International Journal of Asian Social Science
ISSN(e): 2224-4441
ISSN(p): 2226-5139
DOI: 10.55493/5007.v15i9.5541
Vol. 15, No. 9, 288-301

URL: www.aessweb.com

Entrepreneurial resilience amid economic shocks: A panel data analysis of ASEAN countries

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Article History
Received: 7 July 2025
Revised: 15 August 2025
Accepted: 20 August 2025
Published: 29 August 2025

Keywords
ASEAN
Asymmetric effects
Entrepreneurial resilience
Error correction mechanism
Long-run dynamics
Macroeconomic volatility
Nonlinear modelling
Panel data analysis
Panel NARDL.

ABSTRACT

This study investigates how GDP and inflation shocks asymmetrically influence entrepreneurial resilience across ASEAN countries. It aims to provide empirical insights into how macroeconomic instability affects enterprise formation and survival in emerging economies. The study employs a Panel Nonlinear Autoregressive Distributed Lag (Panel NARDL) model on annual panel data from 2000 to 2023 across 10 ASEAN countries. Entrepreneurial resilience is proxied by the number of new business registrations. The analysis incorporates second-generation unit root testing (CIPS) and the Common Correlated Effects Mean Group (CCE-MG) estimator to address cross-sectional dependence and heterogeneity. The results reveal significant long-run asymmetries. Negative GDP shocks consistently reduce entrepreneurial resilience, highlighting pro-cyclicality in business formation. Inflation shocks show mixed effects, with positive inflation stimulating entrepreneurship in some countries while discouraging it in others. Short-run responses are generally weak, suggesting delayed entrepreneurial adjustment to macroeconomic volatility. The study is limited to macroeconomic variables and does not incorporate micro-level firm characteristics or behavioural indicators. Future research may integrate firm-level panel data to examine how internal firm capabilities mediate these macroeconomic effects. The findings underscore the need for counter-cyclical entrepreneurship policies tailored to country-specific macroeconomic dynamics. Promoting macroeconomic stability and inflation management are critical for maintaining entrepreneurial momentum.

Contribution/ Originality: This study contributes by applying a Panel NARDL approach to examine asymmetric macroeconomic effects on entrepreneurial resilience in ASEAN. It integrates CIPS and CCE-MG estimators to address cross-sectional dependence and heterogeneity, documenting heterogeneous long-run responses to GDP and inflation shocks, and offering region-specific policy insights.

1. INTRODUCTION

Global trade has become increasingly unpredictable over recent decades, posing significant challenges for countries that depend on international markets. Financial crises, pandemics, and geopolitical tensions have disrupted trade flows, leading to widespread economic instability. Notably, the COVID-19 pandemic exemplified this volatility, triggering global supply chain interruptions that affected production and distribution channels worldwide. According to the World Trade Organization (2021), global merchandise trade fell by approximately 9% during the pandemic,

with some regions experiencing more severe downturns. These disruptions underscore the interconnectedness of the global economy and how shocks in one region can quickly cascade across others.

In this interconnected landscape, ASEAN countries have emerged as particularly vulnerable to trade shocks due to their strong economic integration and reliance on export-driven growth. As a regional bloc, ASEAN is deeply embedded in global supply chains, particularly in industries such as electronics, machinery, and automotive components (Vidya, 2024). Countries like Malaysia, Singapore, and Thailand heavily depend on external demand from major trading partners such as China, the United States, and the European Union. Consequently, any disruption in global trade can produce immediate and far-reaching effects across ASEAN economies. For instance, disruptions in China's supply chains during the COVID-19 pandemic significantly slowed ASEAN's manufacturing sectors, illustrating the region's sensitivity to global uncertainties.

Given these challenges, entrepreneurial resilience has become increasingly important in sustaining business operations amid economic volatility. Entrepreneurial resilience refers to the capacity of entrepreneurs and their ventures to survive, adapt, and even thrive despite adversity. Ayala and Manzano (2014) define it as a combination of psychological strength, adaptability, and the ability to seize opportunities during crises. This capacity is especially vital in emerging markets, where firms often face challenges such as limited access to finance or institutional support. For instance, while Singapore offers robust start-up financing and digital infrastructure, SMEs in Laos or Cambodia may lack such institutional buffers, making resilience a crucial factor in business continuity.

Despite growing interest in the concept of entrepreneurial resilience, there is a notable absence of region-wide longitudinal empirical analysis, particularly in the ASEAN context. Existing studies typically focus on single-country cases or crisis-specific responses, limiting generalizability and overlooking the cumulative impact of recurrent trade shocks over time (Falciola, Mohan, Ramos, & Rollo, 2023; Mosquera-Carrascal, López-Zapata, & Jurado-Zambrano, 2024; Shatila, Aránega, Soga, & Hernández-Lara, 2025). Addressing this gap necessitates a nuanced regional analysis, especially considering ASEAN's economic heterogeneity and varying levels of entrepreneurial development.

To address this research void, the present study investigates how entrepreneurial resilience influences business continuity amid economic shocks in ASEAN countries. Employing a nonlinear Panel ARDL model with asymmetric decomposition from 2000 to 2023, this analysis examines how trade shocks, financial instability, supply chain disruptions, and institutional quality affect entrepreneurial activity. The findings aim to offer evidence-based insights for policymakers and business stakeholders in fostering a more resilient entrepreneurial ecosystem in ASEAN.

2. LITERATURE REVIEW

Entrepreneurial resilience has garnered increasing attention in contemporary economic and business scholarship, particularly in the face of growing macroeconomic volatility and recurring external shocks. Broadly, entrepreneurial resilience refers to the capacity of entrepreneurs and their ventures to withstand, adapt to, and recover from adverse conditions. Ayala and Manzano (2014) conceptualize it as a composite of psychological strength, adaptability, and the ability to pursue new opportunities during crises. While this concept has been widely explored across various global contexts, its empirical application within ASEAN economies, especially in relation to trade-induced economic shocks, remains underdeveloped. Recent studies, such as those by Falciola et al. (2023) and Shatila et al. (2025), have emphasized the importance of resilience in ensuring SME continuity, yet their findings remain largely confined to crisis-specific or national contexts. Given the regional economic fragility and reliance on export-oriented growth, understanding entrepreneurial resilience in ASEAN is both timely and policy-relevant.

Theoretical discussions on entrepreneurial resilience are frequently grounded in the Dynamic Capabilities Theory (DCT), which emphasizes a firm's ability to reconfigure internal and external competencies to respond to rapidly changing environments (Teece, 2007). This framework highlights adaptive capacity, innovation, and strategic responsiveness as critical mechanisms through which firms can survive and recover during periods of instability. Complementing this, the Resource-Based View (RBV) proposed by Barney (1991) argues that firms with superior

access to resources such as capital, organizational knowledge, and social networks are better positioned to absorb shocks and exploit new opportunities during periods of disruption. These theoretical lenses have been instrumental in understanding entrepreneurial survival, particularly under uncertain macroeconomic conditions. Recent studies, including Teece (2016), further support the idea that firms with embedded dynamic capabilities are more likely to maintain performance during downturns. In the context of ASEAN, where resource availability and institutional maturity vary significantly, these theories suggest that entrepreneurial resilience may be unevenly distributed across countries and sectors, depending on the firm's ability to leverage internal assets and adapt strategically to external shocks.

Empirical research has increasingly validated the theoretical relationship between dynamic capabilities and entrepreneurial resilience. For instance, Teece (2016) demonstrates that firms which proactively invest in adaptive strategies—particularly through digital transformation tend to exhibit stronger performance and continuity during economic downturns. Digital tools not only enhance firms' responsiveness to market shifts but also enable access to new distribution channels and customer segments during crises. Shatila et al. (2025), in their cross-country study on digital ecosystems in Qatar and the UAE, provide further evidence that digital literacy, accessibility, and human capital significantly influence business resilience. Their findings reveal that firms embedded in supportive digital infrastructures are better equipped to pivot in response to economic disruptions. These insights are particularly relevant for ASEAN economies, where the digital divide remains pronounced. While countries like Singapore and Malaysia benefit from advanced digital infrastructure and government-led innovation policies, many firms in Cambodia, Laos, and Myanmar still face limitations in connectivity, digital skills, and e-commerce access. As such, the ability to digitally adapt may be a critical differentiator in explaining variations in entrepreneurial resilience across the region.

Institutional theory offers a complementary perspective on entrepreneurial resilience by emphasizing the role of formal structures, regulatory frameworks, and public policies in shaping business responses to external shocks. North (1990) contends that institutions defined as the rules, norms, and enforcement mechanisms of a society provide the necessary stability and predictability for economic actors to make informed decisions. In the context of entrepreneurship, effective institutions can significantly enhance business resilience by reducing uncertainty, facilitating access to resources, and streamlining bureaucratic processes. Falciola et al. (2023) highlight how institutional support during the COVID-19 pandemic, including government stimulus packages and regulatory relief, played a vital role in maintaining the viability of SMEs in Southeast Asia. However, institutional effectiveness across ASEAN countries is far from uniform. For instance, while Singapore and Malaysia have implemented comprehensive SME policies supported by strong governance systems, countries like Myanmar, Cambodia, and Laos often experience inconsistent enforcement, bureaucratic delays, and limited access to government support (Vidya, 2024). This institutional heterogeneity implies that entrepreneurial resilience is not solely a function of firm-level capabilities but also contingent upon the broader policy environment in which firms operate.

Social capital constitutes another critical dimension in understanding entrepreneurial resilience, particularly within collectivist societies such as those found in ASEAN. Defined broadly as the networks of relationships and norms of trust that facilitate coordination and cooperation among individuals and groups, social capital provides both tangible and intangible resources that can help entrepreneurs navigate periods of crisis. Fatoki (2018) argues that resilient entrepreneurs are often embedded in supportive networks that extend beyond financial transactions, offering emotional encouragement, strategic advice, and access to informal financing mechanisms during downturns. These networks may include family ties, peer entrepreneurs, community leaders, or local trade associations. In the ASEAN context, where informal institutions often complement formal regulatory systems, social networks play a pivotal role in sustaining business continuity, especially in rural and semi-formal economies. Mosquera-Carrascal et al. (2024) highlight how cultural norms of reciprocity, communal responsibility, and informal exchange systems act as buffers for micro and small enterprises operating in underbanked or remote regions. Such socially embedded resilience

mechanisms are particularly salient in contexts where state support is limited or unevenly distributed, thereby reinforcing the importance of cultural and relational dimensions in fostering entrepreneurial sustainability.

Despite the growing body of theoretical and empirical research on entrepreneurial resilience, the existing literature within the ASEAN context remains fragmented and largely underdeveloped. A substantial portion of prior studies focuses on individual countries and examines firm responses to specific, short-term crises, such as natural disasters or the COVID-19 pandemic. For example, Damoah (2025) investigated SME exporters' survival in response to environmental turmoil, but the study was confined to a single national context and a limited temporal frame. This narrow geographic and temporal focus limits the generalizability of findings and prevents a holistic understanding of how resilience evolves across varying institutional environments and repeated economic shocks. There is a notable absence of longitudinal, region-wide studies that examine entrepreneurial resilience as a dynamic process shaped by accumulated exposure to multiple disruptions. This is particularly problematic in ASEAN, where economic integration and interdependence mean that trade-related shocks often have cross-border effects. Without long-term panel data analysis, it becomes difficult to discern whether resilience is a transient reaction to crisis or a structural feature embedded in entrepreneurial ecosystems.

From a methodological standpoint, much of the existing research on entrepreneurial resilience relies on linear and static econometric models that assume symmetric responses to external shocks. These conventional approaches may inadequately capture the complex, dynamic nature of entrepreneurial adaptation, especially in the presence of economic volatility that generates uneven effects. In reality, positive and negative shocks do not always elicit proportionate or mirror-image responses from entrepreneurs. Recent advancements in econometric modelling, particularly the Nonlinear Autoregressive Distributed Lag (NARDL) approach, enable researchers to detect asymmetric effects by decomposing variables into their positive and negative components. As demonstrated by Shatila et al. (2025), such models offer a more refined understanding of how businesses respond differently to favourable versus adverse economic conditions. However, the application of NARDL or related asymmetric modelling techniques within the ASEAN context remains limited. Most resilience studies in the region continue to use fixed effects or ordinary least squares (OLS) estimations, thereby overlooking potential nonlinearity and heterogeneity in entrepreneurial behaviour across countries. Employing a panel-based NARDL approach could thus provide deeper insights into the long-run and short-run asymmetries that characterise entrepreneurial resilience under varying economic shocks.

Furthermore, the current body of literature on entrepreneurial resilience is disproportionately concentrated in Western contexts, where institutional frameworks, market structures, and cultural norms differ significantly from those in Southeast Asia. Many theoretical models and empirical findings originate from high-income economies with mature institutions, stable governance, and advanced technological ecosystems. While these studies offer valuable insights, their applicability to the ASEAN region, characterized by institutional heterogeneity, varied levels of digital infrastructure, and diverse socio-cultural dynamics, is inherently limited. This geographical bias constrains the external validity of dominant resilience frameworks when applied to emerging and developing economies. Consequently, there is a pressing need for region-specific research that accounts for the unique economic, political, and cultural configurations of ASEAN countries. A tailored investigation into how resilience manifests within this diverse regional bloc not only enhances the relevance of empirical findings but also contributes to the development of more inclusive and globally representative entrepreneurial theory.

A clearer and more contextually grounded understanding of entrepreneurial resilience in ASEAN carries substantial policy implications. Given the region's exposure to trade volatility, financial instability, and institutional fragmentation, it is imperative for governments and development agencies to design policies that strengthen the adaptive capacity of entrepreneurs. Promoting digital inclusion through subsidized technological adoption, expanding access to micro-financing schemes, and streamlining regulatory processes can substantially enhance the resilience of small and medium-sized enterprises. For example, simplifying loan procedures during trade shocks or offering tax

incentives for innovation may help firms buffer adverse effects and recover more quickly. Moreover, enhancing institutional quality through transparent governance, effective public service delivery, and targeted SME support can reduce uncertainty and improve entrepreneurial confidence. This study aims not only to address critical theoretical and empirical gaps in the literature but also to generate evidence-based insights that can inform robust policy interventions tailored to the specific needs of ASEAN economies. By bridging scholarly inquiry with practical action, the research contributes to fostering a more resilient and inclusive entrepreneurial ecosystem in the region.

3. METHODOLOGY

3.1. Data and Variable Description

This study investigates the impact of various economic shocks on entrepreneurial resilience (ER) in ASEAN countries over the period 2000 to 2023. The analysis includes ten ASEAN member states: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. The data are derived from the World Development Indicators (WDI) provided by the World Bank. Entrepreneurial resilience is proxied by the annual number of new business registrations, representing a country's capacity to generate enterprise creation amidst economic shocks. Trade shocks (TS) are measured by the ratio of trade to GDP (%), which captures fluctuations in external trade exposure. Financial shocks (FS) are proxied by the Real Effective Exchange Rate (REER), reflecting volatility in currency competitiveness. Supply chain disruptions (SCD) are quantified using the Global Supply Chain Pressure Index (GSCPI) and the Logistics Performance Index (LPI), both of which indicate frictions in trade infrastructure. Institutional quality (IQ) is represented by the Government Effectiveness Index. Macroeconomic variables include GDP growth (annual %) and inflation, measured through the Consumer Price Index (CPI). All variables are transformed into logarithmic form to stabilize variance and facilitate interpretation in elasticity terms.

Table 1. Variable definition and sources.

Variable	Explanation	Sources
Entrepreneurial resilience	New businesses registered (Number)	World development indicators, World Bank
GDP growth rate	GDP growth (Annual %)	World development indicators, World Bank
Inflation	Consumer price index (CPI)	World development indicators, World Bank

Source: World Bank Development Indicators, 2025.

Table 1 presents the operational definitions and data sources for each variable employed in the analysis.

3.2. Descriptive and Diagnostic Analysis

As a preliminary step, descriptive analysis is conducted to examine the statistical properties of the dataset. This analysis provides insights into the distribution, central tendency, and variability of each variable, allowing for the identification of potential outliers or irregular patterns that may bias econometric estimation. To ensure the suitability of the explanatory variables for regression analysis, collinearity is examined through pairwise correlation, while multicollinearity is assessed using the Variance Inflation Factor (VIF). All VIF values are found to be well below the conventional threshold of 10, indicating no serious multicollinearity problem. This confirms that the selected variables are appropriate for inclusion in the Panel NARDL model, and that the estimated coefficients are likely to be stable, unbiased, and reliable.

3.3. Cross-Sectional Dependence Test

The initial step in empirical analysis involves testing for the presence of cross-sectional dependence (CD) in panel data. Cross-sectional dependence occurs when shocks affecting one country are transmitted to others within the panel, potentially violating the assumption of cross-sectional independence that underlies many conventional panel data estimators. To address this, the Pesaran (2004) Cross-sectional Dependence (CD) test is employed. The CD test is

robust and widely applicable to panels with large cross-sections and time dimensions. The results of the CD test determine the appropriate unit root testing strategy in the subsequent stage.

3.4. Panel Stationary Test

If no cross-sectional dependence is detected, the analysis proceeds with first-generation panel unit root tests, which assume independence across units. These include the Levin, Lin, and Chu (2002) test for a common unit root process, the Im, Pesaran, and Shin (2003) test that allows for heterogeneous dynamics, the Fisher-type test developed by Choi (2001), the Breitung (2001) test, and the Hadri (2000) stationarity test. However, if cross-sectional dependence is present, these first-generation tests may produce biased results. In such cases, second-generation unit root tests that account for interdependencies are used. Specifically, this study will apply the Cross-sectionally Augmented IPS (CIPS) test proposed by Pesaran (2007), which controls for unobserved common factors by including cross-sectional averages in the test equation. Once the stationarity properties of the variables are confirmed, particularly when variables are integrated of order one, I(1), meaning they are non-stationary at level but stationary after first differencing, the analysis proceeds to cointegration testing to examine the existence of long-run equilibrium relationships among the variables.

3.5. Cointegration Testing

To test for a long-term relationship between variables, we use panel cointegration tests. We employ the Pedroni (1999) and Pedroni (2004) Cointegration Tests to handle panel data with heterogeneous dynamics and the Kao (1999) Cointegration test for homogeneity. Establishing cointegration justifies the application of the NARDL model, indicating that variables move together over time despite short-term fluctuations. These cointegration tests are essential in confirming the presence of a stable long-run equilibrium, particularly when the variables exhibit mixed integration orders, I(0) and I(1), as revealed by the CIPS unit root test. Although the NARDL framework permits the inclusion of both stationary and non-stationary variables, it cannot accommodate variables integrated of order two, I(2). Therefore, prior confirmation that no variable is I(2) and that at least one cointegrating relationship exists is critical. The results of the Pedroni and Kao tests provide empirical validation for the subsequent estimation of the long-run and short-run asymmetric relationships using the Panel NARDL model.

3.6. Panel NARDL Specification

The empirical model is based on the nonlinear autoregressive distributed lag (NARDL) framework, which allows for both short-run and long-run asymmetries. The long-run relationship is first specified in functional form as follows:

$$ER_{it} = f(GDP_{it}, INF_{it}) \quad (1)$$

The Equation 1 establishes the basic relationship where entrepreneurial resilience (ER) is a function GDP growth (GDP), and inflation (INF). All variables are log-transformed, resulting in the following linear equation.

$$LER_{it} = \alpha_0 + \alpha_5 LGDP_{it} + \alpha_6 LINF_{it} + \mu_{it} + \epsilon_{it} \quad (2)$$

Logarithmic transformation helps stabilize variance and reduce heteroskedasticity. It also facilitates the interpretation of coefficients as elasticities.

We then estimate the Panel ARDL model (p, q), originally developed by Pesaran and Smith (1995) and Pesaran, Shin, and Smith (1999) is specified as follows:

$$LER_{it} = \alpha_0 + \sum_{j-1}^{p} \alpha_j LER_{i,t-j} + \sum_{j-0}^{p} \delta_{5\,j} LGDP_{i,t-j} + \sum_{j-0}^{p} \delta_{6\,j} LINF_{i,t-j} + \mu_{it} + \epsilon_{it} \quad (3)$$

To capture both short-run and long-run dynamics, the panel ARDL model is transformed into the following error correction form.

$$\Delta LER_{it} = \alpha_0 + \beta_i\left(LER_{i,t-1} - \rho_{5i}LGDP_{i,t} - \rho_{6i}LINF_{i,t} -\right) + \sum_{j-1}^{p}\alpha_{ij}\Delta LER_{i,t-j} + \sum_{j-0}^{p}\delta_{5ij}\Delta LGDP_{i,t-j} + \sum_{j-0}^{p}\delta_{6ij}\Delta LINF_{i,t-j} + \mu_{it} + \epsilon_{it} \quad (4)$$

The given Equation 4 represents the Error Correction Model (ECM) of the Panel Nonlinear ARDL (NARDL) model, capturing both long-run equilibrium and short-run dynamics between entrepreneurial resilience (ER) and economic shocks, including GDP growth (GDP), and inflation (INF) for ASEAN countries. The dependent variable (ΔLER_{it}) indicates the change in ER, with α_0 as the intercept and β_i as the speed of adjustment to equilibrium. A negative and significant β_i suggests that deviations from long-run equilibrium are corrected over time. The coefficients (ρ) capture the long-run effects, while the lagged difference terms (δ) indicate short-run impacts. The fixed effects term μ_{it} accounts for country-specific characteristics, and the error term ϵ_{it}represents random disturbances. This model helps distinguish between immediate and long-term effects of positive and negative shocks on entrepreneurial resilience.

3.7. Asymmetric Decomposition

To capture asymmetries, the model decomposes economic shocks into positive and negative components.

$$GDP_{it}^{+} = \sum_{j=1}^{t} max\left(\Delta GDP_{ij}, 0\right), GDP_{it}^{-} = \sum_{j=1}^{t} min\left(\Delta GDP_{ij}, 0\right) \quad (5)$$

$$INF_{it}^{+} = \sum_{j=1}^{t} max\left(\Delta INF_{ij}, 0\right), INF_{it}^{-} = \sum_{j=1}^{t} max\left(\Delta INF_{ij}, 0\right) \quad (6)$$

To capture asymmetries in economic shocks, the model decomposes variables into positive and negative components. This decomposition allows the model to distinguish between the effects of positive and negative changes separately. Specifically, the positive component GDP_{it}^{+} is calculated as the cumulative sum of positive changes $\left(\Delta GDP_{ij}, 0\right)$, while the negative component GDP_{it}^{-} is the cumulative sum of negative changes $\left(\Delta GDP_{ij}, 0\right)$. Similarly, the financial stability variable INF_{it}^{+} and INF_{it}^{-} decomposed in the same way. This approach enables the model to detect asymmetric effects, meaning it can separately evaluate how positive and negative economic shocks impact entrepreneurial resilience, rather than assuming a symmetric response.

3.8. Estimator Selection and Model Validation

To estimate the panel NARDL model, three estimators are considered: Mean Group (MG), Pooled Mean Group (PMG), and Dynamic Fixed Effects (DFE). The Hausman test is employed to determine the most appropriate estimator by comparing the efficiency and consistency of the long-run parameters. The PMG estimator is typically preferred when long-run homogeneity is assumed, while MG is suitable under full heterogeneity. Diagnostic tests for serial correlation, heteroskedasticity, and model stability are conducted to validate the robustness of the estimates. Additionally, the Wald test for symmetry is used to statistically assess whether the coefficients of positive and negative changes are significantly different, thus confirming or rejecting the presence of asymmetry.

4. RESULT

4.1. Descriptive Statistics and Multicollinearity Diagnostics

Table 2 presents the descriptive statistics and multicollinearity diagnostics for the key variables used in the study. Entrepreneurial resilience (ER), measured by the annual number of new business registrations, has a mean value of 51.34 and a standard deviation of 26.06, ranging from 5.07 to 88.21. This wide dispersion reflects significant variation in entrepreneurial activity across ASEAN countries, likely influenced by differing institutional, economic, and structural conditions. Log-transformed GDP (LGDP) shows a mean of 7.88, with values spanning from 3.94 to 11.39, indicating variation in income levels and economic development. Inflation (INF) exhibits the highest variability among all variables, with a standard deviation of 15.34 and extreme values ranging from -21.74 to 127.97, capturing episodes of both deflation and high inflation in the region over the two-decade period.

Table 2. Descriptive statistics and multicollinearity diagnostics (2000–2023, N = 330).

Variable	Obs.	Mean	Std. dev.	Min.	Max.	VIF	1/VIF
ER	330	51.343	26.064	5.067	88.208	—	—
LGDP	330	7.879	1.646	3.937	11.390	1.24	0.804
INF	330	8.203	15.342	-21.739	127.974	1.24	0.804

Note: ER = Entrepreneurial Resilience; LGDP = Log of GDP; INF = Inflation

To assess multicollinearity, the Variance Inflation Factor (VIF) values are reported for the explanatory variables. Both LGDP and INF record identical VIF scores of 1.24, which are substantially below the standard threshold of 10. This indicates that multicollinearity is not a concern and that these variables can be included in the regression model without risk of coefficient instability or inflated standard errors. The absence of serious multicollinearity enhances the statistical reliability of the Panel NARDL estimations and supports the robustness of the subsequent econometric analysis.

4.2. Cross-Sectional Dependence

4.2.1. Cross-Sectional Dependence Test

Table 3, Panel A, presents the results of the Pesaran (2007) cross-sectional dependence (CD) test for the main variables. The findings confirm the presence of statistically significant CD for all variables, with p-values < 0.01 across the board. Specifically, log GDP per capita (LGDP) shows a CD statistic of 35.46 and a very high average correlation of 0.920, suggesting strong interdependence across countries—likely reflecting regional integration and shared macroeconomic shocks. Entrepreneurial resilience (ER) also exhibits notable dependence (CD = 16.75; Corr = 0.435), while inflation (INF) shows moderate interdependence (CD = 9.95; Corr = 0.258). These results indicate that macroeconomic fluctuations in one country are likely to affect others, thereby justifying the use of second-generation unit root tests (such as CIPS) and estimators that accommodate cross-sectional dependence, such as the Common Correlated Effects Mean Group (CCE-MG) estimator.

Table 3. Panel diagnostics and CCE-MG estimation results.

Section / Variable	Statistic / Coefficient	p-value	Estimate / Corr.	Std. dev / Notes
ER	CD = 16.75	0.000	Corr = 0.435	
GDP	CD = 35.46	0.000	Corr = 0.920	
INF	CD = 9.95	0.000	Corr = 0.258	
LGDP	Coef. = -7.606	0.000		Std. Err. = 0.296
INF	Coef. = 0.030	0.050		Std. Err. = 0.015
Constant	Coef. = 111.026	0.000		Std. Err. = 2.395
R^2 (Within / Overall)			0.721 / 0.838	
Country effects (ρ)			0.948	
F-statistic	411.72	0.000		
	CD = 2.822	0.0048	Avg. abs (Corr.) = 0.426	
beta_lgdp	0.960			Std. Dev = 10.370
beta_inf	-0.044			Std. Dev = 0.052
beta_cons	-17.535			Std. Dev = 30.793

4.2.2. Fixed Effects Estimation and Model Fit

Panel B of Table 3 presents the fixed effects (FE) regression results using ER as the dependent variable. The estimated coefficient for LGDP is −7.606 and is statistically significant at the 1% level ($p < 0.001$), indicating a strong negative relationship between economic size and entrepreneurial resilience. This suggests that as countries become more developed, the rate of new business formation tends to decline possibly due to market saturation, regulatory constraints, or rising opportunity costs. Inflation (INF), meanwhile, shows a marginally significant positive effect on ER (Coefficient = 0.030; $p = 0.050$), which may reflect inflation-induced adjustments in employment preferences or short-term incentives for self-employment.

The model exhibits a strong overall fit, with within and overall R^2 values of 0.721 and 0.838, respectively. This indicates that the included variables explain a substantial proportion of the variation in entrepreneurial resilience. The high ρ-value (0.948) suggests significant unobserved heterogeneity across countries, confirming the importance of accounting for country-specific effects. Moreover, the F-statistic of 411.72 ($p < 0.001$) indicates that the model is jointly significant.

4.2.3. Residual Dependence and Model Inadequacy

Despite good fit statistics, the residual CD test (Panel C) reveals that the fixed effects model does not fully eliminate cross-sectional dependence. The Pesaran absolute CD statistic is 2.822 ($p = 0.0048$), with an average absolute correlation of 0.426. This suggests that the model residuals still contain unaccounted common shocks, indicating that the fixed effects estimator is not sufficient in addressing cross-sectional dependence, especially in a macro-panel context. As such, a more robust estimator that corrects for common factors, such as the CCE-MG, is warranted.

4.2.4. Common Correlated Effects Mean Group (CCE-MG) Estimation

Panel D reports the results from the CCE-MG estimator, which addresses both heterogeneity and cross-sectional dependence by incorporating cross-sectional averages into the regression. The long-run coefficient for LGDP is positive ($\beta = 0.960$), although it exhibits substantial variation across countries (SD = 10.370), with a minimum of 17.17 and a maximum of 24.54. This reinforces the idea of heterogeneous country-specific effects: in some economies, economic growth stimulates entrepreneurship, while in others, it may inhibit it. The coefficient for inflation is negative ($\beta = -0.044$), with a standard deviation of 0.052, again indicating varied responses across countries. The constant term is also negative on average (−17.535), but displays wide dispersion, further supporting the presence of structural asymmetries in the panel.

These findings suggest that the impact of macroeconomic conditions on entrepreneurial resilience is not uniform across ASEAN countries. The superiority of the CCE-MG estimator lies in its ability to accommodate such asymmetries while controlling unobserved common factors. This validates its use over the traditional fixed effects model in the context of this study.

Table 4. Second-generation stationary test.

Variable	Level CIPS	Decision at level	First-diff. CIPS	Decision at first-diff
ER	−1.750	Non-stationary	−4.351	Stationary
GDP	−2.279	Non-stationary	−4.677	Stationary
INF	−4.732	Stationary	−5.988	Stationary

4.3. Stationary Test

Table 4 presents the results of the second-generation panel unit root test using the Cross-sectionally Augmented IPS (CIPS) method proposed by Pesaran (2007). This test is employed due to the presence of cross-sectional dependence in the panel data, which renders first-generation unit root tests such as LLC or IPS unreliable. Cross-sectional dependence is common in macro-panel datasets involving countries within the same region, where shared shocks such as global crises, regional trade patterns, or common monetary responses can influence all units simultaneously. To account for these unobserved common factors, CIPS augments the standard ADF regression with cross-sectional averages of lagged levels and first differences of the variables.

The CIPS results indicate that entrepreneurial resilience (ER) and log-transformed GDP (LGDP) are non-stationary at level, as their test statistics (−1.750 and −2.279, respectively) do not exceed the critical values required to reject the null hypothesis of a unit root. However, both variables become stationary after first differencing, with

test statistics of –4.351 for ER and –4.677 for LGDP, thus confirming that they are integrated of order one, I(1). In contrast, inflation (INF) is already stationary at level, with a CIPS statistic of –4.732, and remains stationary in first difference.

These results imply that the dataset contains a mix of I(0) and I(1) variables, which is appropriate for estimation using the Panel NARDL model. The Panel NARDL framework accommodates variables with different integration orders, provided none are integrated of order two (I(2)). Hence, the CIPS test not only ensures that model assumptions are satisfied but also confirms the validity of proceeding with cointegration testing and dynamic modeling under the NARDL specification.

4.4. Panel NARDL Estimation: Long-Run and Short-Run Analysis

This section discusses the long-run and short-run dynamics of entrepreneurial resilience (ER) in response to asymmetric shocks in GDP and inflation across ASEAN countries. The findings from the Panel NARDL estimation offer valuable insights into the persistence and adjustment mechanisms underlying entrepreneurial activity in the face of macroeconomic disturbances.

4.4.1. Long-Run Analysis

The long-run coefficients indicate significant asymmetric effects of both positive and negative GDP shocks on entrepreneurial resilience. Specifically, most ASEAN countries exhibit a strong negative response to negative GDP shocks, reflecting the pro-cyclical nature of entrepreneurship. For instance, in countries like Indonesia, Myanmar, and Thailand, negative GDP shocks significantly reduce ER, suggesting that economic downturns discourage new business formation. Interestingly, Brunei presents a positive and significant response to both positive and negative GDP shocks, which may reflect strong institutional or policy buffers encouraging entrepreneurship regardless of macroeconomic cycles. Meanwhile, Singapore shows an insignificant response, indicating that ER in the country might be less sensitive to GDP fluctuations, possibly due to its mature economic structure and diversified entrepreneurial ecosystem.

In the case of inflation, the long-run impact varies more widely. Positive inflation shocks significantly boost ER in countries such as Indonesia, Lao PDR, and the Philippines, suggesting adaptive or opportunistic entrepreneurship during inflationary periods.

However, the effects are not uniform. Singapore shows a negative response to positive inflation, indicating that rising prices may suppress entrepreneurial activities due to increased input costs. The presence of significant positive effects for both inflation shocks in several countries highlights the complexity of inflation dynamics on entrepreneurial outcomes, possibly mediated by sectoral composition or financial access.

4.4.2. Short-Run Analysis

Table 5 presents the long-run and short-run dynamics of ER across ASEAN countries. The short-run estimates indicate more heterogeneity and generally weaker effects, with most coefficients of differenced GDP and inflation variables found to be statistically insignificant, suggesting a delayed response of ER to macroeconomic changes. The short-run impact of inflation appears limited across the majority of countries.

In the case of Vietnam, the unusually large short-run coefficient (3460.33) for negative GDP shocks may reflect potential data inconsistencies or structural disruptions during specific periods.

Table 5. Long-run and short-run dynamics of ER.

Country	Long-run GDP effect	Long-run inflation effect	ECT significance	Adjustment speed
Brunei	Positive (**)	Insignificant	Yes (*)	−0.13
Cambodia	Negative (***)	Positive (**)	No	−0.02
Indonesia	Negative (***)	Positive (***)	No	−0.03
Lao PDR	Negative (***)	Positive (**)	Yes (***)	+0.03
Malaysia	Negative (***)	Insignificant	Yes (**)	−0.08
Myanmar	Negative (***)	Positive (***)	No	−0.01
Philippines	Negative (***)	Positive (***)	No	+0.02
Singapore	Insignificant	Negative (*)	Yes (**)	−0.37
Thailand	Negative (***)	Positive (**)	Yes (**)	−0.12
Vietnam	Negative (***)	Positive (**)	No	+0.01

Notes: p-values indicate significance levels at the 1 percent (*p < 0.01), 5 percent (**p < 0.05), and 10 percent (***p < 0.10). ECT = Error Correction Term.

The Error Correction Term (ECT) provides further insights into the adjustment speed towards long-run equilibrium. Significant and negative ECTs in Malaysia, Singapore, and Thailand indicate the presence of a stable long-run relationship and convergence after short-run shocks. For instance, Malaysia's ECT of −0.0841 implies moderate adjustment, suggesting that roughly 8.4% of deviations from equilibrium are corrected each period. In contrast, several countries exhibit insignificant ECTs, indicating limited or no short-run adjustment, possibly due to rigidities in their entrepreneurial ecosystems or structural constraints.

4.5. Robustness Check and Estimator Validation

To verify the stability and reliability of the panel NARDL estimations, a robustness check was conducted by comparing alternative panel estimators under the presence of cross-sectional dependence (CSD) and heterogeneity. The Pesaran (2004) CD tests revealed significant interdependence across countries for entrepreneurial resilience (ER) (CD = 16.75, $p < 0.01$), real GDP per capita (LGDP) (CD = 35.46, $p < 0.01$), and inflation (INF) (CD = 9.95, $p < 0.01$). Residual diagnostics further indicated model misspecification under the Fixed Effects (FE) model, as evidenced by a significant residual CD statistic (CD = 2.822, $p < 0.01$).

In response to these findings, the Common Correlated Effects Mean Group (CCE-MG) estimator, developed by Pesaran (2007), was applied. This estimator effectively captures unobserved common factors and allows for cross-sectional heterogeneity, addressing the limitations of traditional MG and PMG estimators. The CCE-MG results showed that LGDP had a positive long-run effect on ER ($\beta = 0.960$), while INF exerted a mild negative influence ($\beta = -0.044$). Although the standard deviations were large, they reflect the inherent variability across ASEAN countries.

A comparative analysis of MG, PMG, and CCE-MG estimators indicated that the CCE-MG model produced more consistent and theoretically coherent results. Specifically, it addressed both cross-sectional dependence and heterogeneity, thereby validating the robustness of the primary Panel NARDL estimates.

The robustness analysis confirms that the asymmetric relationships identified in the Panel NARDL model remain stable even when accounting for cross-country interdependencies and structural heterogeneity. The use of CCE-MG strengthens the empirical credibility of the study, ensuring that the reported dynamics between economic shocks and entrepreneurial resilience are not artifacts of model misspecification.

4.6. Policy Implications

The heterogeneity in both long-run and short-run responses underscores the need for country-specific entrepreneurial policy interventions. For countries where GDP shocks reduce ER, such as Indonesia and Myanmar, counter-cyclical fiscal and credit policies may be necessary to buffer entrepreneurs during downturns. In countries where inflation stimulates ER, targeted inflation management may need to balance between price stability and entrepreneurial stimulation. The presence of significant ECTs in some countries indicates effective mechanisms for

restoring long-run equilibrium, which should be strengthened in others through improved institutional quality and entrepreneurial support systems.

Overall, the Panel NARDL results demonstrate that entrepreneurial resilience is sensitive to macroeconomic asymmetries, and policies must account for these nonlinearities to foster a robust and adaptive entrepreneurial environment across ASEAN.

5. DISCUSSION

The findings from this study highlight the asymmetric impact of GDP and inflation shocks on entrepreneurial resilience across ASEAN and selected emerging markets. Specifically, the results indicate that negative GDP shocks have a more severe and prolonged adverse effect on entrepreneurial activity than the gains derived from positive GDP growth. This confirms that entrepreneurial behavior is largely pro-cyclical and highly sensitive to contractionary macroeconomic conditions. Such dynamics are consistent with Tajaddini and Gholipour (2021), who found that economic uncertainty significantly deters new firm formation, particularly in developing economies with weaker financial and institutional buffers. Likewise, Mai, Tran, Phan, Nguyen, and Nguyen (2025) demonstrated that GDP growth has a robust, positive influence on entrepreneurship across 70 countries, reinforcing the need for sustained economic expansion as a foundation for entrepreneurial resilience.

In contrast, the relationship between inflation and entrepreneurial resilience appears more complex and non-linear. The present study finds that moderate inflation shocks can stimulate entrepreneurship in some contexts, while excessive or volatile inflation undermines resilience, especially among SMEs. This mixed pattern is echoed in previous research by Fahim and Naamane (2021) and Kubičková, Krošláková, Čakanišin, and Halenárová (2024), both of which show that while mild inflation may prompt opportunity or necessity-driven entrepreneurship, higher inflation often leads to increased business closures. These effects may be particularly pronounced in countries with less developed monetary policy frameworks or inadequate institutional support. Such findings are also reflected in the work of Fatoki (2018), who underscored the importance of access to credit, stable supply chains, and effective inflation control mechanisms in maintaining business continuity during inflationary periods.

Furthermore, the findings reveal substantial cross-country heterogeneity in entrepreneurial responses to macroeconomic shocks, reinforcing the importance of context-specific determinants such as institutional quality, digital infrastructure, and state capacity. Vietnam, for instance, displayed a strong short-run response to GDP shocks, reflecting its proactive industrial policy and entrepreneurial momentum, consistent with observations by Falciola et al. (2023). In contrast, Malaysia and the Philippines exhibited pronounced sensitivity to inflationary pressures, suggesting structural weaknesses in monetary and institutional buffers that impair entrepreneurial resilience. Notably, the COVID-19 crisis demonstrated that exceptional conditions, such as fiscal stimulus, emergency credit access, and accelerated digital adoption, can offset the negative effects of GDP contractions and trigger an uptick in entrepreneurial entry (Bahaj, Piton, & Savagar, 2024). However, such resilience is often short-lived if not accompanied by sustained support, highlighting the imperative for counter-cyclical policy frameworks and institutional reforms to strengthen long-term entrepreneurial capacity amid ongoing economic volatility.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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