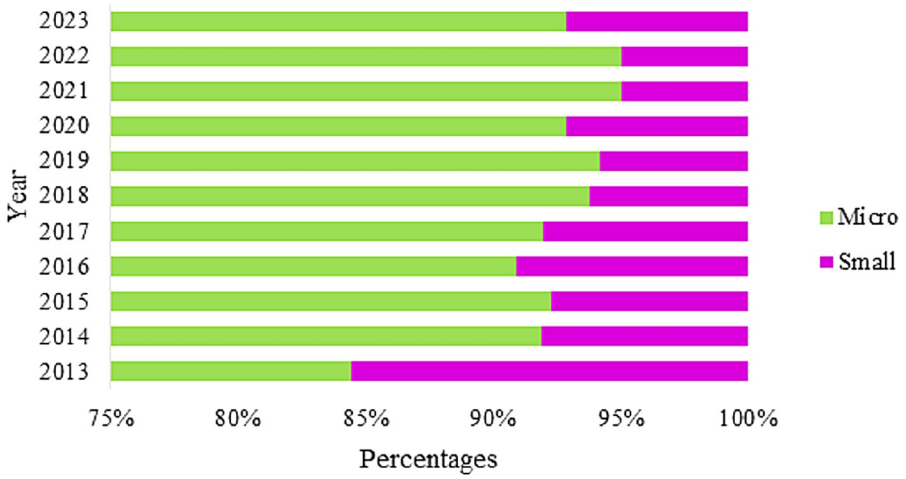

Figure 1. Number of MSIs in Indonesia 2013–2023 (BPS Indonesia, 2024a)

2013 to 2017, the number of MSIs in Indonesia appears to have declined thereafter, particularly in 2018. It then rose again in 2019 but decreased from 2020 to 2022 due to the impact of the COVID-19 pandemic. The most recent data confirms that the number of MSIs increased again in 2023. Referring to Figure 1 above, which is a stacked bar chart, the average number of MSIs, both micro and small, over the past 11 years was 4,084,529 units. The highest number of MSIs was recorded in 2023 at 4,500,584 units, while the lowest was 3,418,366 units in 2013.

Explicitly, the number of micro industries has consistently exceeded that of small industries over the past eleven periods. On average, there were 3,776,857 micro-industry units (92.3%), compared with 307,672 small-industry units (7.7%). Notably, when examining development trends, the growth rate of micro industries significantly outpaces that of small industries, at 3.9% versus –1.1%. This indicates that micro industries are expanding at a much higher rate than small industries. In addition, the graph presented in Figure 2 illustrates that the number of small industries fluctuated considerably over several years. For example, the highest number of small industries was recorded in 2013, at 531,351 units, while the lowest was in 2021, at 206,605 units (–25.9%). In contrast, micro industries showed a different pattern, with the highest number of 4,181,128 units (1,4%) in 2023 and the lowest of 2,887,015 units in 2013.

Manuscripts identifying macroeconomic elements such as Gross Domestic Product (GDP), tax incentives, inflation, interest rates, exchange rates, unemployment, export values, and credit in shaping the growth of micro and small businesses in both developing and developed markets have been validated in numerous publications across various editions. However, few studies focus specifically on the MSI sector. First, Adiwinata and Annisa (2024) examine the relationship between GDP and MSIs. Using a spatial panel data regression model, they demonstrate that increases in the number of MSIs and inflation reduce economic growth across Indonesia's regions. Second, regarding tax incentives and MSIs, Benedek et al. (2017) reveal that size-based tax incentives that do not target research and development (R&D) may reduce productivity and growth, potentially creating a "small business trap" by diminishing growth incentives at the firm level in four European countries. Third, Yusuf et al. (2024) analyze inflation's impact on micro, small, and medium enterprises (MSMEs), concluding that MSMEs' contribution to Nigeria's GDP has a significant positive effect. Fourth, interest rates and business capacity. Abbas and Honghui (2016) surveyed 400 respondents who took out loans from microfinance institutions in Tanzania. Their results indicate a positive correlation between business capacity and high interest rates. Fifth, exchange rates and small and medium-sized enterprises (SMEs). Focusing on Nigeria, Obiekwe and Edokobi (2025) found that currency depreciation (higher exchange rates) has a significant negative impact on SME performance. This suggests that increased operational costs exert pressure on business performance. Meanwhile, exchange rate volatility has a long-term causal relationship with the informal sector and SME performance. Precisely, exchange rate volatility has a significant positive effect on performance (Edoko et al., 2018). Sixth, unemployment and the formation and survival of new businesses. The unemployment-driven formation of new businesses in the service sector (wholesale, retail, and repair) in Europe between 2004–2020 shows that rising unemployment often

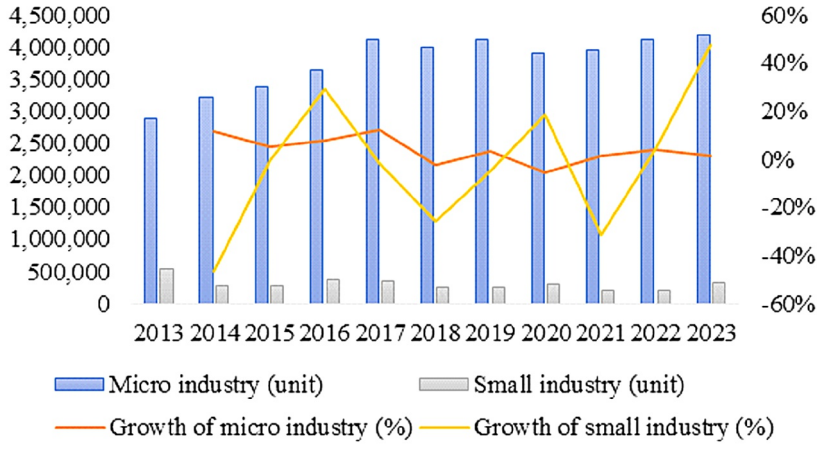

Figure 2. Number and Growth Trends of MSIs in Indonesia 2013–2023 (BPS Indonesia, 2024a)

encourages the emergence of micro and small businesses in the operational sector, although this effect is not consistent across all sectors (Wosiek, 2023). The unemployment rate has a significant negative impact on the survival of new businesses in Brazil. This phenomenon implies that rising unemployment undermines businesses' resilience to endure (Neves et al., 2024). Seventh, the value of exports by micro and small enterprises (MSEs) plays a crucial role. Cunha and Rocha (2015) explain that export marketing strategies, such as price adaptation to target markets and leveraging international competencies, substantially enhance the performance of MSEs in Brazil. Eighth, the proportion of credit available to SMEs is also important. Similar to the situation in China, limited access to credit—often characterized by the rejection of credit applications among SMEs—is influenced by aspects such as personal debt, business receivables, size, and assets (Cheng & Yang, 2022). Nonetheless, in the diverse business environment of East Java, Indonesia, there is no evidence that access to credit or its proportion consistently drives SME growth (McPherson & Rous, 2010).

It can be observed that the studies cited cover a variety of countries, with their relevance to Indonesia centred on shared structural characteristics commonly found in emerging markets, such as limited access to formal finance and the predominance of the informal sector, as well as a high sensitivity to macroeconomic conditions. These similarities enable a hypothetical comparison to explore how macroeconomic components influence the sustainability of the MSIs. Nevertheless, the scope for such comparison remains limited due to differences in institutional quality, economic structure, and government policy capacity across countries. Substantively, characteristics specific to Indonesia, such as a more diversified economic structure and intensive policy intervention, serve as vital distinguishing factors. Given that Indonesia shares similar structural attributes, such as limited access to finance and the predominance of the informal sector, cross-country literature remains relevant, provided it is formulated coherently. The essence of this literature is also valuable as a comparative framework for exploring general patterns, while the interpretation of results remains focused on the case of Indonesia.

This paper aims to investigate the development of MSIs and the macroeconomic factors that influence them, specifically: (1) GDP, (2) tax incentives, (3) inflation, (4) interest rates, (5) exchange rates, (6) unemployment, (7) export values, and (8) proportion of credit. In summary, the fundamental research questions are elaborated in the following three points: (1) How do macroeconomic variables (including GDP, tax incentives, inflation, interest rates, exchange rates, unemployment, export values, and the proportion of credit) simultaneously influence the MSIs in Indonesia? (2) Among the macroeconomic variables included in the model, which variable has the greatest explanatory power for variations in both the reduction and increase of MSIs' growth, when considered in isolation, during the estimation period? (3) Is the impact of macroeconomic variables on MSIs homogeneous, or does it vary across business types?

Beyond conducting a macroeconomic assessment, this paper's novelty lies in its contextual focus on MSIs. To date, previous study has been limited to MSMEs. Although all eight macroeconomic factors are relevant to MSMEs, analyzing distinct issues related to MSIs is vital to provide new insights. Conceptually, MSIs are a subset of MSMEs, which encompass micro, small, and medium-sized enterprises, classified by criteria such as number of employees, assets, and turnover. In other words, MSMEs represent a broader category, while MSIs cover only the two smallest segments within MSMEs. In addition to providing an assessment based on macroeconomic analysis, the contextual focus on MSIs avoids treating MSMEs as a homogeneous group. Typologically, MSIs represent the most distinctive category within MSMEs, characterised by limited access to formal finance, a high dependence on informal markets, minimal technological capacity, and capital constraints. This structural profile means that MSIs are more vulnerable to macroeconomic shocks and exhibit different responses compared to medium-sized enterprises, which generally have better market integration and greater financial resilience. Raes (2021) and Tudose et al. (2024) also highlight that heterogeneity in business size plays a crucial role in determining how macroeconomic shocks are absorbed at the firm level, with small-scale enterprises tending to be more affected by institutional weaknesses and constraints. Here, grouping all SME classifications into a single category risks obscuring fundamental differences in responses to macroeconomic variables; consequently, a focused analysis of MSIs offers a more refined approach to generating precise, policy-relevant insights.

The novelty of this paper lies in that few studies have examined the macroeconomic

aspects of MSIs, thereby enriching future research syntheses. Moreover, beyond its academic contributions, this paper's findings offer a significant advancement in planning and policymaking. Governments, as decision-makers, can implement coherent monetary, fiscal, and other macroeconomic policies to support and stimulate MSIs.

■ METHOD

Research Design

This paper employed quantitative methods, specifically linear regression, on secondary time-series data. This paper aims to analyze the relationship between macroeconomic components and MSIs. The macroeconomic components calculated include: (1) GDP, (2) tax incentives, (3) inflation, (4) interest rates, (5) exchange rates, (6) unemployment, (7) export values, and (8) proportion of credit. These eight macroeconomic components are treated as exogenous, while MSIs are treated as endogenous. The conceptual framework is illustrated in Figure 3.

Data Sources and Sample

Medium-term secondary data spanning the period 2013–2023 were obtained from official documents issued by Indonesian government agencies, primarily BPS Indonesia. In addition to documentation, data collection involved comprehensive reviews of articles, internet sources, and digital media, as well as access to databases managed by Bank Indonesia.

Variables and Measurement

Each variable was measured using a different instrument (see Table 1). Technically, the natural logarithm (ln) was applied to standardize the units of measurement for MI, SI, MSIs, GDP, TI, ER, EV, and PC data. In contrast, data for Inf, IR, and Upt are presented in their original, untransformed forms.

Data Analysis Technique

Linear regression was used to estimate the impact of macroeconomic factors—including GDP, tax incentives, inflation, interest rates, exchange rates, unemployment, export values, and the proportion of credit, on the growth of micro and small industries, individually or in combination. The linear regression technique produced four key outputs: (1) descriptive statistics, (2) correlation analysis, (3) multicollinearity testing, and (4) hypothesis testing. To address potential multicollinearity, a Variance Inflation Factor (VIF) test was conducted. Variables with very high VIF scores were identified as indicating strong linear relationships among the independent variables. In particular, the model was simplified by eliminating variables with high multicollinearity to ensure that the regression calculations were reliable and robust.

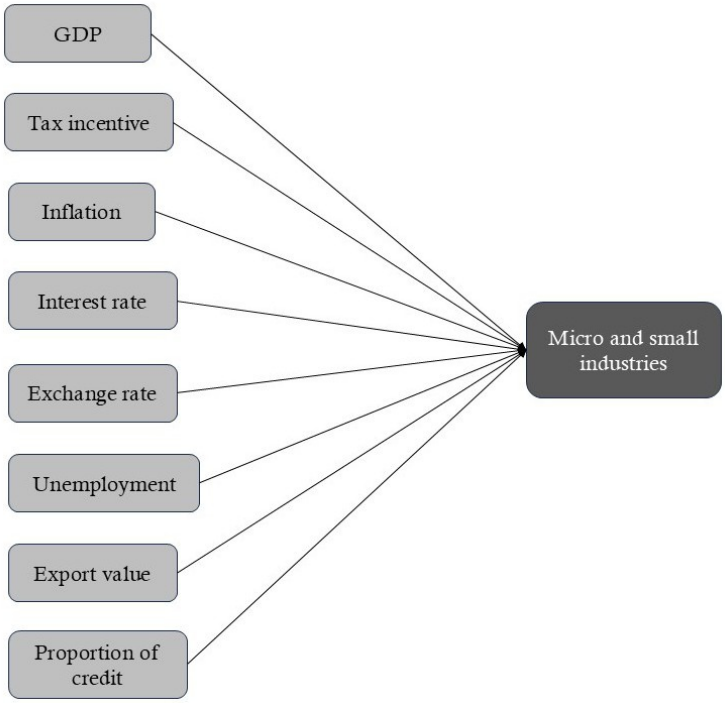

Figure 3. The Proposed Framework Model

Table 1. Groups of Variables and their Measures

Variables Name	Operational Definition (Indicator)	Data Source	Alternative Hypothesis (Sign)
MSIs	Number of micro and small industries (business units)	BPS Indonesia (2024a)	–
SI	Number of small industries (business units)	BPS Indonesia (2024a)	–
MI	Number of micro industries (business units)	BPS Indonesia (2024a)	–
GDP	GDP at constant prices based on the 2010 series of business fields (Rupiah/IDR billion)	BPS Indonesia (2025a)	H_1, H_9 and H_{17}: GDP has a positive impact on micro and small industries, as well as combined micro and small industries (MSIs)
TI	Government expenditure on fiscal incentives in the form of tax exemptions or reductions for MSIs to ensure replicability (Rupiah/IDR billion)	BPS Indonesia (2024b)	H_2, H_{10} and H_{18}: Tax incentives has a positive impact on micro and small industries, as well as combined MSIs
Inf	Inflation of all commodities (percent)	Bank Indonesia (2025a)	H_3, H_{11} and H_{19}: Inflation has a positive impact on micro and small industries, as well as combined MSIs
IR	Reference interest rate set by Bank Indonesia (percent)	Bank Indonesia (2025b)	H_4, H_{12} and H_{20}: Interest rates has a positive impact on micro and small industries, as well as combined MSIs
ER	Bank Indonesia transaction rate (Rupiah/IDR against US Dollar/US$)	Bank Indonesia (2025c)	H_5, H_{13} and H_{21}: Exchange rates has a positive impact on micro and small industries, as well as combined MSIs
Upt	Open unemployment rate/TPT as of August (percent)	BPS Indonesia (2025b)	H_6, H_{14} and H_{22}: Unemployment has a positive impact on micro and small industries, as well as combined MSIs
EV	The value of exports of both goods and services (US$ million)	BPS Indonesia (2025c)	H_7, H_{15} and H_{23}: Export values has a positive impact on micro and small industries, as well as combined MSIs
PC	Proportion of MSIs credit to total credit (Rupiah/IDR trillion)	BPS Indonesia (2018)	H_8, H_{16} and H_{24}: Proportion of credit has a positive impact on micro and small industries, as well as combined MSIs

The modeling framework described above is actualized through three relationship patterns. First, micro-industry growth is predicted by GDP, tax incentives (TI), inflation (Inf), interest rates (IR), exchange rates (ER), unemployment (Upt), export value (EV), and the proportion of credit (PC). Second, small industry growth is predicted using the same eight exogenous variables. Third, overall MSI growth is also predicted based on these variables. The econometric functions for the three structural equations are expressed as follows:

$$lnMI_t = \beta_0 + ln\beta_1 GDP_t + ln\beta_2 TI_t + \beta_3 Inf_t + \beta_4 IR_t + ln\beta_5 ER_t + \beta_6 Upt_t + ln\beta_7 EV_t + ln\beta_8 PC_t + e_{1t}$$

$$lnSI_t = \beta_0 + ln\beta_9 GDP_t + ln\beta_{10} TI_t + \beta_{11} Inf_t + \beta_{12} IR_t + ln\beta_{13} ER_t + \beta_{14} Upt_t + ln\beta_{15} EV_t + ln\beta_{16} PC_t + e_{2t}$$

$$lnMSIs_t = \beta_0 + ln\beta_{17} GDP_t + ln\beta_{18} TI_t + \beta_{19} Inf_t + \beta_{20} IR_t + ln\beta_{21} ER_t + \beta_{22} Upt_t + ln\beta_{23} EV_t + ln\beta_{24} PC_t + e_{3t}$$

Symbol notation: ln = natural logarithm, MIt, SIt, and MSIst = value of the endogenous variables at time t, β0 = intercept coefficient, β1,..β24 = regression coefficient, GDPt, TIt, Inft, IRt, ERt, Uptt, EVt, and PCt = value of the exogenous variables at time t, as well as e1t, e2t, and e3t = error on all models at time t.

■ RESULT AND DISCUSSION

Overview of Descriptive Statistics and Pearson Correlation Test

This chapter presents the findings of the linear regression. First, descriptive statistics are not merely a formality but serve as a crucial foundation for building a time-series linear regression model. The purpose of descriptive statistics is to ensure that the data are well

understood, valid, and ready for analysis, as well as to provide an initial overview of the temporal dynamics among variables. Table 2 below shows that the data characteristics vary across variables. Even so, some similarities exist; for example, the micro industry, small industry, and MSI variables share similar characteristics, while GDP, tax incentives, exchange rates, export values, and proportion of credit are measured in nominal terms. Percentage data include inflation, interest rates, and unemployment.

Table 2. Summary of Descriptive Statistics

Variables	Range	Mean	Std. Deviation	Std. Error
MI	1,294,113	3,776,856.91	433,932.4	130,835.54
SI	324,746	307,672.18	89,787.2	27,071.86
MSIs	1,082,218	4,084,529.1	384,826.38	116,029.52
GDP	4,144,977.3	10,207,380.7	1,320,178.3	398,048.74
TI	17,067.5	7,419.87	5,256.08	1,584.77
Inf	6.51	4.37	2.27	.69
IR	4.02	5.49	1.35	.41
ER	3,542	13,937.36	1,075.2	324.19
Upt	1.84	5.88	.57	.17
EV	147,052.7	192,470.22	47,486.2	14,317.63
PC	847.07	1,000.5	269.38	81.22

Ordered from highest to lowest range values, the GDP variable had a range of 4,144,977.3; the micro industry variable had a range of 1,294,113; the MSIs variable had a range of 1,082,218; the small industry variable had a range of 324,746; the export value variable had a range of 147,052.7; the tax incentive variable had a range of 17,067.5; the exchange rate variable had a range of 3,542; the proportion of credit variable had a range of 847.07; the inflation variable had a range of 6.51; the interest rate variable had a range of 4.02; and the unemployment variable had a range of 1.84. Referring to the mean values, ranked from highest to lowest, the GDP variable had a mean of 10,207,380.7; the MSIs variable had a mean of 4,084,529.1; the micro industry variable had a mean of 3,776,856.91; the small industry variable had a mean of 307,672.18; the export value variable had a mean of 192,470.22; the exchange rate variable had a mean of 13,937.36; the tax incentive variable had a mean of 7,419.87; the proportion of credit variable had a mean of 1,000.5; the unemployment variable had a mean of 5.88; the interest rate variable had a mean of 5.49; and the inflation variable had a mean of 4.37. Statistically, the MSIs variable had the third-largest range but the second-largest mean. In contrast, the micro industry variable ranked second in range but third in mean. The only variable with both the largest range and mean values was GDP.

Second, the correlation in linear regression is based on Pearson's correlation coefficient, which measures the strength and direction of the contemporaneous relationship between two variables, particularly between exogenous and endogenous variables. Pearson's correlation provides insight into whether the relationship is positive or negative and its magnitude, thereby aiding in determining whether a variable should

Table 3. Summary of Pearson Correlation

	MI	SI	MSIs	GDP	TI	Inf	IR	ER	Upt	EV	PC
MI	1	-.594	.983**	.91**	.862**	-.716*	-.689*	.825**	-.319	.391	.914**
SI	-.594	1	-.443	-.611*	-.477	.436	.431	-.643*	-.034	-.421	-.599
MSIs	.983**	-.443	1	.887**	.864**	-.709*	-.697*	.788**	-.371	.363	.895**
GDP	.91**	-.611*	.887**	1	.822**	-.604*	-.685*	.922**	-.186	.649*	.998**
TI	.862**	-.477	.864**	.822**	1	-.608*	-.856**	.658*	.047	.264	.825**
Inf	-.716*	.436	-.709*	-.604*	-.608*	1	.377	-.601	.334	-.047	-.596
IR	-.689*	.431	-.697*	-.685*	-.856**	.377	1	-.578	-.188	-.469	-.705*
ER	.825**	-.643*	.788**	.922**	.658*	-.601	-.578	1	-.182	.658*	.931**
Upt	-.319	-.034	-.371	-.186	.047	.334	-.188	-.182	1	-.085	-.182
EV	.391	-.421	.363	.649*	.264	-.047	-.469	.658*	-.085	1	.657*
PC	.914**	-.599	.895**	.998**	.825**	-.596	-.705*	.931**	-.182	.657*	1

*** p < 0.01; * p < 0.05.*

be included in the regression model. In time-series data, Pearson's correlation is also useful for identifying patterns of relationships between variables that occur simultaneously or with a time lag, which can serve as the foundation for constructing a more accurate regression model. Table 3 summarizes the correlation coefficients (*r*). The following thresholds define the strength of the correlation based on the absolute value of *r*: (1) $r = +1$ indicates a perfect positive linear relationship, (2) $r = -1$ indicates a perfect negative linear relationship, and (3) $r = 0$ indicates no linear relationship.

At a significance level of 1% ($p < 0.01$), it was concluded that there were 14 perfect positive linear relationships and 1 perfect negative linear relationship. Among the perfect positive correlations, the strongest was between GDP and the proportion of credit, with a value of 0.998, while the weakest was between MSIs and the exchange rate, with a value of 0.788. Conversely, a perfect negative linear relationship was observed between tax incentives and interest rates, with a correlation of –0.856. At a significance level of 5% ($p < 0.05$), four perfect positive linear relationships and ten perfect negative linear relationships were identified. Notably, among the four perfect positive correlations, the relationships between tax incentives and exchange rates, and between exchange rates and export values, both exhibited the highest correlation of 0.658, which is considered strong. Similarly, among the perfect negative correlations, micro industries and inflation showed a strong correlation of –0.716. In practice, only two ranges of *r* values (positive or negative) are found, with three interpretations of correlation strength: weak, moderate, and strong. Therefore, a literal interpretation of correlation cannot serve as a basis for causation; it merely indicates a relationship between variables.

Multicollinearity Test

Testing for multicollinearity is essential in regression to ensure that the exogenous variables do not exhibit significant statistical overlap. This helps produce stable, reliable, and well-justified estimates for models involving micro, small, and MSIs. Multicollinearity testing involves two key measures: tolerance and the VIF. A tolerance value below 0.1 indicates high multicollinearity, while a value above 0.1 suggests low multicollinearity. Similarly, a VIF value exceeding 10 signifies high multicollinearity, whereas a value below 10 indicates low multicollinearity.

Table 4 reports the results of the multicollinearity test for the regression model, indicating that six variables met the specified tolerance and VIF criteria, thereby avoiding multicollinearity. Specifically, inflation (tolerance = 0.352 > 0.1; VIF = 2.83 < 10), interest rates (tolerance = 0.121 > 0.1; VIF = 8.29 < 10), exchange rates (tolerance = 0.268 > 0.1; VIF = 4.72 < 10), unemployment (tolerance = 0.149 > 0.1; VIF = 6.7 < 10), export value (tolerance = 0.151 > 0.1; VIF = 5.67 < 10), and proportion of credit (tolerance = 0.251 > 0.1; VIF = 8.21 < 10) all satisfy the criteria. Conversely, one variable, tax incentives, failed to meet these assumptions, exhibiting multicollinearity (tolerance = 0.031 < 0.1; VIF = 32.64 > 10).

Table 4. Multicollinearity test results

Variables	Tolerance	VIF
TI	.031	32.64
Inf	.352	2.83
IR	.121	8.29
ER	.268	4.72
Upt	.149	6.7
EV	.151	5.67
PC	.251	8.21

Given the very high correlation between GDP and the proportion of credit ($r = 0.998$), it is clear that these two variables convey nearly identical information in the regression model. From an econometric landscape, retaining both variables simultaneously risks complicating the model and introducing redundancy when assessing their individual effects. To address this issue, the model was re-specified by eliminating the variable with the highest multicollinearity, GDP, due to its near-perfect correlation with the proportion of credit. This decision is also supported by theoretical considerations: the credit share is a more specific variable that directly reflects MSIs' access to financing, whereas GDP is a broad macroeconomic aggregate that is less capable of capturing sectoral dynamics in a nuanced manner.

By retaining the proportion-of-credit variable, the model continues to account for the factor most closely associated with MSI performance while reducing redundancy among variables. Dropping the GDP variable can improve the accuracy of estimates, enhance stability, and facilitate the interpretation of regression results. This approach aligns with contemporary empirical studies that emphasize variable reduction as an effective strategy for addressing multicollinearity, particularly when VIF values exceed recommended thresholds. For instance, Al-Essa et al. (2024) assert that

high multicollinearity can reduce model reliability and distort parameter estimates, thereby necessitating model simplification. Similarly, Ogunbona et al. (2024) highlight that removing redundant variables improves model interpretability and stability compared to retaining variables with very high correlations.

Other econometric literature, such as Aladeitan et al. (2021), indicates that multicollinearity does not introduce bias into coefficient estimates but increases their variance, potentially leading to misleading or unreliable conclusions from significance tests. In situations of near-perfect correlation, model re-specification by eliminating variables, such as GDP, that are conceptually or empirically redundant, is generally recommended over retaining them. This adjustment ensures that the estimated coefficients are not influenced by multicollinearity and can actually enhance the credibility of the empirical analysis.

Linear Regression Test

The examination of the hypothesis design was conducted. The procedure for determining whether a variable affects other variables partially, consistently, and simultaneously uses significance levels of 1% and 5%. In Model 1, GDP (β = 0.383; p = 0.009) and the proportion of credit (β = 0.64; p = 0.035) have a significant positive effect on the micro industry. In Model 2, tax incentives (β = 0.0029; p = 0.046), interest rates (β = 0.187; p = 0.006), export value (β = 0.037; p = 0.021), and proportion of credit (β = 7.103; p = 0.003) partially affect small industries with a significant positive effect. Proportion of credit (β = 0.92; p = 0.027) is a variable that partially affects MSIs with a significant positive effect across all three models.

From the regression results, a one-unit increase in the exogenous variable corresponds to an average one-unit increase in the endogenous variable, assuming other variables remain constant. When the macroeconomic variable is zero, the predicted value of the micro industry remains constant with a significant positive effect (β = 15.273; p = 0.033). Micro industries have a significant influence in Model 1, where their variation is explained by macroeconomic factors to the extent of 96.3%, leaving a residual of 3.7%. In Model 2, when the macroeconomic variable is zero, the predicted value of the small industry remains constant with a significant positive effect (β = 218.349; p = 0.000). Small industries have a moderate influence in this model, with 56.1% of their variation explained by macroeconomic factors and a residual of 43.9%. In Model 3, when the macroeconomic variable is zero, the predicted value of MSIs remains constant with a significant positive effect (β = 27.136; p = 0.027). MSIs have a significant influence on Model 3, with 98.4% of their variation explained by macroeconomic factors and a residual of 1.6%.

From the regression results, a one-unit increase in the exogenous variable corresponds to an average one-unit increase in the endogenous variable, assuming other variables remain constant. When the macroeconomic variable is zero, the predicted value of the micro industry remains constant with a significant positive effect (β = 15.273; p = 0.033). Micro industries have a significant influence in Model 1, where their variation is explained by macroeconomic factors to the extent of 96.3%, leaving a residual of 3.7%. In Model 2, when the macroeconomic variable is zero, the predicted value of the small industry remains constant with a significant positive effect (β = 218.349; p = 0.000). Small industries have a moderate influence in this model, with 56.1% of their variation explained by macroeconomic factors and a residual of 43.9%. In Model 3, when the macroeconomic variable is zero, the predicted value of MSIs remains constant with a significant positive effect (β = 27.136; p = 0.027). MSIs have a significant influence on Model 3, with 98.4% of their variation explained by macroeconomic factors and a residual of 1.6%.

Table 5 also confirms that all macroeconomic variables have a significant positive effect on micro industries simultaneously in Model 1 (F = 6.568; p = 0.039). In Model 2, macroeconomic variables similarly have a significant positive simultaneous effect on small industries (F = 16.319; p = 0.005). Furthermore, in Model 3, macroeconomic variables exhibit a significant positive effect on MSIs simultaneously (F = 15.202; p = 0.003). Model interpretation does not rely solely on predictive capabilities; instead, it emphasizes the mathematical exploration of statistical quantitative relationships among variables. Technically, the analysis focuses on the coefficients' directions, their relative contributions, and the significance levels of each variable in capturing the dynamics of MSIs.

Empirically, the model yields two primary outcomes: a significant positive effect and its opposite. Precisely, GDP and the credit-to-GDP ratio have a significant positive impact on micro industries, whereas other macroeconomic variables exhibit negative and insignificant effects. For small industries, tax incentives, interest rates, export value, and the proportion of credit have significant positive effects,

Table 5. Recapitulation of Regression Results

Variables (item)	Model 1	Model 2	Model 3
Gross domestic product (ln_GDP)	.383**	–13.293	–.462
	(.009)	(.582)	(.781)
Tax incentive (ln_TI)	–.119	.029*	–.093
	(.577)	(.046)	(.44)
Inflation (Inf)	–.001	–.005	–.001
	(.93)	(.968)	(.87)
Interest rate (IR)	–.059	.187**	–.048
	(.462)	(.006)	(.31)
Exchange rate (ln_ER)	–.446	–4.299	–.578
	(.72)	(.652)	(.425)
Unemployment (Upt)	–.034	–.02	–.039
	(.503)	(.956)	(.222)
Export value (ln_EV)	–.404	.037*	–.327
	(.376)	(.021)	(.232)
Proportion of credit (ln_PC)	.64*	7.103**	.92*
	(.035)	(.003)	(.027)
Constant	15.273*	218.349**	27.136*
	(.033)	(.000)	(.027)
R	.981	.749	.992
R^2	.963	.561	.984
Std. error of the estimate	.052	.391	.028
Durbin-Watson	2.493	2.427	2.854
F	6.568*	16.319**	15.202**
	(.039)	(.005)	(.003)
N	99	99	121

** $p < 0.01$; * $p < 0.05$

whereas other macroeconomic variables have negative and insignificant effects. Similarly, the proportion of credit has a significant positive effect on MSIs, with other macroeconomic variables showing negative and insignificant effects. To further discover the influence of macroeconomic dynamics on MSIs, numerous studies have been reviewed. The roles of GDP, tax incentives, inflation, interest rates, exchange rates, unemployment, export value, and proportion of credit in either stimulating or hindering the economy are comprehensively examined. Some previous references align with the current findings, while others contradict them.

In general, the performance of MSIs is closely linked to macroeconomic dimensions, such as GDP, taxes, inflation rates, interest rates, foreign exchange rates relative to the national currency, unemployment rates, export values, and capital loan flows as reflected in credit. GDP has a significant causal effect on the development of MSIs (Surya et al., 2021; Tambunan, 2019). An increase in GDP indicates positive economic growth, which typically enhances people's purchasing power and drives demand for MSI products. What is more, economic growth, as reflected by GDP accumulation, fosters a more favorable business environment, expands access to financing, and creates new market opportunities for GDP participants. Conversely, a decline in GDP weakens purchasing power, restricts access to capital, and reduces demand, which can hinder growth and potentially lead to a decline in MSI activities. Tax incentives can alleviate the operational cost burden for MSIs, thereby enhancing profitability and supporting business continuity (Afandi et al., 2023; Ding, 2024; Putri et al., 2024; Zhao et al., 2025). With a reduced tax burden, MSIs have greater capacity to expand their operations, such as by increasing their workforce or scaling up production. These incentives also promote greater tax compliance and encourage businesses to formalize their operations. Additionally, inflation can raise production costs for MSIs, particularly when prices for raw materials and transportation increase (Chowdhury et al., 2024). According to Friess and Kassemeier (2023), these cost increases are often difficult to fully pass on to consumers due to declining purchasing power. Consequently, MSIs' profit margins may be compressed, hindering business growth.

High interest rates can make it difficult for MSIs to access loans due to increased capital costs (Yang et al., 2023). This can hinder business expansion, raw material procurement, and investment in production

equipment. On the other hand, low interest rates encourage MSIs to borrow more actively and expand their operations. Macroeconomic indicators, such as exchange rates, also influence the viability of MSIs. Exchange rate fluctuations directly impact the production costs of MSIs, especially when they rely on imported raw materials. Mehtiyev et al. (2021) and Ullah and Nobanee (2025) affirm that a weakening exchange rate raises the price of imported goods, thereby increasing operational costs. At the same time, a depreciated exchange rate can benefit MSIs that export products by making their prices more competitive in international markets. High unemployment rates can reduce consumers' purchasing power, weakening demand for MSI products (Hernita et al., 2021; Prasetyo & Cahyani, 2022). However, this situation also results in an abundant labor supply, making it easier for MSIs to recruit workers at relatively low costs. If managed effectively, MSIs have the potential to absorb labor and help reduce unemployment rates.

An increase in export value automatically opens up broader markets for MSIs, thereby driving growth in revenue and production (Anatan & Nur, 2023). Access to international markets also encourages MSIs to enhance the quality and competitiveness of their products. By contrast, a decline in export value may lead to reduced demand and revenue for MSIs that rely on foreign markets. Also, other macroeconomic factors, such as credit availability, play a crucial role in fostering positive growth for MSIs. A high proportion of credit allocated to MSIs reflects banking sector initiatives that can accelerate business growth by increasing working capital and investment (Firdaus et al., 2023; Jin et al., 2022; World Bank Group, 2019). Adequate access to credit enables MSIs to purchase equipment, expand operations, and increase production capacity. Conversely, limited credit availability restricts MSIs' ability to develop their businesses due to constrained financing sources. Insufficient financing can hinder the long-term competitiveness and sustainability of these enterprises.

Factual evidence also suggests that not all macroeconomic variables contribute equally to explaining the dynamics of the MSIs. By analogy, the predominance of the credit-to-GDP ratio over other variables underscores that limited access to finance is a major structural barrier for MSIs. This reality reinforces the argument that, within the small-scale industrial sector, factors such as liquidity are more decisive than aggregate macroeconomic stability. This finding aligns with the article by Cheng and Yang (2022), which states that limited access to credit analytically restricts the expansion of small businesses, particularly in developing countries. Examining other calculation results, the insignificance of the exchange rate, inflation, and interest rate variables suggests that the macroeconomic policy framework does not operate bidirectionally on the development of MSIs. This may be reflected in the characteristics of MSIs, which tend to operate in the informal sector and have weaknesses in their integration with the formal financial system. Complementing this existing phenomenon, Al-Essa et al. (2024) observe that within complex economic structures or multicollinearity, relationships among macroeconomic variables are often imbalanced at the micro level due to surges in business-unit heterogeneity.

The fact that the impact of GDP is not consistently significant across all models demonstrates that aggregate economic growth is not necessarily distributed to the MSIs sector. This paradoxical situation is driven by the phenomenon of ‘growth without inclusion’, whereby economic expansion is not fully accompanied by a commensurate increase in MSIs capacity. Ogunbona et al. (2024) also report that, in many cases, highly correlated macroeconomic variables (multicollinearity) have a greater impact on the reliability of projections than the general direction of causality.

Although the quantitative studies cited originate from various countries, the findings are not intended to be generalized or directly applied to Indonesia. Instead, cross-country references are adopted as a comparative framework to explore structural patterns commonly found in emerging markets. Ibrahimov et al. (2025) calculate that the influence of macroeconomic variables on the performance of micro and small enterprises is highly dependent on the economic and institutional structures of each country.

In numerous empirical comparisons, limited access to formal finance has consistently emerged as a major barrier across emerging markets (Jin et al., 2022; Yang et al., 2023), while inflationary pressures tend to increase production costs, though their impact varies across countries (Chowdhury et al., 2024). Importantly, the principal theoretical implication of this paper’s findings is that conventional macroeconomic channels are insufficient to capture the development of MSIs without accounting for institutional factors, particularly access to finance. The findings highlight the urgency of adopting market-structure- or financial-inclusion-based

approaches when analyzing the behavior of small industries, rather than relying solely on aggregate macroeconomic indicators.

■ CONCLUSION

This paper examines macroeconomic factors influencing MSIs through three distinct models. In Model 1, GDP and the proportion of credit exert a significant positive effect on micro industries. Model 2 reveals that tax incentives, interest rates, export value, and the proportion of credit have a significant positive impact on small industries. In Model 3, among the macroeconomic factors, only the credit proportion has a significant positive effect on MSIs. In fact, the proportion of credit is the most dominant variable across all models during the contemporary period, consistently promoting growth in MSIs and their two derivative scales. In Indonesia, however, tax incentives, inflation, interest rates, exchange rates, unemployment, and export values tend to reduce the growth of micro industries, as their effects are negative and statistically insignificant. Similarly, aside from GDP, inflation, interest rates, exchange rates, and unemployment negatively and insignificantly affect the growth of small industries. Finally, aside from the credit share, seven other macroeconomic variables (GDP, tax incentives, inflation, interest rates, exchange rates, unemployment, and export values) negatively and insignificantly affect MSI growth.

This paper has several limitations, particularly regarding the use of economic variable data. For instance, many macroeconomic variables exhibit negative and statistically insignificant effects in the regression model, except for MSIs, which remain relatively stable despite fluctuations in inflation rates. This sector also demonstrates strong resilience to inflation spillovers, showing only a slight decline in the medium term and remaining relatively unaffected in the long term. Scientific recommendations for future work include careful consideration of the paper's scope, data, and analytical methods. First, the scope of analysis could be expanded to include related themes, such as those concerning MSMEs. Second, to ensure data normality, the dataset could be expanded by adding more samples, selectively selecting relevant macroeconomic variables, and incorporating comparisons across short-, medium-, and long-term data. Third, the analytical approach should not be limited to existing data; it could be enhanced by incorporating micro-level survey data to enable more robust testing. Fourth, the factual evaluation has limitations relating to potential multicollinearity in the initial analysis, which has been addressed through model simplification. Alternative methods, such as principal component regression (PCR), could be considered in future empirical investigations.

The three models investigated generally demonstrate a close correlation with moderate explanatory power; however, many macroeconomic variables exhibit a negative and statistically insignificant influence. The follow-up study is expected to offer valuable insights for stakeholders, particularly in addressing these issues. Seven practical recommendations are prioritized to help the government foster a transformative MSI ecosystem. First, restructure local supply chains by integrating the sector into larger industrial supply chains to enhance resilience against national economic fluctuations. Second, allocate incentive funds based on specific targets. Third, provide low-interest credit programs for small businesses (KUR). Fourth, monitor exchange-rate volatility to prevent excessive burdens on imported raw materials from currency fluctuations. Fifth, simplify licensing procedures and ensure legal certainty for local workers through industrial partnerships, certification, and a fair wage system. Seventh, expand access to export markets by offering digital education and targeted financial literacy training. Not all macroeconomic variables have a significant impact on the MSIs. Only the proportion of credit consistently makes a significant positive contribution across all models, whilst other variables exhibit contradictory and limited effects. These empirical findings confirm that policies aimed at strengthening the capacity of small industries and improving access to finance are more effective than those based solely on macroeconomic stabilization.

DECLARATION OF GENERATIVE AI USAGE

During the preparation of this manuscript, the authors employed DeepL in conjunction with Wordvice AI to assist with language refinement and proofreading. The authors have thoroughly reviewed and edited the content generated by these tools and assume full responsibility for the final published article.

Conflicts of Interest and Data Availability Statement

The authors declare that they have no conflicts of interest related to this work. Data are available from the corresponding author upon reasonable request.

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