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INTERMEDIATION DYNAMICS, EFFICIENCY, COMPARATIVE ADVANTAGE, AND COMPETITIVENESS IN MSME CREDIT DISBURSEMENT IN THE SUMATRA REGION

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Absract

Micro, Small, and Medium Enterprise (MSME) credit plays a crucial role in supporting regional economic growth, but its distribution characteristics vary across regions. This study analyzes the dynamics of intermediation, efficiency, comparative advantage, and competitiveness in MSME credit distribution in Aceh, North Sumatra, and West Sumatra using a quantitative approach with balanced panel secondary data from Bank Indonesia. The analysis employs the Loan-to-Deposit Ratio (LDR) for intermediation, Data Envelopment Analysis-Constant Returns to Scale (DEA-CRS) for efficiency, Location Quotient (LQ) for comparative advantage, and Shift-Share for growth dynamics and competitive position. One-Way ANOVA and Pearson correlation are used as supporting analyses. The highest average LDR was found in West Sumatra (143.08%), followed by Aceh (121.95%) and North Sumatra (86.47%). The DEA-CRS efficiency score was 1.0000 in West Sumatra, 0.5426 in Aceh, and 0.4472 in North Sumatra. West Sumatra holds a comparative advantage (LQ 1.289), whereas Aceh and North Sumatra scored 0.822 and 0.953, respectively. Shift-Share analysis indicates a positive Differential Shift (DS) in Aceh (+IDR 0.95 trillion) and North Sumatra (+IDR 0.16 trillion), alongside a negative DS in West Sumatra (−IDR 1.12 trillion). Pearson correlation shows a very strong positive relationship between deposits and MSME credit ($r = 0.9766$; $p < 0.001$). West Sumatra excels in intermediation, efficiency, and comparative advantage, while Aceh and North Sumatra demonstrate competitive positioning based on positive DS. These findings emphasize the need for region-based MSME credit policies through strengthening intermediation, increasing distribution efficiency, and optimizing funding sources to sustainably expand MSME financing access.

Keywords: *Intermediation Dynamics, Efficiency, Comparative Advantage, MSME Credit*

Introduction

From the perspective of financial intermediation theory, banks serve as a bridge between surplus units (savers) and deficit units (borrowers) in the economy (Oyebowale and Algarhi, 2024). However, the banking intermediation function remains uneven across

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regions. The condition of financial dualism continues to pose a real challenge in developing countries, where modern banks tend to focus on large corporations, while MSMEs rely more heavily on the informal sector (Kalai, 2023). Consequently, internal capital flight occurs at the regional level, where gathered third-party funds (DPK) are not re-circulated into local productive credit, but are instead diverted to national economic hubs or safe instruments such as Government Securities (SBN) (Aviliani et al., 2026). Such lazy banking practices ultimately suppress regional economic potential and widen interregional disparities (Wang et al., 2024).

Spatial inequality in financial liquidity distribution has long been a fundamental issue in regional economic and financial geography studies, particularly in developing archipelagic countries like Indonesia. The Micro, Small, and Medium Enterprise (MSME) sector is widely recognized as the backbone of the national economy, contributing not only over 60% of Gross Domestic Product (GDP), but also absorbing approximately 97% of the workforce and providing 99% of employment in Indonesia (BI, 2018; Tambunan, 2019). Nevertheless, access to formal financing remains a structural constraint limiting the expansion capacity of MSMEs (Beck et al., 2018). Data from the Financial Services Authority (OJK, 2023) indicates that the ratio of MSME credit to total national banking credit still hovers around 21%, well below the government's target of 30% by 2024. These credit market imperfections frequently manifest as information asymmetry and geospatial bias, wherein banking institutions tend to concentrate their credit distribution in growth center regions or corporate sectors perceived to carry lower default risk (Mahesta, 2023).

On the island of Sumatra, the dynamics of the regional financial sector display striking heterogeneity. Three major provinces, Aceh, North Sumatra, and West Sumatra, possess distinct banking architectures and economic structures. Aceh, with the full implementation of an all-Islamic banking system through Aceh Qanun No. 11 of 2018 on Islamic Financial Institutions, faces a transition in its intermediation model. North Sumatra operates as an industrial and large-scale corporate trade epicenter, particularly in the palm oil plantation, processing industry, and international trade sectors via Belawan Port (Buha et al., 2025). Meanwhile, West Sumatra is historically dominated by a community-based economic structure and medium-scale trade, supported by the entrepreneurial culture of the Minangkabau people (OJK, 2023). These structural differences create an urgency to empirically evaluate the extent to which each province possesses an advantage or specialization in allocating its banking credit to the MSME sector relative to the region's overall total.

In the regional economic literature, comparative advantage and sectoral specialization are generally measured using the Location Quotient (LQ) index (Greshinta et al., 2026). However, its application remains largely limited to macro-level indicators such as Gross Regional Domestic Product (GRDP) and employment, and is rarely adapted for regional banking credit portfolios. On the other hand, Shift-Share analysis has proven effective in dissecting structural competitive sources through the decomposition of Regional Share, Industry Mix, and Differential Shift (Arjuniadi et al., 2025)*;* yet, its integration with LQ to evaluate MSME credit allocation remains a largely unexplored methodological gap. This occurs amidst the growing relevance of spatial approaches in regional finance, driven

by increasing attention to financial agglomeration and geographic determinants in credit distribution (Wei et al., 2024).

Although many previous studies have examined the banking sector's contribution to MSME financing (Hartini et al., 2023; Paulus Laratmase et al., 2024; Seleky, 2019). The majority of research remains partial in nature. LDR-based studies generally capture the level of intermediation only in the aggregate (Mahesta, 2023). Whereas LQ and Shift-Share approaches are rarely combined within a single analysis to evaluate MSME credit portfolios (Arjuniadi et al., 2025; Supriyanto supriyanto & Kaparang, 2024). Such methodological limitations prevent a comprehensive understanding of the interplay between intermediation efficiency, spatial specialization, and regional competitiveness in shaping MSME credit dynamics. Therefore, the novelty of this study lies in integrating diverse analytical dimensions, namely LDR, DEA-CRS, LQ, and Shift-Share, to comprehensively examine MSME credit distribution within a unified spatial and temporal framework.

The objective of this study is to assess the characteristics and differences in MSME credit distribution across Aceh, North Sumatra, and West Sumatra over the period 2023Q2–2025Q4. Empirically, this research contributes by providing a comprehensive mapping of regional intermediation capacity and competitiveness. Practically, the findings can serve as a foundation for formulating asymmetric MSME financing policies tailored to the distinct characteristics of each region, thereby supporting sustainable expansion of access to financing.

Methodology

This study adopts a quantitative approach, with the unit of analysis comprising three provinces: Aceh, North Sumatra, and West Sumatra over a quarterly observation period from 2023Q2 to 2025Q4, yielding a total of $N \times T = 3 \times 1 = 33$ observations. The data utilized are secondary data obtained from official publications of Bank Indonesia, specifically provincial economic and banking indicators accessed via its official website www.bi.go.id. The dataset includes indicators for deposits, MSME credit distribution, and loan variables, with all values expressed in millions of Rupiah to maintain consistency across the calculations used to measure intermediation, efficiency, comparative advantage, and the competitive dynamics of MSME credit distribution. This observational structure enables the study to compare the characteristics of MSME credit/financing distribution across provinces throughout the research period.

The measurement of each indicator in this study was conducted using several mathematical calculations as follows:

Loan to Deposit Ratio (LDR)

The Loan to Deposit Ratio (LDR) is used as an indicator to measure the level of banking intermediation in channeling third-party funds collected from the public into loans. LDR is calculated as the ratio between total loans disbursed by banking institutions and total deposits collected in province i at period t. Mathematically, LDR is formulated as:

$$LDR_{it} = \frac{LOAN_{it}}{DEP_{it}} \times 100\%$$

where (LDR_{it}) represents the banking intermediation level in province (i) at period (t), ($LOAN_{it}$) is total loans disbursed by banks, and (DEP_{it}) is total deposits or third-party funds collected by banks. All monetary values are expressed in millions of Rupiah.

The interpretation of LDR is based on the proportion of third-party funds re-channelled as loans. A higher LDR value indicates a relatively greater disbursement of funds compared to the funds collected, whereas a lower LDR value indicates a relatively smaller proportion of funds disbursed as loans. In descriptive analysis, LDR is interpretatively categorized into three conditions: LDR < 80% indicates a relatively low intermediation level, 80% ≤ LDR ≤ 100% indicates a relatively high or more active intermediation level, and LDR > 100% indicates that loan values exceed total deposits collected, thereby suggesting a higher reliance on funding sources beyond third-party funds. These criteria serve as guidelines for descriptive interpretation rather than statistical testing thresholds.

The use of LDR in this study aims to compare banking intermediation levels across provinces and periods, as well as to provide an overview of the banking sector's capacity to channel funds gathered from the public into financing or lending activities.

Comparative Advantage of MSME Credit Distribution (Location Quotient)

This study observes three provinces, namely Aceh ($i = 1$), North Sumatra ($i = 2$), and West Sumatra ($i = 3$). over several time periods ($t = 1,2, \dots, T$). In this observation, K_{it} represents the total MSME (Micro, Small, and Medium Enterprises) Credit in province i at period t, while P_{it} indicates the total loans in province i at period t.

First, the proportion of MSME Credit to total loans in province i is defined as:

$$S_{it} = \frac{K_{it}}{P_{it}}$$

Furthermore, the proportion of MSME Credit in the aggregate reference region of the three provinces is:

$$S_{Rt} = \frac{\sum_{i=1}^{3} K_{it}}{\sum_{i=1}^{3} P_{it}}$$

Thus, the Relative Comparative Advantage Index (Location Quotient) can be formulated as:

$$LQ_{it} = \frac{S_{it}}{S_{Rt}} = \frac{\frac{K_{it}}{P_{it}}}{\frac{\sum_{i=1}^{3} K_{it}}{\sum_{i=1}^{3} P_{it}}}$$

or it can be simplified to

$$LQ_{it} = \frac{K_{it} \sum_{j=1}^{3} P_{jt}}{P_{it} \sum_{j=1}^{3} K_{jt}}$$

The Relative Comparative Advantage Index measures the level of relative advantage of a province in MSME Credit distribution, based on the proportion of MSME Credit to total loans, compared to the same proportion in the aggregate reference region of Aceh, North Sumatra, and West Sumatra. The criteria for the LQ index are:

$$LQ_{it} \begin{cases} > 1 \text{ relative advantage} \\ = 1 \text{ relative position equal to the aggregate} \\ < 1 \text{ no relative advantage} \end{cases}$$

In interpreting the comparative advantage of MSME credit distribution in the Sumatra region, it can be evaluated as follows

$$\frac{K_{it}}{P_{it}} > \frac{\sum_{j=1}^{3} K_{jt}}{\sum_{j=1}^{3} P_{jt}}; \quad \frac{K_{it}}{P_{it}} = \frac{\sum_{j=1}^{3} K_{jt}}{\sum_{j=1}^{3} P_{jt}}; \text{ atau } \frac{K_{it}}{P_{it}} < \frac{\sum_{j=1}^{3} K_{jt}}{\sum_{j=1}^{3} P_{jt}}$$

If $LQ_{it} > 1$ it means the proportion of MSME Credit to total loans in the province i is greater than the proportion of MSME Credit to total loans in the aggregate of the three provinces. In other words, the province has a relative comparative advantage in MSME Credit distribution compared to the aggregate structure of Aceh, North Sumatra, and West Sumatra.

For $LQ_{it} = 1$ the MSME Credit distribution structure of the province i is identical to the aggregate structure of the three provinces, meaning there is no relative advantage or disadvantage.

Meanwhile $LQ_{it} < 1$ the proportion of MSME Credit to total loans in the province i is lower than the aggregate proportion of the three provinces, indicating that the province does not possess a relative comparative advantage in MSME Credit distribution.

***Shift-Share* Analysis**

The objective of the Shift-Share Analysis in the context of MSME (Micro, Small, and Medium Enterprises) Credit in Aceh, North Sumatra, and West Sumatra is to decompose the changes in MSME Credit in each province into distinct sources of growth. This allows for an understanding of the underlying reasons behind the increase or decrease in a province's MSME Credit. Growth is defined as the nominal difference in MSME Credit between the initial period (2023Q2) and the final period (2025Q4).

The Shift-Share Analysis is utilized to decompose the change in MSME Credit of the province i between the initial period t_0 (2023Q2) and the final period t_1 (2025Q4) into three components: Regional Share (RS_i), Proportional Shift (PS_i), and Differential Shift (DS_i):

$$\Delta K_i = K_{i,t_1} - K_{i,t_0} = RS_i + PS_i + DS_i$$

Where K_{it} represents the MSME Credit of the province i, P_t represents the total loans in the regional area, and

$$K_t = \sum_{i=1}^{3} K_{it}$$

represents the total regional MSME Credit, the growth rates are defined as follows:

$$g_P = \frac{P_{t_1} - P_{t_0}}{P_{t_0}},\ g_K = \frac{K_{t_1} - K_{t_0}}{K_{t_0}},\ g_i = \frac{K_{i,t_1} - K_{i,t_0}}{K_{i,t_0}}$$

The Shift-Share components are formulated as:

$$RS_i = K_{i,t_0} g_P,$$
$$PS_i = K_{i,t_0}(g_K - g_P),$$
$$DS_i = K_{i,t_0}(g_i - g_K).$$

Thus, the decomposition can be mathematically verified as:

$$\begin{aligned}\Delta K_i &= K_{i,t_0}[g_P + (g_K - g_P) + (g_i - g_K)] \\ &= K_{i,t_0} g_i\end{aligned}$$

The value of RS_i indicates the contribution of total regional loan growth, PS_i reflects the effect of MSME Credit growth relative to total regional loan growth, while DS_i indicates the province's relative competitive position. A value of $DS_i > 0$ indicates that the MSME Credit growth in the province i is higher than the regional MSME Credit growth, whereas $DS_i < 0$ indicates lower growth.

The Shift-Share Analysis is used to answer the following question: "Is the growth of MSME Credit in a province driven by the general growth of the region, by the regional development of MSME Credit, or by the province's own growth advantage?"

Regarding the interpretation criteria for Shift-Share, it is important to note that these are not statistical tests with p-value thresholds. Instead, the criteria are based on the signs (+/−) and the comparison of growth rates.

Table 1. Shift-Share Criteria

Component	Criteria	Interpretation
RS (Regional Share)	RS > 0	The growth of total regional loans provides a positive impetus to the province's MSME Credit.
	RS < 0	The growth of total regional loans exerts a negative effect.
PS (Proportional Shift)	PS > 0	Regional MSME Credit grows faster than total regional loans.
	PS < 0	Regional MSME Credit grows slower than total regional loans.
DS (Differential Shift)	DS > 0	The province's MSME Credit grows faster than the reference region's MSME Credit = relative competitive

	advantage.
DS < 0	The province's MSME Credit grows slower than the reference region.
DS = 0	The province's growth is equal to the reference region's growth.

Data Envelopment Analysis (DEA)

The use of the Data Envelopment Analysis (DEA) method under the assumption of Constant Returns to Scale (CRS) aims to measure and compare the relative efficiency levels among provinces in utilizing Deposits as inputs to generate MSME Credit as outputs. Through this method, it is possible to identify provinces that have achieved relative efficiency, as well as those that still have room to improve their efficiency in MSME Credit distribution.

The input-oriented CRS DEA model is formulated as follows:

$$\min_{\theta,\lambda} \theta$$

subject to:

$$\sum_{j=1}^{3} \lambda_j X_j \leq \theta X_o$$

$$\sum_{j=1}^{3} \lambda_j Y_j \geq Y_o$$

$$\lambda_j \geq 0$$

The Decision Making Unit (DMU) is defined as a province-quarter period combination, resulting in a total of 33 DMUs (3 provinces × 11 quarters). To present performance at the provincial level, each province's final score was obtained by calculating the average (mean) value across 11 quarterly observations. This average value serves as a representative score reflecting the overall efficiency level of each province during the observation period (2023Q2–2025Q4). In these equations, θ represents the efficiency score being analyzed, X_j represents Deposits as the input, and Y_j represents MSME Credit as the output. The symbol X_o denotes the amount of Deposits of the specific province being evaluated for efficiency, while Y_o denotes the amount of MSME Credit of the province being evaluated. The symbol λ_j represents the weight or combination of other DMUs used by the DEA to form a comparator or benchmark for the province under analysis. The value of θ ranges from 0 to 1. If $\theta = 1$, the province is considered relatively efficient. Conversely, if $\theta < 1$, the province is considered relatively inefficient.

One-Way ANOVA Model for Testing Differences in Regional Liquidity Intermediation Efficiency

This model is used to simultaneously test whether there are significant differences in liquidity intermediation efficiency performance among provinces. A One-Way Analysis of Variance (ANOVA) is applied to the quarterly Loan-to-Deposit Ratio (LDR) data series

of each province.

Single-Factor Model Specification

$$Y_{it} = \mu + \tau_i + \varepsilon_{it}, \quad \varepsilon_{it} \sim iid\, N(0, \sigma^2)$$

Hypotheses

$$H_0: \tau_1 = \tau_2 = \tau_3 = 0 \quad \text{vs} \quad H_1: \exists\, \tau_i \neq 0$$

Sum of Squares Between Groups (SSB)

$$SSB = T \sum_{i=1}^{N} (\overline{Y_{i.}} - \overline{Y_{..}})^2$$

Sum of Squares Within Groups (SSW)

$$SSW = \sum_{i=1}^{N} \sum_{t=1}^{T} (Y_{it} - \overline{Y_{i.}})^2$$

Mean Squares and Degrees of Freedom

$$MSB = \frac{SSB}{N-1}; \quad MSW = \frac{SSW}{N(T-1)}$$

Test Statistic

$$F = \frac{MSB}{MSW} \sim F_{(N-1,\, N(T-1))}$$

In the ANOVA model, Y_{it} represents the LDR of province *i* in period *t* (%), where *i* is the province index (N = 3: Aceh, Nort Sumatera, and West Sumatera), *t* is the quarterly time index (T = 11: 2023Q2-2025Q4), μ denotes the overall regional LDR mean ($\overline{Y_{..}}$), τ_i represents the spatial or structural effect of the *i*-th province, indicating the deviation of the province's LDR from the regional average, and ε_{it} is the random error capturing internal liquidity fluctuations between quarters, assuming $\varepsilon_{it} \sim iid\, N(0, \sigma^2)$, Furthermore SSB and MSB represent the sum of squares and mean square of between-province variations, reflecting spatial disparities. Meanwhile, SSW and MSW represent the sum of squares and mean square of within-province variations, reflecting temporal or internal fluctuations.

Decision Criteria: H_0 is rejected if the *p-value* < 0,05. Empirically, this indicates that intermediation disparities (such as the phenomeon of Over-Loaned vs Idle Liquidity) are structural during the observation period. However, it is important to note that applying a One-Way ANOVA to panel data consisting of repeated quarterly observations for the same province has limitations regarding the assumption of independence of observations due to the presence of a temporal structure. Therefore, the results of this test are not interpreted as definitive evidence that inter-provincial gaps are permanent or structural, but rather as a statistical indicator of disparities in average intermediation performance over the

observation period. The justification for asymmetric macroprudential policies in this study is not solely based on the ANOVA results, but on the synthesis of these average difference findings with the analysis of temporal trends and the economic characteristics of each region.

Pearson Correlation Test: Deposits and MSME Credit

The correlation test is a statistical technique used to measure the strength and direction of the linear relationship between two variables, namely Deposits and MSME Credit.

Pearson Product-Moment Correlation Coefficient

$$r = \frac{\sum_{i=1}^{N}\sum_{t=1}^{T}(X_{it} - \bar{X})(Y_{it} - \bar{Y})}{\sqrt{\sum_{i=1}^{N}\sum_{t=1}^{T}(X_{it} - \bar{X})^2 \sum_{i=1}^{N}\sum_{t=1}^{T}(Y_{it} - \bar{Y})^2}}$$

t-Statistic

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \sim t_{(n-2)}$$

Confidence Interval via Fisher-z Transformation

$$z = \frac{1}{2}\text{In}\left(\frac{1+r}{1-r}\right); \quad SE_z = \frac{1}{\sqrt{n-3}}; \quad r = \tanh(z)$$

In the Pearson correlation test, X_{it} and Y_{it} represent the values of Deposits and MSME Credit in province *i* at period *t* (in million IDR), respectively $\bar{X}$ and $\bar{Y}$ denote the pooled means across all 33 observations, and r is the sample correlation coefficient. The sample size is $n = 33$, yielding $n - 2 = 31$ degrees of freedom for the *t*-test, while the Fisher transformation utilizes $n - 3 = 30$ for its standard error calculation.

Results and Discussion

Statistic Deskriptive

Table 2. Descriptive Statistics Results

Province	Mean Deposits	SD Deposits	Mean Loans	SD Loans	Mean MSME	SD MSME
Aceh	42.138.230	2.425.967	51.306.408	1.757.478	12.632.150	762.000
North Sumatera	322.365.755	10.618.653	279.773.423	26.274.167	79.641.233	2.330.000
West Sumatera	54.614.346	2.422.932	78.109.837	3.093.576	30.170.942	655.000

(*Note: All values are in million IDR*)

North Sumatra recorded the highest average nominal values across all variables: Deposits at IDR 322.37 trillion, Loans at IDR 279.77 trillion, and MSME Credit at IDR

79.64 trillion. It also has the largest standard deviation, particularly for Loans (IDR 26.27 trillion) and MSME Credit (IDR 2.33 trillion), indicating that this province's data is the most varied (volatile) during the observation period. West Sumatra ranks in the middle, with average Deposits of IDR 54.61 trillion, Loans of IDR 78.11 trillion, and MSME Credit of IDR 30.17 trillion, along with the smallest standard deviation for MSME Credit (IDR 655 billion). Aceh exhibits the lowest averages across all variables, namely Deposits at IDR 42.14 trillion, Loans at IDR 51.31 trillion, and MSME Credit at IDR 12.63 trillion.

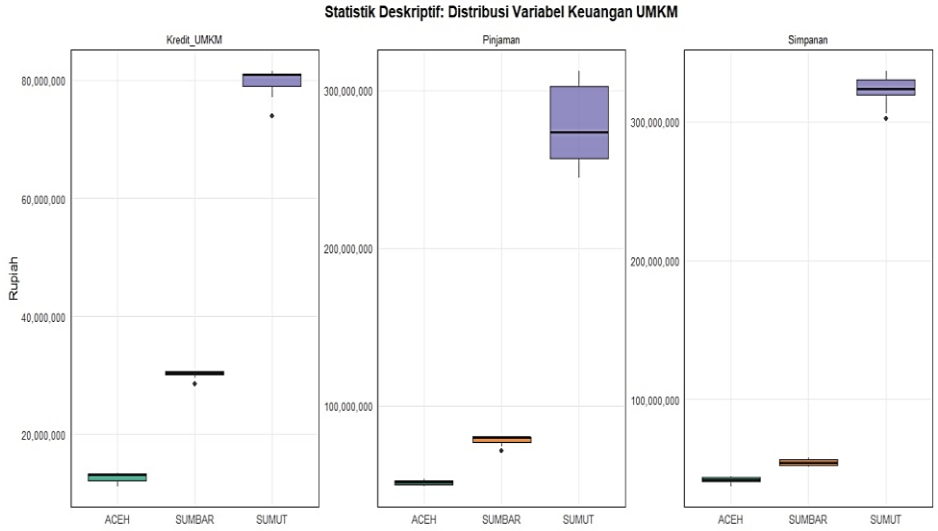

Figure 1. Descriptive Statistic

The boxplot in Figure 1 illustrates a similar pattern: the highest distribution of values is observed in North Sumatra, followed by West Sumatra, and then Aceh.

Efesiensi Intermediasi Likuiditas Regional (Loan to Deposit Ratio)

Regional banking intermediation efficiency is analyzed using the Loan-to-Deposit Ratio (LDR) to evaluate the capacity of regional banks in transforming third-party funds (deposits) into productive financing or credit allocation (loans). The results of the quarterly time-series estimation (2023Q2–2025Q4) are presented in Table 3, while Figure 2 illustrates the trend.

Table 3. LDR Test Results

Period	Aceh	Noth Sumatera	West Sumatera
2023Q2	130,67	80,82	138,33
2023Q3	127,59	81,88	143.15
2023Q4	121,26	80,07	146,23
2024Q1	120,91	81,15	146,72
2024Q2	119,03	82,29	144,88
2024Q3	118,74	84,50	146,86
2024Q4	118,80	92,66	146,54
2025Q1	127,24	90,55	142,64
2025Q2	117,02	92,64	139,73

2025Q3	119,45	92,75	139,64
2025Q4	120,77	93,88	139,16
Rata-rata	**121,95**	**86,47**	**143,08**

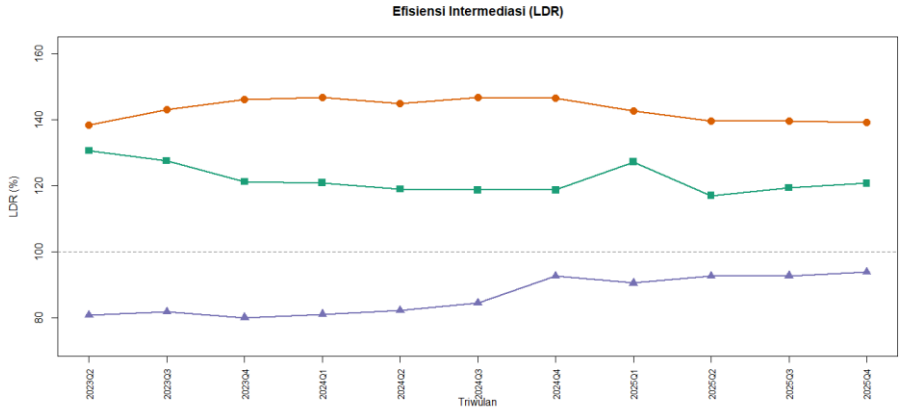

Figure 2. Intermediation Efficiency Chart

West Sumatra and Aceh consistently remained above 100% (*over-loaned*), with average LDRs of 143.08% and 121.95%, respectively. Meanwhile, North Sumatra remained below 100% (*under-loaned*) with an average of 86.47%, although it showed an upward trend from 80.82% in 2023Q2 to 93.88% in 2025Q4.

Comparative Advantage of MSME Credit Distribution (*Location Quotient*)

The level of specialization and concentration of MSME financing is measured using the Location Quotient (LQ) index. An LQ > 1 indicates that the region possesses a comparative advantage relative to the aggregate banking sector in Sumatra. The LQ estimation results are presented in Table 4, with the corresponding trend illustrated in Figure 3.

Table 4. LQ Test Results

Period	Aceh	North Sumatera	West Sumatera
2023Q2	0,730	0,971	1,283
2023Q3	0,749	0,973	1,261
2023Q4	0,764	0,975	1,239
2024Q1	0,775	0,968	1,250
2024Q2	0,803	0,965	1,244
2024Q3	0,827	0,961	1,246
2024Q4	0,887	0,934	1,318
2025Q1	0,864	0,939	1,316
2025Q2	0,874	0,933	1,340
2025Q3	0,888	0,930	1,348
2025Q4	0,883	0,932	1,338
Rata-rata	0,822	0,953	1,289

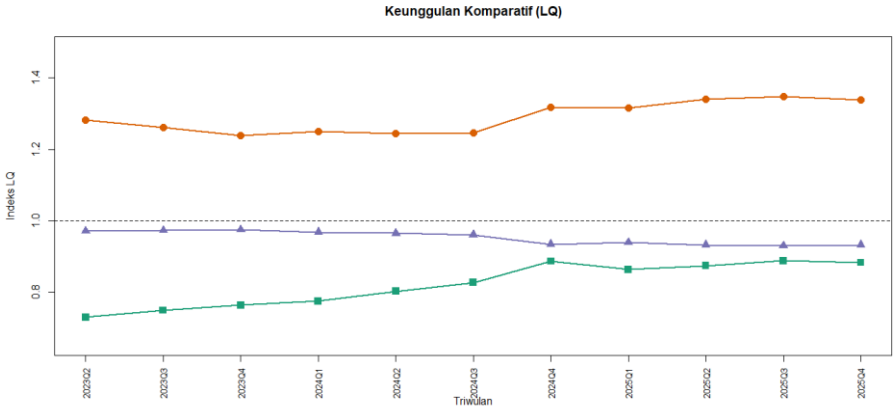

Figure 3. Comparative Advantage Chart

Only West Sumatra exhibits an LQ > 1 (average of 1.289), signifying a comparative advantage. North Sumatra (0.953) and Aceh (0.815) remain below 1. Notably, Aceh's LQ has shown consistent improvement from 0.730 in 2023Q2 to 0.883 in 2025Q4, whereas North Sumatra's LQ experienced a slight decline from 0.971 to 0.932 over the same period.

Growth Dynamics and Competitiveness Decomposition (Shift-Share Analysis)

To evaluate the factors determining the nominal changes in MSME credit distribution from the base period (t_0 = 2023Q2) to the final period (t_1 = 2025Q4), a Shift-Share decomposition analysis was conducted. The total growth of MSME credit ($\Delta MSME$) is decomposed into three constituent components: *Regional Share* (*NS*), *Industry Mix* (*IM*), and *Differential Shift* (*DIF*). The mathematical estimation results are presented in Table 5.

Table 5. Shift-share Analysis Results

Province	MSME t0	MSMEt1	Growth (ΔMSME)	Regional Share (RS)	Proportional Shift (PS)	Differential Shift (DS)
Aceh	11.129.328	13.132.102	+2.002.774	+2.503.893	-1.454.790	+953.672
Sumatera Utara	73.959.534	81.092.934	+7.133.400	+16.639.525	-9.667.755	+161.630
Sumatera Barat	28.530.782	30.104.924	+1.574.142	+6.418.897	-3.729.453	-1.115.302
Total Agregat	13.619.644	24.329.960	+10.710.316	+25.562.315	-14.851.998	0

(*Note: All values are in million IDR.*)

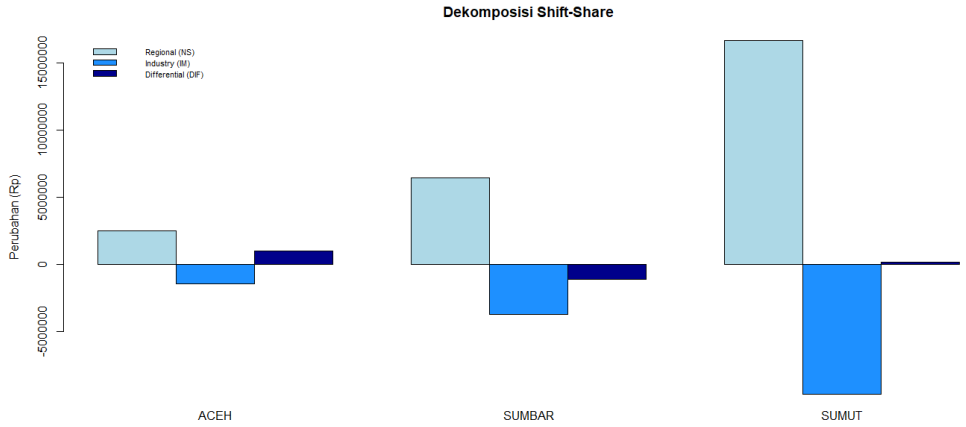

Figure 4. Shift-Share Decomposition Chart

The RS component is positive across all provinces, with the highest value in North Sumatra (IDR 16.64 trillion), followed by West Sumatra (IDR 6.42 trillion) and Aceh (IDR 2.50 trillion). Conversely, the PS component is negative across all provinces: North Sumatra (-IDR 9.67 trillion), West Sumatra (-IDR 3.73 trillion), and Aceh (-IDR 1.45 trillion). Regarding the DS component, Aceh (+IDR 953.67 billion) and North Sumatra (+IDR 161.63 billion) are positive, while West Sumatra is negative (-IDR 1.12 trillion). The total aggregate DS equals zero, thereby fulfilling the Shift-Share decomposition identity.

Data Envelopment Analysis (DEA)

The reported DEA-CRS efficiency scores represent the average aggregated results of 11 quarterly observations for each province. Based on these calculations, West Sumatra achieved 1.0000 (100%), indicating that this province consistently remained on the efficiency frontier during the observation period, while Aceh recorded 0.5426 (54.26%), and North Sumatra 0.4472 (44.72%). This identifies that Aceh and North Sumatra still possess considerable slack or room for improvement in efficiently converting Deposits (inputs) into MSME credit (outputs) compared to the best-practice frontier achieved by West Sumatra.

Test for Differences in Regional Liquidity Intermediation Efficiency (One-Way ANOVA)

To simultaneously test the significance of differences in regional banking intermediation efficiency performance, a One-Way Analysis of Variance (ANOVA) was conducted on the Loan-to-Deposit Ratio (LDR) across the three observed provinces (Aceh, North Sumatra, and West Sumatra) for the period from 2023Q2 to 2025Q4. The summary of these statistical parameters is presented in the following table:

Table 6. ANOVA Test Results

Source of Variation	Degrees of Freedom (DF)	Sum of Squares (Sum Sq)	Mean Squares (Mean Sq)	F-value	p-value (Pr(> F))
Province (Between Groups)	2	17.879	8.939	417,4	$< 2 \times 10^{-16}$***
Residuals (Within Groups)	30	643	21		

The results yielded F (2,30) = 417,4 with p < 0,001, leading to the rejection of H_0. These results indicate that there are statistically significant differences in average LDR across provinces during the observation period. Despite the limitations regarding the independence assumption due to the panel data structure (repeated quarterly observations), these findings descriptively confirm that the intermediation patterns across the three provinces are not uniform and consistently exhibit distinctly different levels of aggregation. In other words, the disparity in intermediation performance across provinces is not merely a random fluctuation, but reflects persistent differences in characteristics throughout the 2023Q2–2025Q4 period.

Pearson Correlation Test: Deposits and MSME Credit

The Pearson Correlation Test between Deposits and MSME Credit yielded a Correlation Coefficient (r): 0,9766, a t-statistic of 25,301, a p-value of: < 0,001, and a 95% confidence interval (via Fisher-z transformation) of: 0,9528 – 0,9885. The r-value, which is close to 1, indicates a very strong positive relationship between Deposits and MSME Credit across the pooled dataset of 33 observations.

Rekapitulation of Analysis Results

The relative position of each province across the five dimensions of analysis is summarized in Table 7.

Table 7. Rekapitulation of MSME Credit Distribution Analysis Results

Dimension	Aceh	North Sumatera	West Sumatera	Highest Position
Intermediation (LDR)	121,95%	86,47%	143,08%	West Sumatra is the highest
Efficiency (DEA-CRS)	0,5426	0,4472	1,0000	West Sumatra is the highest
Comparative Advantage (LQ)	0,822	0,953	1,289	West Sumatra has a comparative advantage
Differential Shift (DS)	+0,95 T	+0,16 T	−1,12 T	Aceh is the highest

Total Change	2,00 T	7,13 T	1,57 T	North Sumatra is the largest

(*Note: T = trillion IDR*

Intermediation Dynamics and Scale of Credit Distribution

The structural breakdown in Table 3 confirms that the banking intermediation pattern in Sumatra is not uniform. West Sumatra and Aceh, which consistently remain in the *over-loaned* (LDR > 100%) category, demonstrate aggressive intermediation that exceeds the local deposit base. This phenomenon aligns with Mahesta's findings that regions with limited deposits but high credit demand tend to be *over-loaned* (Mahesta, 2023). West Sumatra appears highly dependent on external liquidity supply to sustain its expansion, whereas Aceh has been able to channel its local liquidity surplus into productive sectors, among other avenues, through the Islamic financial transformation following the enactment of Aceh Qanun Number 11 of 2018.

North Sumatra is in the opposite condition, namely the paradox of abundance (*idle liquidity*). Despite accumulating the largest deposits (Table 2), this province is classified as *under-loaned* with an average LDR of 86.47%. This condition indicates weak credit absorption by the local market and opens the risk of *capital flight* to the national economic center or safe instruments such as Government Securities (Aviliani et al., 2026; Wang et al., 2024). North Sumatra's economy is dominated by large corporations in the oil palm plantation and processing industries (Buha et al., 2025; Siahaan, 2016), causing MSME credit to lag proportionally and the LDR to remain low, even though the nominal value of its MSME credit is the largest.

These findings suggest that LDR is more appropriately viewed as a proxy for aggregate intermediation intensity, whereas MSME credit reflects sectoral scale. Both are complementary; LDR illustrates how aggressively banks distribute funds, while MSME credit indicates the magnitude of financing flowing to community-based productive sectors.

Spatial Specialization vs Growth Competitiveness

Tables 4 and 5 highlight the fundamental difference between comparative advantage (LQ) and growth competitiveness (DS), a distinction rarely discussed in previous literature. West Sumatra has the highest LQ (1.289), indicating that banking in this region has long been specialized in MSME financing, supported by the Minangkabau entrepreneurial culture and community-based trade sectors (Ermayanti et al., 2023). The proportion of MSME credit to total banking credit in West Sumatra also consistently remains higher than the regional average.

Nevertheless, this specialization does not guarantee faster growth, as evidenced by West Sumatra's negative DS (-IDR 1.12 trillion). In other words, despite its strong MSME base, MSME credit in West Sumatra grows slower compared to the reference regions. Structural comparative advantage does not automatically generate dynamic growth momentum.

Conversely, Aceh and North Sumatra have positive DS. Although the MSME specialization in both remains below the regional average (LQ < 1), MSME credit in both

regions grows more competitively and is more responsive to market dynamics. Aceh, in particular, shows the most dynamic LQ convergence (from 0.730 to 0.883), reflecting the effectiveness of regional banking policies post-Islamic financial reform. These findings enrich the Shift-Share literature (Arjuniadi et al., 2025) on banking credit portfolios; a positive DS can emerge in regions not yet comparatively specialized, provided there is policy momentum or structural transformation driving MSME credit expansion.

Efficiency of Fund Utilization and Its Implications

The DEA-CRS results show that West Sumatra is not only specialized in MSME credit (LQ > 1) but also the most efficient in transforming Deposits as inputs into MSME Credit as outputs (score of 1.0000). This signifies that the banking structure in West Sumatra has reached the *best practice frontier* in the output-input ratio for the MSME portfolio.

Aceh (0.5426) and North Sumatra (0.4472), on the other hand, still leave a considerable slack. In North Sumatra, this inefficiency is not solely due to poor banking performance, but rather because its economic structure is indeed not oriented towards MSMEs, resulting in large deposits not being significantly converted into MSME credit. In Aceh, the inefficiency more reflects the transition period of Islamic financial transformation, which is still in the process of optimization.

The ANOVA with $F(2,30) = 417{,}4$ and $p < 0{,}001$ confirms that there are statistically significant differences in average intermediation levels across provinces during the observation period. Although this test does not directly prove that the gap is permanent or purely structural given the limitations of the independence assumption in quarterly time-series data these empirical results demonstrate that intermediation disparities (such as the over-loaned phenomenon in West Sumatra and Aceh versus idle liquidity in North Sumatra) are not merely temporary random fluctuations. This pattern of differences, when synthesized with temporal LDR trends and regional economic characteristics, provides a strong foundation for the necessity of formulating asymmetric macroprudential and intermediation policies tailored to the specific capacities and conditions of each region.

The Role of Local Fund Mobilization and Policy Implications

The Pearson correlation ($r = 0{,}9766$; $p < 0{,}001$) indicates that the ability to mobilize local funds (Deposits) is very closely related to MSME Credit expansion. This finding aligns with the financial intermediation theory (Oyebowale & Algarhi, 2024) which views banks as intermediaries between surplus and deficit units. Nevertheless, this relationship is associative, not causal. An increase in Deposits does not automatically increase MSME Credit, as bank risk preferences, macroprudential regulations, and local economic structures also play a role.

Overall, these multidimensional findings imply that MSME credit development policies cannot be standardized. At least three asymmetric policy agendas need to be formulated:

1. North Sumatera: Corporate funds and idle liquidity need to be directed towards the MSME sector to curb *capital flight*, while simultaneously raising the LQ, which is still below 1, through MSME financing incentives.

2. Aceh: The positive momentum of Islamic financial transformation needs to be maintained to elevate the LQ, which is still below 1, accompanied by improvements in DEA-CRS efficiency through the optimization of the distribution process.
3. West Sumatera: Focus needs to be directed towards product innovation and distribution efficiency so that comparative advantage (LQ > 1) translates into growth competitiveness (positive DS), as currently, specialization has not been followed by competitive growth momentum.

This region-based characteristic approach aligns with the financial agglomeration literature (Wei et al., 2024) which emphasizes the role of geographical and structural factors in credit distribution, and supports the expansion of sustainable MSME financing access.

Conclusion

This study demonstrates that the dynamics of MSME credit distribution in Aceh, North Sumatra, and West Sumatra are heterogeneous and multidimensional, as reflected in the differences in intermediation levels, efficiency, comparative advantage, and competitive position across provinces. West Sumatra exhibits relatively strong performance in terms of intermediation, efficiency, and comparative advantage, as indicated by an average LDR of 143.08%, a DEA-CRS efficiency score of 1.0000, and an LQ of 1.289. Conversely, Aceh and North Sumatra record positive Differential Shift (DS) values, indicating a relative competitive position in the dynamics of MSME credit distribution, although the magnitude of total credit changes is not determined solely by the competitive component.

Substantively, this study shows that the dynamics of MSME credit cannot be explained merely by the magnitude of credit growth, but must instead be understood simultaneously through each region's intermediation capacity, resource utilization efficiency, relative specialization, and competitive position. The integration of LDR, DEA-CRS, LQ, Shift-Share analysis, and Pearson correlation provides a multidimensional perspective for identifying the characteristics of MSME credit distribution across regions. The implication is that the development of MSME financing should be directed toward region-specific strategies, particularly through strengthening fund mobilization capacity, improving intermediation efficiency, and developing sectors that possess a relative advantage. Such an approach can support a more effective and sustainable expansion of MSME financing access.

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