

Credit Composition and Subnational Economic Growth: Long-Run and Short-Run Evidence from East Nusa Tenggara

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ABSTRACT

Research Originality. This study advances the finance–growth nexus literature by providing subnational time-series evidence on credit composition rather than aggregate credit, focusing on a structurally developing province in Eastern Indonesia.

Research Objectives. This study examines whether different types of bank credit contribute differently to regional economic growth in East Nusa Tenggara.

Research Methods. This study applies the Autoregressive Distributed Lag (ARDL) approach. The ARDL Bounds Test is employed to verify cointegration, followed by Error Correction Model (ECM) estimation and diagnostic stability tests.

Empirical Results. The findings confirm a significant long-run relationship between credit composition and regional economic growth. Consumer credit exhibits a positive long-run effect on real GRDP, while investment credit shows a moderate impact. Working capital credit does not demonstrate a significant long-run contribution.

Implications. The results suggest that not only the volume but also the credit allocation structure plays a crucial role in shaping regional economic performance. Policy strategies in developing regions should therefore emphasize productive and demand-supporting credit allocation to promote sustainable growth.

Keywords:

financial intermediation; finance growth nexus; subnational growth dynamics; credit allocation structure; developing regional economy

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INTRODUCTION

Economic growth is widely recognized as a multidimensional process shaped by the interaction of human capital accumulation, infrastructure development, institutional quality, fiscal policy, technological progress, and financial sector development. Within this broader framework, financial intermediation—particularly the allocation of bank credit—plays a pivotal role in mobilizing savings and channeling them toward productive investment activities (Azolibe, 2020). However, credit constitutes only one dimension of regional growth dynamics, and its effectiveness largely depends on how financial resources are distributed across economic sectors. The finance–growth nexus has been extensively investigated at both cross-country and national levels. Recent studies indicate that financial deepening promotes economic growth by enhancing access to finance and stimulating investment expansion (Lotto, 2023; Mamun & Ariffin, 2018). Nonetheless, emerging evidence suggests that this relationship is neither linear nor uniform. Its impact varies according to institutional quality, economic structure, and crucially the composition of credit (Uddin et al., 2023).

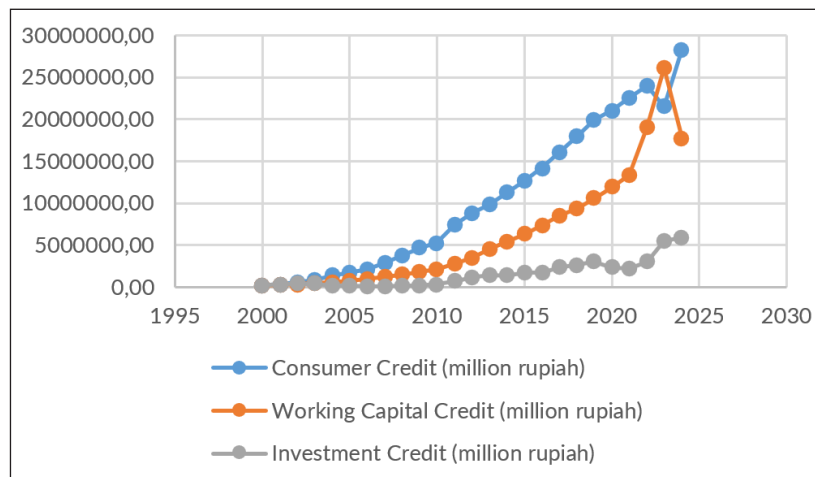
Most empirical studies rely on aggregate credit indicators, implicitly assuming homogeneous effects on economic growth. Such an approach may oversimplify transmission mechanisms by neglecting the heterogeneity among consumer credit, working capital credit, and investment credit. Theoretically, consumer credit primarily stimulates short-term aggregate demand, whereas working capital and investment credit enhance productive capacity and long-run capital accumulation (Sipahutar, 2024). Empirical findings, however, remain mixed. Several studies emphasize the dominant role of productive and investment credit in promoting regional and national growth (Firmansyah, 2024; Lestari et al., 2021) while others indicate that household and consumer credit expansion can also contribute significantly to economic performance in developing economies (Asllani et al., 2020). These inconsistencies highlight the importance of further investigation, particularly at the subnational level, where variations in credit structure and sectoral composition may yield different growth dynamics.

Most Indonesian studies on credit and growth rely on national or provincial panel data with aggregate credit indicators, providing broad insights but overlooking regional heterogeneity and credit-type effects. Evidence from less developed provinces such as East Nusa Tenggara (NTT) remains limited, even though financial access and banking penetration are known to influence regional growth strongly. This gap underscores the need for province-specific analyses of credit composition (Amaluddin et al., 2024; Anton et al., 2023).

East Nusa Tenggara (NTT) presents a relevant case. Between 2000 and 2024, real GRDP (at constant 2010 prices) rose from approximately IDR 27.5 trillion to IDR 78.0 trillion, indicating sustained long-term growth despite periodic volatility, including a contraction during the COVID-19 pandemic in 2020. Over the same period, bank lending expanded more rapidly than output, with consumer credit emerging as the dominant component, while investment credit remained comparatively limited.

East Nusa Tenggara (NTT) presents a relevant case for examining the relationship between credit composition and regional growth. Between 2000 and 2024, real GRDP at constant 2010 prices increased from approximately IDR 27.5 trillion to IDR 78.0 trillion, reflecting steady long-term expansion despite temporary contraction during the COVID-19 pandemic in 2020. During the same period, total bank lending grew more rapidly than output, led by a substantial rise in consumer credit, which expanded from IDR 223 billion in 2000 to IDR 28.3 trillion in 2024. Working capital credit also increased sharply from IDR 207 billion to IDR 17.8 trillion, while investment credit remained comparatively modest, rising from IDR 218 billion to IDR 5.9 trillion. These trends highlight the dominance of consumption-based financing in NTT's credit structure and suggest potential constraints on long-term productive investment.

Figure 1. Bank Credit Composition in East Nusa Tenggara, 2000–2024



Source: Statistics Indonesia (BPS) and Financial Services Authority (OJK)

This study does not posit credit as the sole determinant of economic growth, recognizing that multiple structural and institutional factors shape regional performance. Nonetheless, it focuses specifically on the financial intermediation channel to assess whether different types of credit contribute differently to regional growth dynamics. The research gap lies in the limited time-series evidence at the provincial level on the differentiated effects of consumer credit, working capital, and investment credit on regional economic growth in Indonesia. Previous studies primarily employed national aggregates or panel regressions using total credit indicators, which may obscure heterogeneity across regions (Suhendra & Ronaldo, 2017).

To address this gap, the present study utilizes annual data for 2004–2024. It applies the Autoregressive Distributed Lag (ARDL) framework to capture both short-run dynamics and long-run equilibrium relationships within a single regional economy. This approach follows recent applications in Indonesia that demonstrated the ARDL model's robustness in exploring cointegration between financial intermediation and economic growth (Sumarni, 2019), as well as its effectiveness in analyzing the role of credit and

financial stability during structural shocks such as the COVID-19 pandemic (Sinay & Kembauw, 2023).

Accordingly, this study analyzes the impact of bank credit composition on regional economic growth in East Nusa Tenggara using a time-series approach. Its primary contribution lies in providing subnational empirical evidence that the structure of credit allocation, rather than credit volume alone, plays a crucial role in regional economic development.

METHODS

This study employs annual secondary time-series data covering the period 2004–2024, yielding 21 observations. The selected period reflects the availability and consistency of provincial-level data on bank credit by use type, ensuring comparability across years. The data are obtained from the official publications of the Central Bureau of Statistics (BPS) of East Nusa Tenggara, the Indonesian Banking Statistics issued by Bank Indonesia, and the Financial Services Authority (OJK). Quarterly provincial data on credit composition are not consistently available for the entire period; therefore, annual data are used to ensure reliability and consistency in the estimation. All variables are transformed into natural logarithms to minimize scale differences, reduce potential heteroskedasticity, and facilitate elasticity-based interpretation.

This study uses Gross Regional Domestic Product (GRDP) data for East Nusa Tenggara (NTT) at constant 2010 prices for the period 2000–2024. However, due to periodic base-year revisions (rebasing) conducted by Statistics Indonesia (BPS), the earlier series is not directly comparable with the 2010-base series, despite both being expressed in constant prices. This inconsistency results from changes in relative price structures and sectoral weights applied in the compilation process. To ensure time-series consistency for econometric analysis, a splicing (linking) method is applied using 2010 as the anchor year, as it is common to both datasets: (i) the pre-2010 constant-price GRDP series (2000–2013) and (ii) the 2010-base GRDP series published by BPS from 2010 onward. All observations prior to 2010 are adjusted to the 2010 base scale, producing a single, homogeneous real GRDP series covering the entire study period.

The splicing procedure serves as a scale adjustment that aligns the level of the earlier series with the 2010-base series without altering the underlying growth trajectory. Consequently, base-year revisions do not introduce artificial level shifts or distort long-term trend interpretation. This technique is widely recognized in macroeconomic time-series research as a standard approach for reconciling base-year or methodological revisions (Mustofa & Faizin, 2025).

This study employs the Autoregressive Distributed Lag (ARDL) approach developed by Nkoro & Uko (2016) and Pesaran et al. (2001). The ARDL model is selected based on several methodological advantages. First, it accommodates regressors with mixed integration orders, $I(0)$ and $I(1)$, without requiring uniform stationarity. Second, it performs reliably in small-sample settings. Third, it enables the simultaneous estimation

of both short-run adjustments and long-run equilibrium within a single reduced-form specification. Finally, compared to Johansen's Vector Error Correction Model (VECM), the ARDL framework minimizes the risk of over-parameterization in limited samples.

Given the relatively small sample size (21 annual observations) and the mixed integration orders identified through unit root testing, the ARDL approach is considered more appropriate than VECM for this study. Its suitability for small-sample, mixed-order cointegration analysis has been demonstrated in recent applications in Indonesia (Sudrajat et al., 2023), as well as in broader econometric modeling literature (Kripfganz & Schneider, 2023). The general error-correction representation of the ARDL model can be expressed as:

$$\Delta \ln PDRB^t = \beta_0 + \sum \beta_i \Delta X_{t-i} + \lambda ECT_{t-1} + \varepsilon_t$$

Where ECT denotes the error correction term, which captures the speed of adjustment toward the long-run equilibrium, and λ represents the adjustment coefficient.

The estimation procedure follows several sequential steps. First, unit root tests are conducted to assess the stationarity properties of the variables. The Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests are employed to ensure that none of the variables is integrated of order two, $I(2)$, as the ARDL framework becomes invalid in the presence of $I(2)$ variables.

Second, the optimal lag length is determined using the Akaike Information Criterion (AIC) to balance model parsimony with the ability to capture underlying dynamic adjustments. Based on this criterion, the selected specification is ARDL(4,4,4,3). Third, the ARDL model is estimated in levels to incorporate both the autoregressive structure of the dependent variable and the distributed lag effects of the regressors. Fourth, the ARDL Bounds Test for cointegration is applied. A long-run relationship is confirmed when the calculated F-statistic exceeds the upper critical bound value.

Fifth, once cointegration is established, both the long-run coefficients and the short-run dynamics are estimated by reparameterizing the model as an Error Correction Model (ECM), in which the coefficient on the lagged error-correction term (ECT_{t-1}) represents the speed of adjustment toward long-run equilibrium. Finally, diagnostic and stability tests are conducted to evaluate model robustness. These include the Breusch–Godfrey LM test for serial correlation, the IM-test decomposition for heteroskedasticity, the Jarque–Bera test for normality, and the CUSUM and CUSUMSQ tests for structural stability.

All estimations are performed using Stata, following the ARDL implementation procedures developed by (Kripfganz & Schneider, 2023), which provides integrated bounds testing and ECM estimation within a unified framework.

RESULTS AND DISCUSSION

This study investigates the impact of bank credit composition on regional economic growth in East Nusa Tenggara (NTT) using an ARDL(4,4,4,3) model selected by the Akaike Information Criterion (AIC) with annual data for 2004–2024. The ARDL Bounds

Test confirms a long-run relationship between real GRDP and credit composition: the computed F-statistic (49.056) exceeds the 1% upper critical bound. At the same time, the t-statistic also lies beyond the lower bound, indicating strong evidence of cointegration.

In the long run, consumer credit (lnCC) has a positive effect on regional output. Conversely, working capital credit (lnWCC) shows no significant long-run effect, suggesting that its expansion does not consistently translate into sustained output growth. Investment credit (lnIC) exhibits a positive but weaker long-run influence, implying that its growth impact depends on project efficiency, sectoral allocation, and structural capacity. These findings align with prior studies showing that different types of bank credit affect growth through distinct transmission channels (Anama & Lubis, 2025; Razak et al., 2020)

The Error Correction Term (ECT) is negative, confirming a rapid adjustment toward the long-run equilibrium. Short-run dynamics differ across credit types: lagged changes in consumer and working capital credit significantly influence output, while investment credit shows more volatile short-term responses. Diagnostic and stability tests detect no serial correlation, heteroskedasticity, or non-normal residuals, and both CUSUM and CUSUMSQ tests confirm parameter stability. Overall, these results reinforce the notion that credit composition, not merely credit volume, matters for regional growth, consistent with empirical evidence emphasizing the heterogeneous growth effects of banking intermediation (Naula et al., 2025).

Table 1. Results of Unit Root Tests (ADF and Phillips-Perron)

Variable	ADF		PPerron	
	statistic z(t)	p-value	statistic z(t)	p-value
GRDP	-2.156	0.2226	-2.156	0.2226
Δ GRDP	-2.973	0.0374	-2.973	0.0374
lnCC	-7.225	0.0000	-7.225	0.0000
Δ lnCC	-2.979	0.0369	-2.979	0.0369
lnWCC	-2.342	0.1586	-2.342	0.1586
Δ lnWCC	-4.495	0.0002	-4.495	0.0002
lnIC	-0.134	0.9460	-0.134	0.9460
Δ lnIC	-3.48	0.0085	-3.48	0.0085

Source: Author's calculations using Stata.

Stationarity testing was conducted using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests to ensure that none of the variables were integrated of order two (I(2)), as required under the ARDL framework. The results are presented in Table 1. The findings reveal a mixed order of integration among the variables. Real GRDP (lnGRDP) is non-stationary at levels but becomes stationary after first differencing, indicating integration of order one, I(1). Similarly, working capital credit (lnWCC) and investment credit (lnIC) are non-stationary in level form but stationary after first differencing, and are therefore classified as I(1). In contrast, consumer credit (lnCC) is

stationary at levels, suggesting integration of order zero, $I(0)$. The consistency between ADF and PP test results reinforces the robustness of these classifications.

Importantly, none of the variables are integrated of order two. The coexistence of both $I(0)$ and $I(1)$ variables satisfies the preconditions for applying the ARDL methodology and confirms that alternative techniques requiring uniform integration order, such as Johansen's Vector Error Correction Model (VECM), would be less appropriate in this context. Optimally selecting the lag length is a critical step in ARDL estimation, ensuring the model adequately captures temporal dynamics while avoiding over-parameterization. Several information criteria were employed, including the Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan–Quinn Information Criterion (HQIC), and Schwarz Bayesian Information Criterion (SBIC). The results are presented in Table 2.

All criteria consistently identify a lag order of four as optimal. In particular, the AIC attains its minimum value at lag four, supported by the lowest FPE and a statistically significant Likelihood Ratio (LR) test. The consistency across multiple criteria indicates that this lag configuration provides the most appropriate balance between model fit and parameter efficiency. Accordingly, the ARDL (4,4,4,3) specification is selected for subsequent estimation. This specification captures both short-run adjustments and long-run relationships while maintaining model parsimony and empirical robustness.

Table 2. Lag Length Selection Criteria

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	11.3998				5.80E-06	-0.70474	-0.66156	-0.50578
1	117.339	211.88	16	0.0000	1.10E-09	-9.2704	-9.05451	-8.27562
2	137.817	40.956	16	0.0010	9.20E-10	-9.69688	-9.30828	-7.90627
3	179.298	82.961	16	0.0000	1.50E-10	-12.1236	-11.5623	-9.53718
4	290.254	221.91*	16	0.0000	9.5e-14*	-21.1671*	-20.433*	-17.7848*

Source: Author's calculations using Stata.

The estimated ARDL (4,4,4,3) model is strongly statistically significant, as confirmed by the joint F-test. The relatively high explanatory power and low Root Mean Square Error (RMSE) indicate that the dynamic specification adequately captures variations in regional output. However, given the time-series nature of the data and the limited sample size, interpretation focuses on the signs, magnitudes, and temporal distribution of the coefficients rather than relying solely on goodness-of-fit metrics. The lagged values of real GRDP reveal pronounced intertemporal dynamics, particularly at intermediate lags, suggesting persistence and gradual adjustment in regional economic growth. This finding confirms that current output is significantly influenced by its past realizations, reflecting structural inertia and path dependence in regional production patterns.

Consumer credit (lnCC) exerts positive effects contemporaneously and at early lags, indicating that household-oriented lending stimulates economic activity through

short-term demand-side channels, such as consumption expansion. The negative coefficient observed at longer lags suggests an adjustment mechanism, implying that initial demand-driven gains may dissipate as temporary consumption effects fade. In contrast, working capital credit (lnWCC) displays a delayed transmission mechanism. The contemporaneous and early lag coefficients tend to be negative, while later lags become positive and statistically significant. This pattern suggests that business-related financing requires time for operational adjustments such as inventory accumulation, production planning, and cash flow stabilization before translating into measurable output gains.

Table 3. ARDL(4,4,4,3) Estimation Results (Dependent Variable: lnGRDP)

Sample:	2004 -2024		Number of obs		21	
			F(18, 2)		8345.45	
			Prob > F		0.0001	
			R-squared		1	
			Adj R-squared		0.9999	
Log likelihood	115.4472		Root MSE		0.0032	
Variable	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
lnGRDP						
L1.	-0.30838	0.137859	-2.24	0.155	-0.9015369	0.284785
L2.	-0.80149	0.178632	-4.49	0.046	-1.570078	-0.03289
L3.	-3.43314	0.382581	-8.97	0.012	-5.079248	-1.78703
L4.	4.452554	0.442739	10.06	0.01	2.547602	6.357505
lnCC						
-.	0.284772	0.039771	7.16	0.019	0.11365	0.455894
L1.	0.457816	0.049502	9.25	0.011	0.2448259	0.670806
L2.	0.275753	0.045798	6.02	0.026	0.0786988	0.472807
L3.	-0.10971	0.037987	-2.89	0.102	-0.2731567	0.05373
L4.	-0.48564	0.055892	-8.69	0.013	-0.7261241	-0.24516
lnWCC						
-.	-0.27105	0.043099	-6.29	0.024	-0.4564874	-0.0856
L1.	-0.33102	0.058302	-5.68	0.03	-0.5818736	-0.08016
L2.	0.700601	0.094266	7.43	0.018	0.2950054	1.106196
L3.	0.153784	0.027254	5.64	0.03	0.0365211	0.271046
L4.	-0.2642	0.043794	-6.03	0.026	-0.4526274	-0.07577
lnIC						
-.	0.052387	0.013524	3.87	0.061	-0.005803	0.110577
L1.	-0.07782	0.012747	-6.1	0.026	-0.1326616	-0.02297
L2.	-0.01645	0.008354	-1.97	0.188	-0.052397	0.019489
L3.	0.085999	0.009512	9.04	0.012	0.0450747	0.126924
_cons	12.30093	2.481031	4.96	0.038	1.625917	22.97595

Source: Author's calculations using Stata.

Investment credit (lnIC) exhibits a predominantly lagged impact on regional output. Although its contemporaneous effect is marginal, stronger and statistically significant coefficients emerge at longer lags. This pattern is consistent with the nature of capital formation, where investment projects involve gestation periods before expanding productive capacity and influencing output levels. Overall, the regression results demonstrate that credit composition affects regional economic dynamics in a temporally differentiated manner. The timing, magnitude, and transmission mechanisms vary across credit categories, underscoring that regional growth depends not only on the volume of credit but also on its allocation structure and intertemporal distribution. These findings provide empirical support for the view that financial intermediation shapes subnational economic development through heterogeneous and time-dependent channels (Amaluddin et al., 2024; Bellaa et al., 2022; Razak et al., 2020).

The Error Correction Term (ECT) is negative, confirming convergence toward the long-run equilibrium. Its magnitude indicates that deviations from the equilibrium relationship are corrected rapidly in the subsequent period. An absolute coefficient greater than 1 suggests short-run overshooting before the system stabilizes, implying a relatively strong, potentially volatile adjustment process. This result substantiates the existence of a stable long-run cointegrating relationship between regional output and credit composition. Moreover, it underscores the responsiveness of regional economic growth to disequilibria in financial intermediation, indicating that shocks to credit allocation are not persistent but are instead absorbed through dynamic correction mechanisms.

The long-run estimates reveal heterogeneous effects across credit categories. Consumer credit has a positive impact on regional output, indicating that household-oriented lending contributes meaningfully to sustained economic performance. In regions with limited industrial capacity, such as East Nusa Tenggara (NTT), demand-side channels play a dominant role in supporting long-term growth. In contrast, working capital credit does not exhibit a statistically significant long-run effect. Although theoretically linked to productive activities, the expansion of business financing does not consistently translate into sustained output gains over the study period. This outcome may reflect structural rigidities, limited economies of scale, sectoral concentration, or inefficiencies in the allocation of productive credit.

Investment credit shows a positive long-run coefficient, albeit with weaker statistical significance than consumer credit. This finding suggests that capital formation contributes to economic growth, but its effectiveness depends critically on project implementation, sectoral distribution, institutional quality, and the regional economy's absorptive capacity. Taken together, the long-run results emphasize that the structure of credit allocation plays a decisive role in shaping regional economic performance, yet its effectiveness varies substantially across credit types and depends on the broader structural and institutional context.

Table 4. Empirical Result of ARDL-ECM (2004-2024)

Sample:	2004 -2024	Number of obs		21			
		R-squared		0.9949			
		Adj R-squared		0.9487			
Log likelihood	115.4472	Root MSE		0.0032			
D.lnGRDP		Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
ADJ							
	lnGRDP						
	L1.	-1.09044	0.185339	-5.88	0.028	-1.88789	-0.293
LR							
	lnCC	0.387902	0.081007	4.79	0.041	0.039357	0.736448
	lnWCC	-0.01089	0.068672	-0.16	0.889	-0.30637	0.28458
	lnIC	0.040458	0.013024	3.11	0.09	-0.01558	0.096495
SR							
	lnGRDP						
	LD.	-0.21793	0.140921	-1.55	0.262	-0.82426	0.3884
	L2D.	-1.01942	0.207982	-4.9	0.039	-1.91429	-0.12454
	L3D.	-4.45255	0.442739	-10.06	0.01	-6.35751	-2.5476
	lnCC						
	D1.	-0.13821	0.044508	-3.11	0.09	-0.32971	0.053287
	LD.	0.319602	0.05646	5.66	0.03	0.076674	0.56253
	L2D.	0.595355	0.065853	9.04	0.012	0.31201	0.878699
	L3D.	0.485641	0.055892	8.69	0.013	0.245159	0.726124
	lnWCC						
	D1.	-0.25917	0.048036	-5.4	0.033	-0.46585	-0.05248
	LD.	-0.59019	0.079314	-7.44	0.018	-0.93145	-0.24893
	L2D.	0.110414	0.051002	2.16	0.163	-0.10903	0.329858
	L3D.	0.264198	0.043794	6.03	0.026	0.075768	0.452627
	lnIC						
	D1.	0.00827	0.007858	1.05	0.403	-0.02554	0.042081
	LD.	-0.06955	0.00825	-8.43	0.014	-0.10504	-0.03405
	L2D.	-0.086	0.009512	-9.04	0.012	-0.12692	-0.04507
	_cons	12.30093	2.481031	4.96	0.038	1.625917	22.97595

Source: Author's calculations using Stata.

The short-run dynamics reveal heterogeneous adjustment patterns and distinct transmission mechanisms across credit categories. Lagged changes in regional output are statistically significant, confirming intertemporal persistence and inertia in economic growth. Consumer credit produces significant positive effects at several lagged differences, suggesting that its influence unfolds gradually rather than instantaneously. This pattern aligns with cumulative demand effects, in which increases in household borrowing stimulate consumption and, in turn, reinforce output expansion over successive periods.

Working capital credit exhibits a mixed short-run pattern, characterized by negative coefficients at initial lags followed by positive and significant effects at later stages. These dynamics indicate a delay in transmission from business financing to realized production, reflecting operational adjustments, production cycles, and inventory accumulation before the effects are fully reflected in output growth. Investment credit predominantly displays lagged effects, consistent with the gestation periods inherent in capital formation. Its short-run impact is limited, reinforcing the conceptual distinction between demand-driven credit channels and capacity-expanding investment mechanisms. Overall, the empirical results indicate that credit's growth effects are both category-specific and time-dependent. The intertemporal configuration of credit allocation thus emerges as a key determinant of regional growth dynamics, underscoring that not only the quantity but also the composition and timing of credit expansion are critical for sustainable economic development.

Table 5. ARDL Bounds Test Results

H0: no level relationship	F	=	49.056					
	t	=	-5.884					
Critical Values (0.1-0.01), F-statistic, Case 3								
	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
k_3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61
accept if F < critical value for I(0) regressors								
reject if F > critical value for I(1) regressors								
Critical Values (0.1-0.01), F-statistic, Case 3								
	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
k_3	-2.57	-3.46	-2.86	-3.78	-3.13	-4.05	-3.43	-4.37
accept if t > critical value for I(0) regressors								
reject if t < critical value for I(1) regressors								

Source: Author's calculations using Stata

The existence of a long-run relationship among the variables is examined using the ARDL bounds testing approach developed by Nkoro and Uko, (2016). The results, summarized in Table 5, indicate that the computed F-statistic exceeds the upper bound critical value at the 1% significance level. Additionally, the corresponding t-statistic falls below the lower bound critical value. The results confirm the presence of a long-run cointegrating relationship between real GRDP and the composition of bank credit in East Nusa Tenggara (NTT). Despite the mixed order of integration among the variables, the evidence indicates the existence of a stable long-run equilibrium relationship. The confirmation of cointegration justifies the estimation of long-run coefficients and the corresponding Error Correction Model (ECM). It also implies that short-run fluctuations in credit allocation and regional output converge toward a common equilibrium path

rather than diverging over time, reinforcing the stability of the financial–growth linkage in the regional economy. To ensure the robustness of the estimated ARDL model, a series of diagnostic and stability tests was performed. The results indicate that the model satisfies all key classical assumptions necessary for valid statistical inference, confirming the reliability and stability of the estimated relationships.

Table 6. Autocorrelation Diagnostic Test Results

Metode 1	Durbin-Watson d-statistic(6, 23) = 2.18633			
Metode 2	Breusch-Godfrey LM test for autocorrelation			
	lags(p)	chi2	df	Prob > chi2
	4	3.318	4	0.5062

Source: Author's calculations using Stata.

Serial correlation was assessed using both the Durbin–Watson statistic and the Breusch–Godfrey LM test. The Durbin–Watson value is close to two, indicating no evidence of first-order serial correlation. This result is corroborated by the Breusch–Godfrey LM test, which fails to reject the null of no autocorrelation. These findings suggest that the residuals are free of serial correlation, confirming that the estimated coefficients are unbiased and that the model's dynamic specification adequately captures temporal dependence.

Table 7. Cameron & Trivedi's IM-Test for Heteroskedasticity

chi2(20)	=	21	
Prob > chi2	=	0.3971	
Cameron & Trivedi's decomposition of IM-test			
Source	chi2	df	p
Heteroskedasticity	21	20	0.3971
Skewness	18.23	18	0.4407
Kurtosis	1.15	1	0.2832
Total	40.38	39	0.4091

Source: Author's calculations using Stata

The heteroskedasticity test indicates that the null hypothesis of homoskedastic residuals cannot be rejected. The reported p-value exceeds the conventional 5% significance level, suggesting that the residuals' variance remains constant across observations. This conclusion is further supported by the Cameron and Trivedi IM-test decomposition, which indicates that the heteroskedasticity component is statistically insignificant. Moreover, the skewness and kurtosis components do not reveal any specification issues. Overall, these findings confirm that the model does not suffer from heteroskedasticity. Consequently, the estimated standard errors are reliable, and statistical inference based on t- and F-statistics remains valid.

The normality assumption was evaluated using the Skewness/Kurtosis test. The joint test yields a probability value of 0.2942, which exceeds the conventional 5% significance level. The individual p-values for skewness and kurtosis are also statistically insignificant, indicating that the residuals do not exhibit systematic asymmetry or excess kurtosis. These findings suggest that the residuals are approximately normally distributed, supporting the validity of the t- and F-statistics used in the model. Consequently, statistical inference derived from the ARDL estimation can be considered robust and reliable.

Table 8. Skewness/Kurtosis Test for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj	chi2(2) Prob>chi2
ehat	21	0.6482	0.1601		2.45 0.2942

Source: Author's calculations using Stata

The results of the stability test based on the CUSUM procedure indicate that the cumulative sum of recursive residuals remains within the critical bounds throughout the observation period (2004–2024). At no point does the CUSUM line cross either the upper or lower 5% significance limits. Methodologically, this finding suggests that there are no significant structural breaks in the estimated parameters over the sample period. In other words, the relationship between credit composition and regional economic growth in East Nusa Tenggara (NTT) remains dynamically stable despite external shocks, including the economic contraction during the pandemic. The stability of the estimated parameters reinforces the reliability of the ARDL and ECM estimation results presented earlier. Therefore, the inferences regarding the long-run relationship, adjustment mechanism, and short-run dynamics are robust and not influenced by structural instability in the model.

The findings of this study indicate that credit composition has structural implications for regional economic growth, extending beyond its role as an aggregate liquidity factor. The confirmation of a long-run cointegrating relationship reinforces the finance–growth nexus literature, which posits that the financial and real sectors are intertemporally linked through equilibrium mechanisms (Fukuda, 2025). The principal contribution of this study is to show that the type of credit fundamentally determines the effectiveness of growth transmission—a dimension still underexplored in subnational studies of Indonesia.

The finding that consumer credit serves as a significant long-run determinant of real GRDP aligns with evidence from developing economies, where household credit expansion drives output through the consumption-multiplier mechanism (Çayır, 2021), further demonstrating that household lending exerts stronger effects than productive credit in economies that have not yet achieved industrial deepening. Within East Nusa Tenggara (NTT), whose economy is dominated by trade, services, and domestic consumption, this pattern suggests that growth transmission primarily occurs through demand-side channels rather than long-term capital accumulation.

Consistent with this structural perspective, the insignificant long-run effect of working capital credit indicates that operational financing alone has not generated

measurable productivity gains at the regional level. In structurally less diversified economies such as NTT, where firm size remains small and informal activities dominate, short-term operational credit may support liquidity without necessarily enhancing technological upgrading or production efficiency. This finding aligns with recent literature that emphasizes that the effectiveness of productive credit is conditional on institutional quality, absorptive capacity, and real-sector efficiency (Amaluddin et al., 2024).

Recent empirical studies suggest that the growth impact of bank credit is highly contingent upon structural and institutional conditions. Evidence from dynamic panel analyses indicates that productive lending contributes to sustained output expansion primarily in economies characterized by higher institutional quality, deeper financial markets, and stronger industrial capacity (Uddin et al., 2023). In structurally less diversified regions, where economic activities are dominated by small-scale and informal enterprises, the transmission of productive credit to long-run output tends to be weaker and often delayed (Anama & Lubis, 2025; Idroes et al., 2024). In East Nusa Tenggara (NTT), where structural transformation remains limited and the production base is relatively narrow, credit expansion may not automatically translate into sustained output growth.

Investment credit exhibits a positive yet moderate effect on regional output. This pattern likely reflects implementation lags in project realization as well as the relatively limited scale of capital formation at the regional level. Consistent with the macro-finance literature, investment-related credit often requires adjustment periods before translating into statistically significant output gains, particularly in developing and structurally constrained economies (Uddin et al., 2023). In subnational settings with limited industrial depth, delayed effects are frequently associated with infrastructure bottlenecks, weak project selection mechanisms, and heterogeneous investment quality (Anama & Lubis, 2025; Idroes et al., 2024; Tampubolon et al., 2021).

Interestingly, the rapid error-correction mechanism identified in this study indicates that East Nusa Tenggara's economy is highly responsive to shifts in credit composition. The statistically significant, strongly negative error-correction term suggests that deviations from the long-run equilibrium are swiftly corrected. This finding implies that, although short-run transmission differs across credit categories, a structural integration exists between the financial system and real-sector activities, enabling intertemporal rebalancing and preventing persistent destabilization of regional output.

From a scientific standpoint, this study makes three principal contributions. First, it extends the finance-growth nexus literature to the subnational level by employing a time-series framework in Eastern Indonesia. While much of the existing literature relies on cross-country or interprovincial panel estimations to examine the conditional relationship between bank credit and economic growth (Ho & Saadaoui, 2022), subnational dynamic adjustments are often obscured within aggregated panel structures. In contrast, by focusing on a single province, this study captures within-region intertemporal dynamics and structural responsiveness, complementing recent evidence on heterogeneous regional financial transmission in Indonesia (Aginta & Someya, 2022; Budiman et al., 2024).

Second, this study demonstrates that analyzing credit composition provides more nuanced insights than aggregate credit indicators. Recent empirical work emphasizes that different categories of lending exhibit heterogeneous transmission channels and asymmetric growth effects (Huda et al., 2025; Rahman et al., 2022). By disaggregating consumer, working capital, and investment credit, this study identifies distinct short- and long-run dynamics that would remain concealed under aggregate credit measures, thereby aligning with emerging evidence that financial structure—not merely financial depth—shapes growth outcomes (Idroes et al., 2024; Uddin et al., 2023).

Third, the findings suggest that in consumption-driven regional economies, consumer credit may function as a long-run growth driver. While conventional development theory prioritizes productive credit as the principal engine of sustainable growth, recent studies indicate that household and consumption-based lending can stimulate output through aggregate demand multipliers, particularly in structurally constrained developing economies (Xiao & Tao, 2020). Consistent with this perspective, evidence from Indonesia also shows that credit allocation patterns influence the pace and nature of economic transformation at the regional level (Anama & Lubis, 2025). Accordingly, this study not only reaffirms the existence of a finance–growth relationship but also elucidates how the composition and structural allocation of bank credit shape regional growth dynamics within subnational developing contexts.

CONCLUSIONS

This study examines whether the composition of bank credit influences regional economic growth in East Nusa Tenggara (NTT) and how its effects differ in the short and long run. Using an ARDL approach with annual data from 2004–2024, the results confirm a statistically significant long-run relationship between real GRDP and credit structure. Consumer credit emerges as the strongest long-run growth determinant, investment credit shows a positive but moderate effect, and working capital credit is not significant in the long run. These findings indicate that regional growth depends not merely on the volume of credit expansion but on its composition and alignment with local economic conditions. Policy strategies in structurally constrained regions should therefore emphasize targeted credit allocation, institutional strengthening, and real-sector development to ensure that financial intermediation supports sustainable regional growth.

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