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The impact of global economic dynamics on the performance of the manufacturing industry in ASEAN

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Abstract

Aim: This study analysed the impact of global economic dynamics on the performance of the manufacturing industry in ASEAN.

Methodology: The Panel Vector Error Correction Model (VECM) was employed as a quantitative approach to examine both the short-term and long-term relationships between economic growth, exchange rates, inflation, and manufacturing value added in ten ASEAN countries from 1997 to 2022.

Results: The results indicate that inflation exerts a significant negative effect on manufacturing value added in both the short and long run. Exchange rate movements exhibit a delayed negative short-run effect, whereas their long-run effects are statistically insignificant. Economic growth emerges as the principal long-run driver of manufacturing value added.

Implications and recommendations: The findings stress the critical importance of macroeconomic stability in bolstering manufacturing resilience. Policymakers are encouraged to adopt proactive and adaptive strategies aimed at inflation control, exchange rate stabilisation, and sustained economic growth to enhance productivity and competitiveness in the ASEAN manufacturing sector.

Originality/value: This study contributes to the literature by employing a Panel VECM framework to simultaneously capture short-run dynamics and long-run equilibrium relationships among key macroeconomic variables across ASEAN countries. The findings provide new evidence on the dynamic interactions between economic growth, inflation, exchange rates, and manufacturing value added over a period encompassing several major global economic disruptions.

Keywords: global economic dynamics, economic growth, manufacturing industry performance, ASEAN countries

1. Introduction

The manufacturing industry, defined as economic activities involving the transformation of raw materials or intermediate goods into finished or semi-finished products through mechanical, chemical, or technological processes, as classified under the International Standard Industrial Classification (ISIC) categories C (manufacturing), plays a strategic role in the economies of countries in the ASEAN region. Its contribution to gross domestic product (GDP) and job creation makes it a vital sector for regional economic growth (Haraguchi et al., 2017; Jabbour et al., 2020; Ndubisi et al., 2021). As the global economy becomes increasingly interconnected through trade and investment, ASEAN's manufacturing sector is oriented toward both domestic and international markets and highly depends on international trade and foreign direct investment (FDI). Consequently, changes in global economic dynamics significantly impact this sector's development (Ahmad et al., 2018; Contractor et al., 2020; Tan et al., 2016; Vogiatzoglou, 2016).

The dynamics of the global economy continue to experience rapid change with a high level of uncertainty. After undergoing the devastating effects of the COVID-19 pandemic, the global economic recovery process still faces major challenges (Fakhruddin et al., 2020; Ibn-Mohammed et al., 2020; Jomo & Chowdhury, 2020; Rauf et al., 2023). The prolonged Russia–Ukraine conflict has constrained energy supplies and driven global food prices upward (Li & Tanna, 2019; Lin et al., 2023; Pahl & Timmer, 2020). At the same time , escalating trade and technology tensions between the United States and China, marked by tariffs, export controls on semiconductors and strategic decoupling, have continued to disrupt global trade volumes and supply chains (Abiad et al., 2018; Bown, 2021; Liu & Woo, 2018; Woods, 2025). Furthermore, the escalation of the Israeli–Palestinian conflict since October 2023 has intensified geopolitical tensions in the Middle East and heightened global instability. All this has further slowed economic recovery and increased inflationary pressures due to restricted energy and food. In response to rising inflation, major central banks have implemented monetary tightening policies, including interest rate hikes, which – together with expansive fiscal policies – have added to global financial market uncertainty.

These structural changes in the global economy have brought significant challenges for the ASEAN manufacturing industry, a sector that has long served as the backbone of regional growth. The region's

heavy dependence on global supply chains and exports makes it vulnerable to disruptions caused by trade conflicts, commodity price volatility, and restrictive monetary policies enacted by major economies (Bhattacharyya, 2021; Phuong Loan & Giang, 2020; X.-X. Zhao et al., 2020). The COVID-19 pandemic intensified these problems, severely disrupting global logistics and triggering shortages of raw materials, which drove up production costs. Given the industry's reliance on imports, particularly from China, ASEAN manufacturing industry has faced severe production constraints resulting from supply instability and rising transportation costs (Castañeda-Navarrete et al., 2021; Khan et al., 2022; Teng et al., 2021; Wang et al., 2021; Yu et al., 2022).

These challenges highlight the structural vulnerabilities of ASEAN's manufacturing sector and the risks inherent in overdependence on global supply chains. As global economic changes continue to unfold, the region's manufacturing industry must adopt stronger adaptation strategies. These include diversifying sources of raw materials, optimising domestic supply chains, and accelerating the digitalisation of production processes (Butt, 2022; Dubey et al., 2023; Kittipanya-ngam & Tan, 2020; N. Zhao et al., 2023). Increasing ASEAN's manufacturing sector competitiveness is now contingent on the ability of individual countries to design resilient policies and foster deeper regional economic integration to withstand global uncertainty.

Moreover, the global trend toward protectionism evident in the U.S.–China trade war, has restructured trade and investment flows. While countries like Vietnam have benefited from manufacturing investment diverted from China, uncertainty in global trade policies poses risks for industries dependent on exports (Akbari et al., 2024; Belhadi et al., 2022; Dubey et al., 2023; Le et al., 2019). Global monetary policy shifts have also influenced ASEAN economies. For instance, the US Federal Reserve's rate hikes have triggered capital outflows and currency depreciation across the region, increasing the cost of imported manufacturing inputs (International Monetary Fund. Monetary and Capital Markets Department, 2022). However, under certain conditions, exchange rate depreciation may also enhance export competitiveness by lowering the relative prices of domestically produced goods in international markets, thereby supporting export growth, particularly for manufacturing sectors with high domestic value added (International Monetary Fund, 2023).

Despite these challenges, opportunities remain for ASEAN to enhance its manufacturing resilience. The adoption of Industry 4.0 technologies can improve production efficiency and reduce dependence on cheap labour (ASEAN Secretariat, 2023; Asian Development Bank, 2023). Countries such as Singapore and Malaysia have advanced in automation and digitalization, whereas others still face limitations in infrastructure and workforce capabilities (Oikawa et al., 2024). Additionally, strategies to diversify export markets away from traditional partners such as the US and the EU towards the Middle East, Africa, and Latin America are being explored (Pangboonyanon & Kalasin, 2018; Vogiatzoglou, 2016).

Nonetheless the literature remains limited in terms of empirical studies that directly analyse the specific impacts of global economic dynamics on ASEAN's manufacturing performance. Most of the existing research tends to focus on macroeconomic relationships in general, without disaggregating their influence on industrial output, therefore this study addressed these gaps and assessed how economic growth, inflation, and exchange rate fluctuations influenced the performance of ASEAN manufacturing industries, particularly during crisis periods such as the 1997−1998 Asian Financial Crisis, the 2007–2008 Global Financial Crisis, and the 2020–2022 COVID-19 economic disruption.

2. Literature review

The manufacturing sector has consistently played a central role in driving ASEAN's economic transformation. As of 2024, ASEAN contributes approximately 3.6% to global GDP, with manufacturing serving as a primary engine for exports, employment, and domestic value creation (Ishikawa, 2021; The ASEAN Secretariat, 2024), however deeper integration into global trade and investment networks has increased the sector's exposure to international macroeconomic fluctuations (Kawai & Naknoi, 2015).

Recent global disruptions, including the COVID-19 pandemic, the Russia–Ukraine conflict, and the U.S.–China trade war, have amplified these vulnerabilities. Supply chain disruptions, energy and food price shocks, and heightened trade policy uncertainty have significantly affected manufacturing input costs, production continuity, and investor confidence (Akadiri & Ozkan, 2025; Milton et al., 2024; World Bank, 2024). In addition, monetary tightening by major advanced economies has triggered capital outflows from emerging regions such as ASEAN, contributing to exchange rate depreciation and higher import costs for manufacturing inputs (Tran & Pham, 2020), yet it should be noted that under certain conditions, exchange rate depreciation may also enhance export competitiveness by lowering export prices in foreign markets.

Previous studies showed that economic growth positively influences manufacturing performance through increased domestic demand and investment incentives (Emery, 1967). Conversely, inflation tends to undermine competitiveness by increasing production costs and eroding company margins, thereby constraining expansion and innovation. Exchange rate volatility further complicates manufacturing performance: while it raises costs for firms dependent on imported inputs, it may also affect export competitiveness in asymmetric ways (Nguyen & Do, 2020; Zhu et al., 2022). Although a substantial body of literature focuses on exchange rates and export performance (Handoyo et al., 2023; Vieira & MacDonald, 2016), relatively few studies examined how exchange rate movements affected domestic production costs, pricing structures, and manufacturing value added. This gap is particularly important given the heterogeneous levels of import dependence across ASEAN economies.

Differences in industrial structure further shape these macroeconomic impacts. Export-oriented economies such as Vietnam may respond differently to global shocks compared to countries with stronger domestic consumption bases, e.g. Indonesia (Bi & Xin, 2021). Theoretical perspectives from global value chain analysis emphasised ASEAN's embeddedness in international production networks, while dependency theory highlights the risks associated with excessive external reliance (Kuran, 2024). Taken together, these frameworks underlined the importance of structural transformation to enhance manufacturing resilience. Recent literature also highlighted adaptive strategies including digital transformation and supply chain reconfiguration. Countries such as Singapore and Malaysia have made significant progress in manufacturing digitalisation, while several ASEAN members still face structural and technological constraints (Kim et al., 2019; Oikawa et al., 2024). Government intervention through flexible, innovation-oriented industrial policies has been shown to strengthen sectoral resilience and competitiveness (Butt, 2022; Dubey et al., 2023).

Despite these contributions the literature lacks comprehensive cross-country analyses assessing how global macroeconomic shocks affect manufacturing value added in ASEAN over both the short and the long run. Most studies either focused on macroeconomic aggregates or explored export outcomes. Addressing this gap, the paper examines the dynamic short and long-term effects of economic growth, inflation, and exchange rate movements on manufacturing value added across ten ASEAN countries from 1997 to 2022.

3. Research method

The author employed a quantitative econometric approach to analyse the impact of global economic dynamics on manufacturing performance in ASEAN. A Panel Vector Error Correction Model (VECM) was applied to examine the long-term equilibrium relationships and the short-term dynamics between manufacturing value added and key macroeconomic variables: economic growth, exchange rates, and inflation. The dataset comprised annual panel data for the following ten ASEAN countries: Brunei Darussalam, Indonesia, Cambodia, Laos, Myanmar, Malaysia, the Philippines, Singapore, Thailand, and Vietnam, covering the period 1997–2022. All the data were sourced from the World Bank.

Stationarity was tested using the Levin, Lin, and Chu (LLC) panel unit root test. The hypotheses of the LLC test are as follows:

H0: The variable contains a unit root (non-stationary),

H1: The variable is stationary.

Variables that were non-stationary at level were differenced until stationarity was achieved at order I(1). Cointegration was then examined using the Johansen-Fisher panel cointegration test, which combines the country-specific Johansen trace and maximum-eigenvalue statistics through Fisher's method. Let $g = 4$ denote the number of endogenous variables; the statistics are computed sequentially for $r = 0, 1, \ldots, g - 1$, where r is the number of cointegrating vectors under the null. The two tests use different hypotheses:

Trace test – H_0: $rank \leq r$ (at most r cointegrating vectors) vs. H_1: $rank > r$

Maximum-eigenvalue test – H_0: $rank = r$ vs. H_1: $rank = r + 1$.

The presence of cointegration justified the use of a Panel VECM framework (Gujarati, 2004; Gujarati & Porter, 2013). The lag order selection procedure indicated that the optimal lag length was two periods ($p = 2$) according to the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan-Quinn Criterion (HQ). Therefore, a lag structure of two periods was employed in the subsequent panel VECM estimation.

Long-Run Cointegration Equation:

$$VA_{it} = \alpha_0 + \beta_1 EG_{it} + \beta_2 EXC_{it} + \beta_3 INF_{it} + \varepsilon_{it}. \quad (1)$$

Short-Run Panel VECM with Error Correction Term:

The Vector Error Correction Model (VECM) is inherently a multi-equation system, where all endogenous variables are jointly determined. Accordingly, the Panel VECM in this study consisted of four endogenous variables, i.e. manufacturing value added (VA), economic growth (EG), exchange rates (EXC), and inflation (INF), specified as follows:

$$\Delta y_{it} = \alpha_i + \sum_{j=1}^{p} \Gamma_j \Delta y_{i,t-j} + \lambda ECT_{i,t-1} + \varepsilon_{it}, \quad (2)$$

$$y_{it} = (VA,\ EG,\ EXC,\ INF)', \quad (3)$$

where y_{it} was the vector of endogenous variables consisting of value added (*VA*), economic growth (*EG*), exchange rate (*EXC*), and inflation (*INF*). The coefficient matrices Γ_j contain the short-run dynamic coefficients, while λ represents the speed of adjustment toward the long-run equilibrium. $ECT_{i,t-1}$ was the Error Correction Term derived from the cointegration equation. ECT denotes the speed of adjustment to long-term equilibrium, and if λ is significant and negative, the imbalance is corrected in the short term. To examine the dynamic effects of macroeconomic shocks on manufacturing value added, an Impulse Response Function (IRF) analysis was conducted. The IRF traces the dynamic responses of the endogenous variables to one-standard-deviation innovations over the forecast horizon, providing insights into the adjustment process following unexpected shocks. In addition, Historical Decomposition (HD) analysis was employed to examine how accumulated structural shocks contributed to the historical movements of manufacturing value added, economic growth, exchange rates, and inflation over the sample period. This approach provides a historical interpretation of the relative contribution of each shock to the observed evolution of the endogenous variables within the Panel VECM framework.

4. Results and discussion

Table 1 presents the descriptive statistics of all the variables used in this study, including their measurement units. Value Added (VA) was measured in logarithmic form of real manufacturing value

added (index), Economic Growth (EG) was calculated as annual GDP growth rate (percent), Exchange Rate (EXC) was expressed as the domestic currency per USD (local currency unit/USD), and Inflation (INF) as annual percentage change in the consumer price index. Value Added (VA) averaged 20.21885 with a median of 20.50089. The maximum VA value was recorded at 31.95328, while the minimum value reached 7.452727, indicating a relatively symmetric distribution, even though it had a fairly wide data range. Meanwhile, EG (economic growth) had an average of 4.616021 and a median of 5.397898, with a maximum value of 14.51975 and a minimum of -13.1267. This reflected significant fluctuations in economic growth rates, including periods of high growth and deep recession.

Table 1. Descriptive statistical data

Variable	Unit	Mean	Median	Maximum	Minimum
VA	Index (log)	20.21885	20.50089	31.95328	7.452727
EG	Percent (%)	4.616021	5.397898	14.51975	-13.1267
EXC	LCU/USD	4196.255	47.67969	23271.21	1.249567
INF	Percent (%)	5.142996	2.975071	125.2721	-2.31497

Source: Processed data, 2024.

Value Added (VA) showed a relatively symmetric distribution, with a mean of 20.22 and a median of 20.50, although the wide range indicated heterogeneous performance across countries and periods. Economic growth (EG) exhibited substantial volatility, reflecting episodes of strong expansion and deep contraction. The exchange rate variable (EXC) displayed extreme dispersion, indicating periods of severe depreciation, particularly during crisis episodes. Inflation (INF) also showed large variability, ranging from deflationary episodes to extremely high inflation, consistent with macroeconomic instability during crisis periods.

Before estimating the VECM, the stationarity properties of the variables were examined using the Levin, Lin, and Chu (LLC) panel unit root test, with a significance level of 5%.

Table 2. Unit root test

Variable	Level Statistic	Level Prob	First Difference Statistic	First Difference Prob	Information
VA	-1.2315	0.8912	-10.345	0.0000***	Stationary after differencing
EG	-0.8421	0.7723	-18.383	0.0000***	Stationary after differencing
EXC	1.03537	0.8498	-9.808	0.0003***	Stationary after differencing
INF	-1.5378	0.6450	-21.177	0.0000***	Stationary after differencing

Notes: *, **, *** denote significance at 10%, 5%, and 1%

Source: processed data, 2024.

At the 5% significance level, all the variables failed to reject the null hypothesis of a unit root at level, indicating non-stationarity. After first differencing, all the variables became stationary at the 1% level. These results confirmed that VA, EG, EXC, and INF were integrated of order one, I(1), satisfying the necessary condition for cointegration analysis and VECM estimation.

Table 3. Johansen Fisher panel cointegration test

Hypothesised No. of CE(s)	Fisher Stat. (Trace Test)	Prob. (Trace Test)	Fisher Stat. (Max-Eigen test)	Prob. (Max-Eigen Test)
None	322.3	0.0000	241.5	0.0000
At most 1	181.7	0.0000	139.8	0.0000
At most 2	103.7	0.0000	81.15	0.0000
At most 3	64.27	0.0000	64.27	0.0000

Source: processed data, 2024.

Both the trace and maximum-eigenvalue Fisher statistics reject the null of no cointegration ($r = 0$) at the 1% level, confirming a long-run equilibrium relationship among manufacturing value added, economic growth, the exchange rate and inflation, and thereby justifying a VECM rather than a VAR in first differences. The statistics also reject every successive hypothesis up to the maximum; taken literally this would imply full rank ($r = 4$, i.e. stationary levels), which is incompatible with the unit-root evidence that all four series are $I(1)$. Such a pattern is consistent with the well-documented tendency of Fisher-combined panel cointegration tests to over-reject at moderate N, so the exact cointegration rank is not sharply identified by this procedure. Because the analysis centres on a single long-run relationship — manufacturing value added as a function of the three macroeconomic drivers – and in the interest of parsimony and interpretability, the VECM is specified with one cointegrating vector ($r = 1$). This rank is thus adopted as a maintained assumption rather than inferred from the panel test. Any further cointegrating relations that may be present are not modelled; a more robust determination of the panel rank (e.g. country-by-country Johansen testing or information-criterion-based selection) is left for future research.

Table 4. Short-term VECM results (dependent variable: *ΔVA*, 1997−2022)

Variables	Coefficients	t-Statistics	Significance
CointEq1	-0.00081	-1.69302	*
D(VA(-1))	0.136002	1.87623	*
D(VA(-2))	0.039583	0.555	n.s.
D(EG(-1))	-0.00715	-0.29518	n.s.
D(EG(-2))	0.000675	0.02706	n.s.
D(EXC(-1))	0.000315	1.34759	n.s.
D(EXC(-2))	-0.00062	-3.64102	***
D(INF(-1))	-0.0369	-3.21376	***
D(INF(-2))	-0.02236	-2.25008	**

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively; n.s. indicates not statistically significant.

The panel VECM was estimated using an optimal lag length of 2 selected based on AIC, SBC, and HQ criteria. CointEq1 represents the estimated error correction term (ECT) derived from Equation (1).

Source: processed data, 2024.

The error correction term (ECT) captures the speed of adjustment toward long-run equilibrium. The estimated coefficient is negative (-0.00081) and statistically significant at the 10% level, indicating the existence of a long-run equilibrium relationship. However, the magnitude of the coefficient is very small, implying that the speed of adjustment toward equilibrium is relatively slow. Thus, deviations from the long-run equilibrium are corrected only gradually over time. The exchange rate exhibited different effects across lags. Although the first lag carried a positive coefficient, it was not statistically significant. In contrast, the second lag showed a statistically significant negative effect, suggesting that exchange rate depreciation exerts a delayed adverse impact on manufacturing value added. Inflation consistently had a negative and statistically significant impact in the short run, indicating that rising prices quickly erode manufacturing value added through higher production costs and reduced purchasing power.

To avoid ambiguity, the 1997−1998 Asian Financial Crisis, the 2007−2008 Global Financial Crisis, and the 2020–2022 COVID-19 pandemic were discussed solely as a historical context for interpreting the estimated results. The Panel VECM was estimated using the full sample period (1997−2022) to capture both the short-term dynamics and the long-term equilibrium relationships among the variables.

4.1. Asian Financial Crisis 1997−1998

These findings are consistent with the macroeconomic conditions observed during the Asian Financial Crisis of 1997−1998, exchange rates in countries such as Indonesia, Thailand, and Malaysia experienced sharp depreciation. The exchange rate fluctuations had a significantly negative impact on value-added in the manufacturing sector, especially in the second lag. These findings are consistent with the economic instability experienced during the Asian Financial Crisis, reducing purchasing power and slowing productive investment. High inflation during this period, consistent with VECM results, exacerbated the situation by further suppressing purchasing power and hindering growth in manufacturing sectors reliant on imported raw materials. Sectors such as textiles and electronics in ASEAN were particularly affected by the crisis, while in the EU, manufacturing sectors were better able to cope with currency fluctuations due to stronger fiscal policies and economic integration (European Commission, 2009). This comparison highlights the differing economic resilience between ASEAN and the EU when facing major macroeconomic shocks.

4.2. Global Financial Crisis 2007−2008

The 2007–2008 Global Financial Crisis had a more moderate impact on Southeast Asia compared to previous Asian crises, although sectors such as exports and banking were still affected. In the VECM analysis, economic growth (*EG*) showed no significant effect in the short term, reflecting unstable growth patterns during this crisis. In the EU, manufacturing also faced a significant impact, but the stronger and more coordinated monetary policies allowed EU countries to recover faster than ASEAN nations. In ASEAN, exchange rate volatility remained a crucial factor, with results from VECM showing that fluctuations in the exchange rate due to the global crisis played a role in suppressing value-added in manufacturing, particularly in the electronics and automotive sectors. This crisis further demonstrated that ASEAN countries, more dependent on exports, are more vulnerable to global fluctuations, whilst the EU, with its deeper markets and more robust fiscal responses, experienced a more manageable impact (Torriti et al., 2010).

4.3. Economic Crisis due to the 2020−2022 COVID-19 pandemic

The COVID-19 pandemic of 2020−2022 led to a large contraction in Southeast Asia, particularly in the tourism, manufacturing, and trade sectors. Disruptions in global supply chains caused commodity prices to rise, leading to inflation. The VECM results showed the significant impact of inflation on value-added in ASEAN's manufacturing sector, where industries such as automotive, textiles, and consumer goods were particularly hit. Exchange rate volatility also impacted productivity and output, as global economic uncertainty made business planning and investment more difficult. In the EU, while the pandemic also led to an economic contraction, the manufacturing sector was better protected by stronger government policies and larger fiscal stimulus packages (Dorn et al., 2020). These measures allowed manufacturing in the EU to recover more quickly than ASEAN, which faced structural challenges in managing the deep economic crisis.

Table 5. Long-term cointegration equation

Variables	Coefficients	*t*-Statistics	Significance	Description
EG	14.2183	4.08821	***	Long-term effect of EG
EXC	0.00245	1.57388	n.s.	Long-term effect of EXC
INF	-30.4035	-20.794	***	Long-term effect of INF

Notes: *, **, *** denote significance at 10%, 5%, and 1%

Source: Processed data, 2024.

The long-term VECM regression results provided a clear picture of the relationship between economic growth (EG), exchange rate (EXC), and inflation (INF) on added value (VA). Economic growth had a significant positive impact on added value, with a coefficient of 14.2183 and a significance level of 1%. Increasing economic growth encouraged productivity and output, ultimately increasing added value. This finding aligns with economic growth theory, which states that increasing GDP increases investment, job creation, and production of goods and services (Mankiw, 2021).

In contrast, the exchange rate (EXC) did not show a significant effect in the long term, with a coefficient of 0.00245 and a t-statistic of 1.57388, indicating that the impact of exchange rate fluctuations was more pronounced in the short term. In the long term, exchange rate volatility tends to be offset by price adjustments and monetary policy (Krugman & Obstfeld, 2020). Dornbusch (1980) supported this view, stating that foreign exchange markets achieve long-term equilibrium through adjustments in price mechanisms and market structure.

Inflation (INF) also had a very significant negative impact on added value, with a coefficient of -30.4035 and a significance of 1%. High inflation drastically reduces consumer purchasing power, increases production costs, and creates uncertainty that harms investment and productivity, hence inflation reduces added value in the long term (Blanchard, 2017). This view was also supported by (Friedman, 1977), who stressed that uncontrolled inflation destroys economic balance and creates negative pressure on productive sectors. These results show that strong economic growth is the main driver of increasing added value, whereas uncontrolled inflation damages the economic balance and reduces the ability of productive sectors to contribute to added value (Friedman, 1977). The exchange rate does not have a significant impact in the long term, indicating that its influence is more temporary (Dornbusch, 1980).

During the three major crises – the 1997-1998 Asian Financial Crisis, the 2007-2008 Global Financial Crisis, and the 2020−2022 COVID-19 Pandemic Economic Crisis – countries in Southeast Asia, such as Indonesia, Thailand, Malaysia, the Philippines, and Singapore, experienced a significant economic impact. During the 1997-1998 Asian Financial Crisis, exchange rates (EXC) in these countries fell sharply, especially the Thai baht and the Indonesian rupiah, which triggered a banking crisis and a drastic inflation (INF) increase, as seen in the high inflation graph. The value added (VA) of key sectors, including manufacturing and banking, also experienced a significant decline, reflecting a loss of market confidence and massive capital outflows. Economic growth (EG) across the region contracted sharply, with some countries (e.g.Indonesia) experiencing deep recession.

During the 2007-2008 Global Financial Crisis, Southeast Asian countries experienced a more controlled economic decline than in the 1997−1998 crisis. The exchange rate was volatile, but the graph (see Figure 1) shows more moderate fluctuations, especially in export-dependent countries, e.g. Malaysia and Singapore. The financial and export sectors were subject major pressure, but inflation remained relatively stable due to falling global commodity prices. Economic growth in this region slowed but did not enter into a deep recession, thanks to responsive fiscal policy and banking sector stability.

Economic growth exerted a strong and statistically significant positive long-run effect on manufacturing value added, supporting the predictions of endogenous and neoclassical growth theories that sustained economic expansion enhances production capacity and industrial productivity. Conversely, inflation had a highly significant negative long-run effect, indicating that persistent price increases reduce manufacturing value added by raising production costs, weakening purchasing power, and discouraging investment. The exchange rate did not have a statistically significant long-run effect, suggesting that exchange rate fluctuations are primarily short-term phenomena whose impacts are gradually absorbed through market adjustments and macroeconomic policy responses. Furthermore, the negative and statistically significant error correction term (ECT) indicates the existence of a long--run equilibrium relationship among the variables. However, its relatively small coefficient implies that the adjustment of manufacturing value added toward its long-run equilibrium occurs gradually, reflecting a slow speed of adjustment following short-run disequilibrium. Overall, the results suggest

that economic growth and inflation are the principal long-run determinants of manufacturing value added, while exchange rate movements mainly influence the economy in the short run.

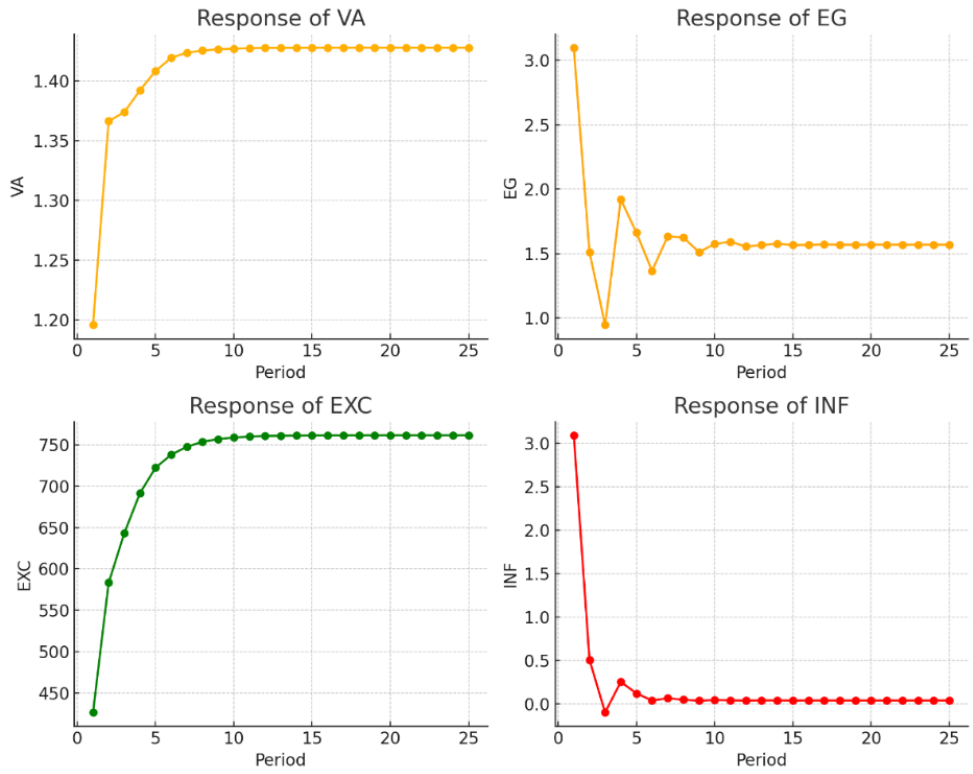


Fig. 1. Impulse Response Functions (IRFs) of Value Added (VA), Economic Growth (EG), Exchange Rate (EXC), and Inflation (INF) following their own one-standard-deviation innovations.

Source: processed data, 2024.

Figure 1 presents the impulse response functions (IRFs) of the endogenous variables – value added (VA), economic growth (EG), exchange rate (EXC), and inflation (INF) – following their own one-standard-deviation shocks. Overall, the responses gradually converge toward stable paths over the forecast horizon, indicating that the estimated Panel VECM is dynamically stable and that temporary disturbances are progressively absorbed rather than generating persistent divergence from the long--run equilibrium.

Following its own innovation, value added (VA) exhibits an immediate positive response during the initial periods before gradually converging to a stable level. This pattern suggests that shocks affecting manufacturing value added are persistent in the short run but gradually diminish over time, reflecting the sector's ability to adjust toward equilibrium. The absence of prolonged oscillations further indicates a relatively stable adjustment mechanism within the manufacturing sector following temporary disturbances.

Economic growth (EG) displays a different dynamic adjustment pattern. The response fluctuates considerably during the initial periods before gradually stabilising after approximately the tenth forecast period. These temporary oscillations indicate that economic growth requires a longer adjustment process following unexpected shocks; however, the eventual convergence confirms that the effects of such disturbances are transitory rather than permanent.

The exchange rate (EXC) responds positively to its own innovation, increasing rapidly in the early periods before gradually approaching a stable plateau. This behaviour suggests that exchange rate disturbances are progressively absorbed through market adjustment mechanisms and macroeconomic policy responses, thereby reducing the persistence of exchange rate volatility over time.

Inflation (INF) exhibits the fastest adjustment among the endogenous variables. Following a substantial initial response, inflation declines rapidly and converges toward a value close to zero within a relatively short period. This rapid convergence indicates that inflationary shocks dissipate more quickly than shocks affecting the other variables, suggesting a relatively efficient adjustment process after temporary price disturbances. These dynamic response patterns can be interpreted within the broader context of major economic disruptions experienced during the observation period, including the 1997––1998 Asian Financial Crisis, the 2007–2008 Global Financial Crisis, and the 2020–2022 COVID-19 pandemic. During the COVID-19 pandemic, manufacturing activity and economic growth contracted sharply across many ASEAN economies, particularly those with strong dependence on tourism and international trade. The subsequent recovery was supported by expansionary fiscal and monetary policies, supply chain adjustments, and large-scale vaccination programmes, which helped restore economic activity (Ferrero et al., 2021; Larson et al., 2022; Michael et al., 2021; Song & Zhou, 2020). Although Figure 1 does not depict these historical events directly, the impulse response functions provide a useful framework for understanding how the endogenous variables adjust following unexpected macroeconomic shocks under the estimated dynamic relationships.

In general, the impulse response analysis demonstrates that all endogenous variables gradually converge toward stable paths following their respective shocks, although the speed and pattern of adjustment differ across variables. These findings complement the Panel VECM estimation by confirming the dynamic stability of the system. Consistent with the long-run estimation results, economic growth remains an important driver of manufacturing performance, while exchange rate movements and inflation primarily influence short-run adjustment dynamics before the economy gradually returns to its long-run equilibrium.

Figure 2 presents the historical decomposition of the endogenous variables – value added (VA), economic growth (EG), exchange rate (EXC), and inflation (INF) – using the Cholesky decomposition approach. Unlike forecast error variance decomposition, historical decomposition illustrates how accumulated structural shocks contribute to the realised historical movements of each endogenous variable over the sample period. Consequently, the figure highlights the dynamic contribution of each shock to the observed evolution of the variables rather than the percentage contribution to forecast error variance.

The historical decomposition of value added (VA) indicates that the realised path of manufacturing value added reflects the combined influence of its own innovations together with shocks originating from economic growth, exchange rate, and inflation. During several periods, the contribution of these shocks changes substantially, suggesting that fluctuations in manufacturing performance were driven by evolving macroeconomic conditions rather than by a single dominant source of disturbance. Economic growth (EG) also exhibits considerable variation in the contribution of historical shocks throughout the observation period. The decomposition indicates that both own shocks and shocks transmitted from the other endogenous variables contributed to the observed fluctuations in economic growth, reflecting the interconnected nature of macroeconomic dynamics within the estimated Panel VECM framework.

The exchange rate (EXC) demonstrates substantial historical fluctuations over time, with exchange-rate innovations accounting for an important share of its realised movements. Nevertheless, shocks originating from value added, economic growth, and inflation also contribute to exchange-rate dynamics, indicating that exchange rate behaviour is influenced by broader macroeconomic interactions rather than by exchange-rate shocks alone. Inflation (INF) displays changing historical contributions across the sample period, reflecting the interaction between inflationary shocks and the other endogenous variables. The decomposition suggests that inflation dynamics are shaped by multiple sources of macroeconomic disturbances, with the relative importance of these shocks varying over time as economic conditions evolve.

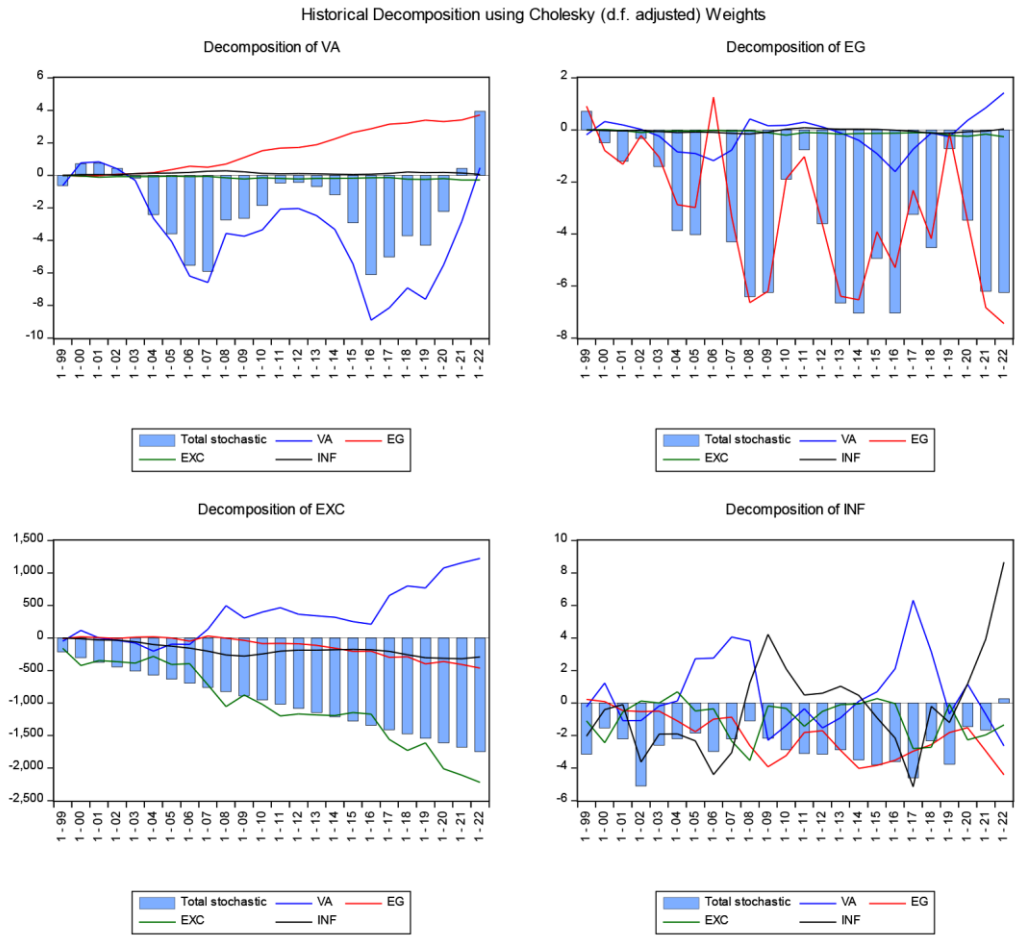


Fig. 2. Historical decomposition of Value Added (VA), Economic Growth (EG), Exchange Rate (EXC), and Inflation (INF)

Source: processed data, 2024.

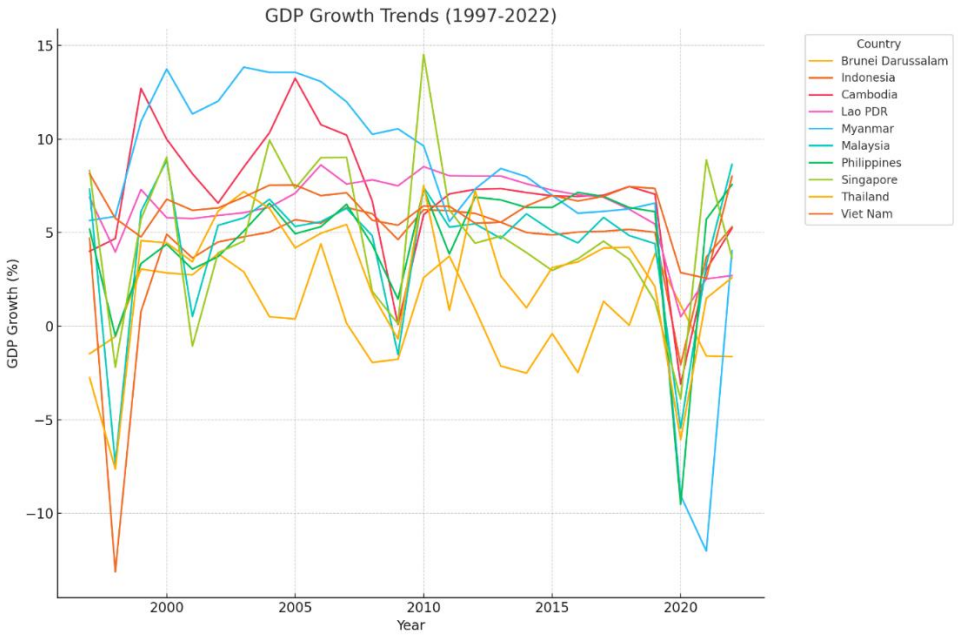


Fig. 3. Economic growth trends in ASEAN countries 1997–2022

Source: World Bank, 2024.

The historical decomposition is particularly useful for interpreting major macroeconomic events that occurred during the sample period, including the 1997−1998 Asian Financial Crisis, the 2007−2008 Global Financial Crisis, and the 2020−2022 COVID-19 pandemic. The varying contributions of structural shocks across these episodes indicate that the realised movements of manufacturing value added and other macroeconomic variables were shaped by different combinations of disturbances over time, highlighting the dynamic nature of the economic adjustment process.

During the 1997−1998 Asian financial crisis, many countries experienced sharp economic contractions. Indonesia was one of the countries most affected, with economic growth plummeting to -13.13% in 1998, before recovering slightly the following year. Thailand and Malaysia also experienced a drastic decline with the negative growth of -7.63% and -7.36% respectively, in 1998. However, in 1999, these countries emerged from the crisis and recorded positive growth, although slower than before. Singapore and Brunei Darussalam were also affected but quickly recovered after a brief contraction in 1998.

The 2007−2008 global financial crisis again tested the resilience of the Southeast Asian economy, but its impact was more moderate than the previous crisis. Indonesia continued to show its resilience, growing by 6.01% in 2008 even though affected by the crisis. Malaysia, Thailand, and Cambodia experienced a marked slowdown in growth, with growth declining but still positive. On the other hand, Singapore, one of the region's most open economies, felt a greater impact, with growth falling sharply from 9.02% in 2007 to 1.86% in 2008. Although burden with the impact, most countries could still maintain positive economic growth during this crisis period.

The deepest impact occurred during the COVID-19 pandemic in 2020-2022, when almost all countries experienced a significant economic contraction in 2020. Indonesia recorded a negative growth of -2.07% in 2020, while Malaysia recorded a sharp contraction of -5.46%. Myanmar was affected even harder, with a contraction of -9.05% in 2020 and -12.02% in 2021, resulting in a prolonged crisis. On the other hand, countries such as Singapore and Malaysia recovered quickly in 2021 and 2022, recording strong growth after drastic declines in the first year of the pandemic. Cambodia also showed a steady recovery after the contraction in 2020.

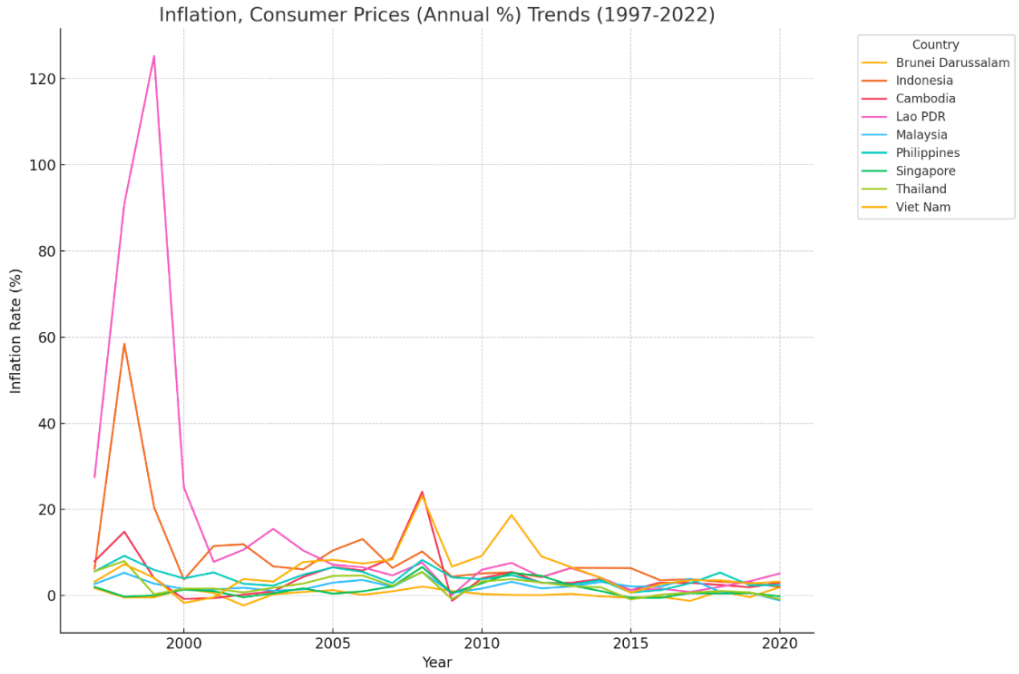


Fig. 4. Inflation trends in ASEAN countries 1997-2022

Source: World Bank, 2024.

During the 1997−1998 Asian Financial Crisis, many countries experienced significant inflation spikes. Indonesia was one of the countries most affected, with inflation reaching 58.45% in 1998. The instability of the rupiah currency and a severe economic crisis caused prices to rise significantly. Lao PDR also showed an extreme spike in inflation, reaching 90.98% in 1998 and increasing further to 125.27% in 1999, reflecting the major impact of the crisis on the country. In contrast, several countries, such as Brunei Darussalam and Singapore, managed to maintain low inflation and even experienced deflation, recording inflation of -0.44% and -0.27%, respectively, in 1998, showing their ability to maintain economic stability amidst the crisis.

In comparison, the EU was not directly impacted by the 1997−1998 crisis as it was predominantly regional to Asia. Inflation rates in the EU remained relatively stable, and the economic turmoil did not significantly disrupt European markets. This contrast highlights the vulnerability of emerging ASEAN economies to capital flight and currency depreciation, particularly in some sectors, including banking, manufacturing, and food distribution, which were highly exposed to foreign debt and global commodity prices. The manufacturing subsector in ASEAN – especially textile, electronics and automotive components – was heavily affected due to rising import costs, reduced export demand, and foreign investor withdrawal, whereas in the EU these subsectors continued operating in a relatively stable way due to better access to credit and less dependence on short-term capital flows.

Furthermore, during the 2007-2008 Global Financial Crisis the impact on inflation in Southeast Asia was more varied but relatively more controlled than the previous crisis. Indonesia experienced a moderate increase in inflation of 10.22% in 2008, while Vietnam recorded quite high inflation, reaching 23.11% in the same year. Cambodia was also subject to high inflation at 24.09% in 2008, indicating vulnerability to rising prices of consumer goods. On the other hand, other countries (e.g. Brunei) remained stable, with inflation of only 2.08% in 2008, while Singapore experienced a slight spike in inflation to 6.62% in the same year, yet it managed to regain control in the following years.

In the EU, inflation during the Global Financial Crisis remained relatively lower, with many countries recording disinflation due to credit tightening and collapsing demand. Unlike ASEAN, where food and energy prices significantly drove inflation, the EU saw price stability due to its diversified economic base and stronger fiscal coordination. The most affected ASEAN subsectors during this crisis were food supply chains, energy-related industries, and manufacturing – particularly export-oriented factories in garments and electronics that faced declining global demand. In contrast, the EU's manufacturing sector experienced a slower decline, supported by government stimulus and social protection policies, although some industries, e.g. automotive and machinery, still suffered from weakened export markets.

The latest crisis, i.e. the 2020–2022 COVID-19 pandemic crisis, uniquely impacted inflation. In 2020 many countries experienced very low inflation or deflation due to reduced demand following lockdowns and economic restrictions. Brunei and Singapore recorded negative inflation, respectively -0.39% and -0.18% in 2020, yet along with economic recovery and global supply chain disruptions, inflation rose in 2021 and 2022. Indonesia recorded an increase in inflation to 4.21% in 2022, while Malaysia also saw an increase to 3.38% in 2022, whereas Vietnam, which showed a faster recovery, recorded inflation of 3.16% in 2022.

The EU experienced a sharp surge in inflation during the post-pandemic recovery period, with several countries recording inflation above 8% in 2022, primarily driven by energy prices following the Russia––Ukraine conflict. This was different from ASEAN, where inflation remained relatively moderate due to continued subsidies and more gradual reopening. The manufacturing subsector in ASEAN faced challenges such as labour shortages, input material delays, and export bottlenecks, especially in electronics and processed foods. In contrast, EU manufacturers were more heavily impacted by energy price volatility and transportation costs, particularly in energy-intensive industries such as chemicals, steel, and automotive, which faced higher production costs and input shortages.

In general, the impact of the crisis on inflation varied greatly in each period. During the 1997-1998 crisis, many countries experienced very high inflation, while the 2007-2008 global crisis had a more moderate impact on inflation in most countries. The COVID-19 pandemic created a new dynamic, with low inflation initially followed by inflation spikes due to global supply disruptions in subsequent years. These three crises demonstrated the importance of appropriate domestic policies to maintain price stability and reduce the negative impact of the global economic crisis.

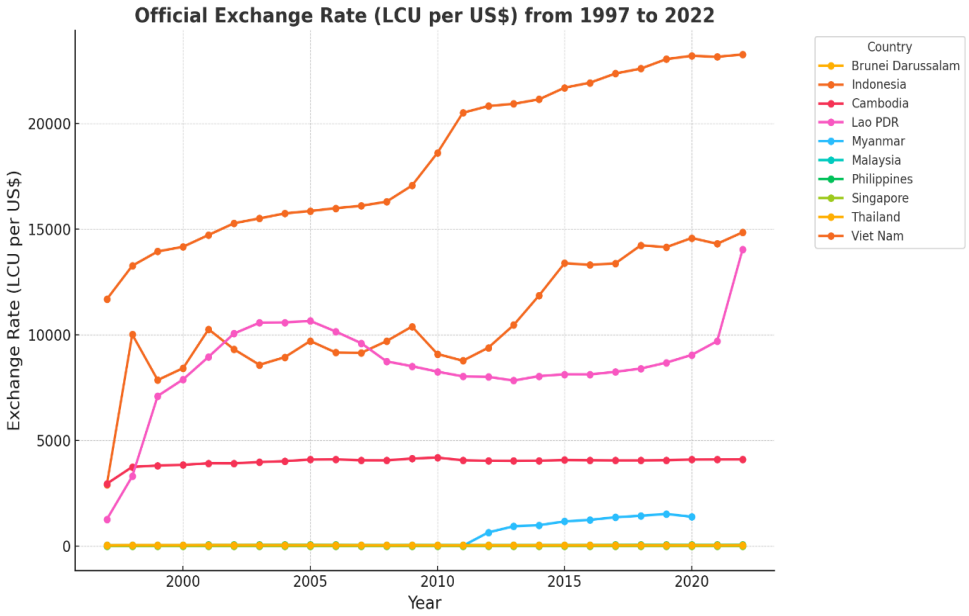


Fig. 5. Exchange rate trends in ASEAN Countries 1997−2022

Source: World Bank, 2024.

The global economic crisis had different impacts on the official exchange rate (LCU per US$) in Southeast Asian countries during three major periods: the 1997−1998 Asian Financial Crisis, the 2007−2008 Global Financial Crisis, and the the COVID-19 pandemic (2020−2022). During the 1997−1998 Asian economic crisis, countries including Indonesia, Thailand, Malaysia, and the Philippines experienced significant currency devaluation. Indonesia was the worst affected, with the rupiah exchange rate soaring from 2,909 per US$ in 1997 to more than 10,000 per US$ in 1998. Similar depreciation occurred in Thailand, where the exchange rate weakened from 31.36 to 41.36 per US$, while the Philippine peso also came under pressure, depreciating from 29.47 per US$ to 40.89 per US$. This crisis was driven by structural vulnerabilities and the collapse of investor confidence, resulting in a massive withdrawal of foreign capital.

The impact was more moderate during the 2007−2008 Global Financial Crisis than in the previous Asian crisis. Exchange rates in Thailand, Indonesia, and Malaysia experienced depreciation within a more controlled range. The Thai baht fell slightly from 34.51 per US$ in 2007 to 33.31 per US$ in 2008, while the Indonesian rupiah weakened from 9,141 to 9,698 per US$. The collapse of the housing market in the United States triggered the crisis. However, Southeast Asian countries which had undertaken structural reforms after the 1997−1998 crisis, showed better resilience to external shocks and were able to maintain relative exchange rate stability.

During the COVID-19 pandemic (2020−2022), many countries experienced exchange rate fluctuations, although not as severe as previous crises. The Indonesian rupiah weakened from around 14,147 per US$ in 2019 to 14,582 per US$ in 2020, and Thailand saw its baht depreciate from 31.04 to 35.06 per US$ between 2019 and 2022. In contrast, the Philippine peso temporarily strengthened in 2020 before weakening again in 2022. Overall, the impact of COVID-19 on exchange rates in Southeast Asia

remained manageable due to stronger monetary and fiscal policy frameworks, as well as more mature economic stabilisation efforts by regional governments.

In comparison, EU countries faced different dynamics during these crises. In the 2007−2008 crisis, the eurozone did not experience as much exchange rate volatility as ASEAN countries because it has a single currency (the euro), which remained relatively stable against the US dollar (Schnabl, 2009). However, some member countries such as Greece, Spain, and Italy faced significant pressure in the form of a debt crisis, although the euro's exchange rate against the dollar only slightly weakened. During the COVID-19 pandemic the euro briefly strengthened due to large monetary stimulus from the European Central Bank (ECB), but later weakened again due to inflationary pressures and global economic uncertainty. Unlike Southeast Asia, which is more sensitive to capital flows and trade, EU countries showed a more controlled exchange rate response thanks to deeper fiscal and monetary integration and a more established and stable financial system.

5. Policy implications and recommendations

Based on the empirical results, which show that inflation, exchange rates, and economic growth significantly affect manufacturing value added (VA) in both the short and long run, proactive monetary policy remains essential for maintaining price stability in the ASEAN region. High inflation, as observed during several crisis episodes, undermines purchasing power and reduces productivity. Accordingly, central banks should prioritise credible inflation-targeting frameworks, primarily through timely interest rate adjustments and liquidity management, to anchor inflation expectations and stabilise domestic prices.

The exchange rate volatility observed during the 1997−1998 Asian Financial Crisis, the 2007–2008 Global Financial Crisis, and the 2020−2022 COVID-19 pandemic stressed that exchange rate fluctuations are an important channel through which macroeconomic instability affects manufacturing performance. However, rather than relying on direct and persistent foreign exchange market interventions – which may be less effective under current geopolitical and global financial conditions – exchange rate stability should be viewed largely as an indirect outcome of credible inflation control and sound macroeconomic fundamentals. Occasional and well-calibrated interventions may be used to smooth excessive short-term volatility, but the primary policy focus should remain on inflation targeting, policy credibility, and macroeconomic consistency, which together help mitigate exchange rate uncertainty and support manufacturing value added, particularly in export-oriented economies.

Additionally, the dependency of certain economic sectors on external factors, including tourism and manufacturing, exacerbates the impact of economic shocks. Given the findings of this study, it is recommended that ASEAN governments prioritise economic diversification by accelerating the development of industries based on technology and creative economies. Such sectors will foster sustainable growth and reduce dependence on global markets, which are often unstable, thus enhancing domestic economic resilience.

Fiscal expansionary policies are also essential for expediting economic recovery, especially after severe economic downturns. The study indicated that economies in the ASEAN region experienced sharp contractions during the 1997−1998 financial crisis and the 2020−2022 COVID-19 pandemic. Therefore, governments must increase public spending on infrastructure, provide tax incentives to productive sectors, and offer direct support to small and medium-sized enterprises (SMEs) under strain. By increasing public investment in sectors requiring quick recovery, governments can accelerate the process of revitalisation and enhance economic productivity.

Moreover, the importance of strengthening subsidy policies to ensure the availability of essential goods during times of high inflation cannot be overstated. As observed in several crises, inflation can significantly reduce the purchasing power of the population, particularly for low-income groups. Consequently, governments need to reinforce subsidy mechanisms for necessities such as food, energy,

and fuel. Targeted subsidies will not only stabilise prices but also help ensure social stability and mitigate the adverse effects of inflation on vulnerable populations in ASEAN countries.

Strengthening the financial sector is another critical area of focus, as the financial system plays a vital role in maintaining economic stability. The research findings indicate that financial volatility can worsen the impact of an economic crisis, therefore ASEAN countries need to tighten financial regulations to prevent systemic risks, especially during periods of crisis. Governments should ensure that financial institutions maintain adequate reserves and can manage economic shocks. Tighter supervision of financial institutions will help mitigate the risk of systemic failure, thereby strengthening the resilience of the financial sector.

Furthermore, ASEAN countries need to adopt more adaptive crisis mitigation policies to prepare for future economic shocks, both external and internal. The research results highlighted the patterns of economic crises in 1997−1998, 2007−2008, and 2020−2022, all of which had significant long-term effects on the region. Hence, establishing a national reserve fund that can be accessed in times of crisis, coupled with flexible anticipatory policies, is essential to ensuring a swift recovery and protecting economies from prolonged downturns.

The need for economic diversification is further emphasised by the study's findings, which suggest that ASEAN countries should reduce their reliance on a few traditional sectors. Given the abundant natural resources in the region, governments should expedite policies for resource-based industrialisation and strengthen technology-driven sectors. By investing in research and development (R&D) and supporting the growth of innovation-driven industries, ASEAN countries can reduce their dependency on raw material exports, thus bolstering economic resilience and competitiveness in the global market.

To enhance long-term economic resilience, ASEAN countries must prioritise domestic competitiveness by supporting both the manufacturing and technology sectors. The study underlined the potential of technology and innovation-driven industries to withstand economic crises and boost added value over time. Policies that encourage technological advancement, industrial innovation, and enhanced productivity are crucial to strengthening the economic structure of ASEAN countries and ensuring their sustained economic growth.

Lastly, preparedness for future crises must be incorporated into long-term economic planning. The results of this research demonstrate that economic crises, even when triggered by external factors, can have long-lasting impacts on the region. Consequently, ASEAN governments should not only focus on short-term recovery but also on fostering more inclusive and sustainable economic development, including investments in infrastructure, education, and policies aimed at enhancing the overall economic resilience of the region. Such measures will help ensure that ASEAN countries are better equipped to handle future challenges and maintain stability in an increasingly interconnected global economy.

6. Conclusions

This study examined the dynamic relationship between key macroeconomic variables, i.e. economic growth, inflation, and exchange rates, and manufacturing value added in ASEAN countries using a Panel Vector Error Correction Model (VECM). By jointly capturing short-run dynamics and long-term equilibrium relationships, the analysis provided a comprehensive empirical framework for understanding how macroeconomic conditions influence manufacturing performance across the region.

The empirical results indicated that economic growth is the principal long-run driver of manufacturing value added, suggesting that sustained aggregate expansion enhances productive capacity and industrial output. In contrast, inflation exerts a statistically significant and persistent negative effect in both the short and long run, reflecting the adverse impact of rising production costs and declining real

purchasing power. Exchange rate movements exerted only a limited short-run influence on manufacturing value added. Although the first lag displayed a positive coefficient, it was not statistically significant, whereas the second lag revealed a significant negative effect, indicating that exchange rate instability may adversely affect manufacturing performance after a short adjustment period. In the long run, however, exchange rate effects were statistically insignificant, suggesting that their influence is largely transitory and gradually absorbed through market and policy adjustments. These findings were further supported by the impulse response and historical decomposition analyses. The impulse response functions demonstrated that the endogenous variables gradually converged toward stable paths following their respective shocks, while the historical decomposition illustrated how the accumulation of structural shocks contributed to the observed historical movements of manufacturing value added, economic growth, exchange rates, and inflation over the sample period.

This study contributes to the literature by providing integrated empirical evidence on the macroeconomic determinants of manufacturing value added in ASEAN within a dynamic and crisis-sensitive framework. The use of a Panel Vector Error Correction Model (VECM) also enables the simultaneous evaluation of both short-run adjustment dynamics and long-run equilibrium relationships across ASEAN countries, providing a more comprehensive understanding of the interactions among macroeconomic variables than static modelling approaches. The results are broadly consistent with previous empirical studies on ASEAN economies, which document that economic growth plays a dominant role in enhancing manufacturing performance, while inflation and exchange rate volatility act as key sources of short-term disruption to industrial output. Previous panel-based and time-series analyses of ASEAN countries similarly reported that inflation undermines manufacturing value added through cost and demand channels, and that exchange rate volatility generates asymmetric and time-dependent effects on export-oriented manufacturing sectors. By explicitly modelling short-term adjustments and long-term cointegration, this study strengthened and extended these earlier findings within a unified multi-country framework.

From a policy perspective, the results suggest that monetary authorities should prioritise inflation control and macroeconomic credibility – within inflation-targeting frameworks – to reduce short-run volatility, while governments should complement these efforts with growth-oriented fiscal and structural policies, such as infrastructure investment, support for productive manufacturing activities, and technological upgrading, to strengthen long-term value added. Strengthening financial sector regulation and enhancing crisis preparedness frameworks are also essential to mitigate the adverse effects of future shocks.

Future research should incorporate additional macroeconomic and structural factors, including interest rates, foreign direct investment, and technological adoption, to better capture the broader determinants of manufacturing performance. Exploring country-specific heterogeneity and nonlinear or crisis-period dynamics using alternative econometric approaches may also provide deeper insights. This would help refine policy recommendations and enhance the understanding of sustainable manufacturing development in ASEAN countries.

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