

DYNAMIC LINKAGES BETWEEN KEY MACROECONOMIC VARIABLES AND ECONOMIC GROWTH

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ABSTRACT

Introduction/Main Objectives: This study investigates the dynamic linkages between Malaysia's economic growth and the key macroeconomic variables of foreign direct investment (FDI), inflation, interest rates, and exchange rates, using annual time series data from 1990 to 2019. **Background Problems:** Malaysia's economic progress is closely tied to macroeconomic stability and external financial flows, yet fluctuations in inflation, interest rates, and exchange rates often create uncertainty that may weaken the effectiveness of FDI as a catalyst for growth. **Novelty:** This study offers a comprehensive empirical assessment by integrating long-run cointegration analysis with short-run causality testing, providing new insights into the dominant role of FDI within Malaysia's macroeconomic framework. **Research Methods:** Time series econometric techniques, including cointegration tests and Granger causality analyses, are applied to annual data covering 1990–2019 to capture equilibrium relationships and directional causality among the variables. **Findings/Results:** The findings confirm a long-run equilibrium relationship between economic growth, FDI, inflation, interest rates, and exchange rates, with Granger causality results indicating a unidirectional causal flow from FDI to other macroeconomic indicators. **Conclusion:** FDI emerges as a key driver of Malaysia's economic growth, underscoring the importance of strategic investment policies and macroeconomic stability for sustaining long-term development.

ARTICLE INFO

Article information:

Received February 5, 2025. Received in revised version September 25, 2025. Accepted December 20, 2025

Keywords:

Economic growth, foreign direct investment, macroeconomic variables, time series analysis, Granger causality

JEL Code:

C32, E22, F21, O47, E01

ISSN:

ISSN 2085-8272 (print)
ISSN 2338-5847 (online)

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INTRODUCTION

Economic growth is a fundamental macroeconomic policy imperative for maintaining competitiveness in the global market, fostering economic development and addressing poverty in Malaysia. It has been defined as a sustained increase in national income or output, reflecting an enhanced capacity by the country's economy to generate goods and services (Impin and Kok, 2021; Kryeziu, 2016). As such, the Malaysian government monitors macroeconomic indicators and seeks to implement policies to spur and enhance economic growth.

Malaysia has pursued a series of comprehensive development strategies, from the New Economic Policy (NEP) and National Development Policy (NDP) to the New Economic Model (NEM), Tenth Malaysia Plan (10MP), Government Transformation Program (GTP), and Economic Transformation Program (ETP), all aimed at stimulating economic growth and structural transformation. More recently, the government has introduced the Shared Prosperity Vision 2030 and the Twelfth Malaysia Plan (12MP, 2021–2025), which emphasize inclusive development, equitable wealth distribution, and sustainability. The positive impacts of these policies are evident in job creation, falling unemployment rates, rising average incomes, higher consumption, and improved living standards, alongside expanded public services funded by increased tax revenues from corporate profits (Todaro & Smith, 2020; World Bank, 2023). Critically, Malaysia's sustained growth trajectory has enabled significant poverty reduction since the 1970s, supported by successive development plans and structural reforms (EPU, 2021). Historical data indicate that absolute poverty declined from around 50% in 1970 to single-digit levels by the early 2020s (Department of Statistics Malaysia, 2023).

Further progress has been recorded under the Twelfth Malaysia Plan (12MP) and Shared Prosperity Vision 2030. As of 2022, poverty remained at a low level, affecting 6.2% of households based on the national poverty line, before declining further to around 5% by 2024 (Department of Statistics Malaysia, 2025). Meanwhile, the share of the labor force with tertiary education increased from 23% in 2010 to 35.5% in 2023, reflecting continued human capital development. Life expectancy has also risen steadily, from approximately 57 years in 1960 to more than 75 years by 2024 (World Bank, 2025a; World Bank, 2025b). Economic growth has played a central role in reducing poverty and improving broader socioeconomic outcomes in Malaysia, particularly through employment creation and rising household incomes (World Bank, 2022; Ravallion, 2020). Yet, sustaining this progress is increasingly challenging. The World Bank (2023) has warned of a marked decline in potential global GDP growth, a trend worsened by the 2008–2009 financial crisis and the COVID-19 pandemic in 2020 and posing particular risks for developing economies such as Malaysia. These headwinds highlight the urgency of reinforcing growth strategies to mitigate the adverse effects of global shocks on poverty reduction and overall prosperity.

In Malaysia's case, these macroeconomic challenges are intertwined with domestic dynamics such as inflation, foreign direct investment (FDI), interest rates, and household consumption variables that collectively shape the nation's economic resilience. Malaysia's reliance on domestic consumption as a key growth driver, alongside efforts to maintain price stability and attract sustained inflows of FDI, underscore the importance of these indicators for evaluating the country's long-term development trajectory. Framing Malaysia's experience within the

broader global context offers valuable insights into how structural reforms and policy interventions can secure sustainable and inclusive growth in the years ahead.

Since achieving independence in 1957, Malaysia has successfully diversified its economy, with the manufacturing and services sectors becoming the primary growth engines. In 2020, the services sector led the economy, contributing 54.78% of GDP, followed by manufacturing at 22.9% and agriculture at 7.4% (Department of Statistics Malaysia, 2020). Although agriculture was historically central to Malaysia's economic foundations, the nation has undergone a significant transition toward a service-driven economy, with tourism playing a key role. Furthermore, Malaysia has developed strong education and healthcare systems, combined with affordable primary resources, positioning the country as an attractive destination for investment and thereby bolstering its economic resilience. This structural transformation is consistent with growth theories such as the Lewis dual-sector model, which describes the shift of labor and resources from traditional agriculture to modern industrial and service sectors as economies develop (Lewis, 1954).

Malaysia, recognized as Southeast Asia's fastest-growing economy, has faced significant challenges due to the COVID-19 pandemic, beginning in 2020 (IMF, 2021; DOSM, 2021). This crisis led to declining household incomes, rising unemployment, and increasing poverty rates. In response, the government introduced new regulations to mitigate the economic fallout. Nevertheless, the country's real GDP contracted sharply, recording a negative growth rate of -5.59% in 2020, largely due to pandemic-related disruptions. As well as the pandemic, the 1997 Asian financial crisis and the 2008–2009 subprime mortgage crisis have exposed vulnerabilities in Malaysia's economy, disrupting trade,

slowing GDP growth, and precipitating recessions. These events underscore the complex array of factors influencing economic performance, particularly in relation to household consumption, interest rates, foreign direct investment, inflation, and broader macroeconomic conditions. Malaysia presents an especially valuable research setting due to its economic evolution from a traditional agricultural base toward a diversified structure driven by manufacturing and services, reinforced by its high degree of trade and investment openness. Its repeated exposure to external shocks makes Malaysia an instructive case for understanding the vulnerabilities and resilience of emerging economies. While prior research has examined aspects of Malaysia's economic performance, relatively few studies have provided a comprehensive assessment of the dynamic interrelationships among macroeconomic variables, especially through long-run equilibrium and causality frameworks. Such an approach can generate deeper insights with important implications for policy formulation in Malaysia and comparable developing economies. Theoretically, this paper extends the growth and macroeconomic stability literature by providing evidence on how FDI, inflation, interest rates, and consumption jointly shape economic resilience in an emerging, highly open economy repeatedly exposed to global shocks. Understanding the interplay between key macroeconomic variables and Malaysia's economic growth will help guide policies that promote sustainable development, job creation, and improved societal welfare. The evolving economic landscape, shaped by recent disruptions, further highlights the urgency of re-evaluating these relationships to enable evidence-based policymaking, support economic recovery, and strengthen Malaysia's global competitiveness.

The remainder of this paper is structured as follows. Section 2 presents a concise review of

the relevant literature. Section 3 describes the research methodology. Section 4 reports the empirical findings and provides a comprehensive discussion. Finally, Section 5 concludes the study, summarizing the key insights and implications.

LITERATURE REVIEW

Macroeconomic variables such as inflation, interest rates, exchange rates, foreign direct investment (FDI), and household consumption play a crucial role in determining the economic growth of a country, as measured by its gross domestic product (GDP). The interactions among these variables have been widely studied, with differing results across various economic contexts. Classical growth theories, such as Smith (1776) and Solow (1956), emphasized the role of capital accumulation, savings, and technological progress. In contrast, contemporary growth theories, particularly Romer (1986) and Lucas (1988), have highlighted human capital, innovation, and knowledge spillovers. Linking these theoretical underpinnings to econometric analysis has enabled researchers to assess how macroeconomic variables directly and indirectly contribute to growth within country-specific contexts, with studies reporting mixed results.

Semuel and Nurina (2015) found that money supply exerted a positive and significant impact on economic growth, while exchange rates had a negative effect on GDP. Inflation, however, exhibited an insignificant negative relationship with economic growth. Conversely, Saxena and Bansal (2019) found that inflation positively influenced India's GDP growth. Supporting this view, Chowdhury, Hamid, and Akhi (2019) observed an inverse relationship between inflation and Bangladesh's GDP growth while Adaramola and Dada (2020) reported similar findings on Nigeria's GDP.

Further studies have explored the long-term dynamics between inflation and GDP. Among these, Abang Abdul Rahman et al. (2017) identified a long-term relationship between inflation and GDP, however without establishing causality. In contrast, Stievany and Jalunggono (2022) and Zahra Wijaya, Ismail, and Santosa (2023) found no significant short or long-term association. Similarly, Daboh, Duramany-Lakkoh, and Knox-Goba (2024) concluded that fluctuations in inflation do not impact GDP per capita. Other research by Raja Aziz and Azmi (2017) confirmed that inflation's impact on GDP growth is negatively insignificant, consistent with findings in Morocco and South Africa (Huseynli, 2022). In contrast, Akalpler and Duhok (2018) found a positive relationship, aligning with studies in Pakistan (Rehman, Cismas, and Milin, 2022; Uddin and Ullah, 2024). Furthermore, low to moderate inflation is generally considered beneficial for sustainable economic growth, with public expectations and inflation fluctuations playing a crucial role in economic outcomes (Atigala, Maduwanthi, Gunathilake, Sathsarani, and Jayathilaka, 2022; Li, 2024).

Examining the relationship between interest rates and GDP in Bangladesh, Chowdhury, Hamid, and Akhi (2019) exhibited a negative correlation between interest rates and GDP using varied methodological approaches. Similarly, Mark (2024) observed a significant positive relationship between GDP and interest rates in the UK. Conversely, research by Tan et al. (2020), Abd Kadir, Ahmad Zaini, and Mohd Zamburi (2019), as well as Yusuf, Akwe, Farouq, Nasiru, and Valati (2024) and Uddin and Ullah (2024), highlighted negative correlations, emphasizing that high interest rates deter investment and slow economic growth for Malaysia, Singapore, Thailand, Pakistan and Nigeria. Alkhawaldeh, Mahmood, and Hassan Jakada

(2020) found that while interest rates negatively impacted GDP growth in Jordan, taxation positively influenced economic expansion. Moreover, in emerging markets, Zahra Wijaya, Ismail, and Santosa (2023) identified both short- and long-term relationships between interest rates and GDP, whereas Oroud, Almahadin, Alkhazaleh, and Shneikat (2023) reported consistent inverse effects. Findings by Sujianto, Pantas, Mashudi, and Pambudi (2020) suggest no significant short-term influence or directional relationship between interest rates and GDP, highlighting the diversity across outcomes based on regional and methodological differences. A study of loan growth and economic stability by Pasaribu and Mindosa (2021) found they were significantly influenced by interest rates and inflation because credit expansion drives investment and household consumption. This reinforces the view that interest rates affect economic growth indirectly through bank lending. In addition, Jacobs et al. (2020) demonstrated that shocks in economic growth can affect public debt through long-term real interest rate channels, underscoring the critical role of interest rates as a transmission mechanism between growth and fiscal sustainability.

Foreign direct investment (FDI) has also been widely recognized as a critical driver of economic growth, including in recent studies by Mustafa (2019), Jiao, Zhou, and Xu (2024), as well as Uddin and Ullah (2024) showing that FDI significantly enhances GDP growth. However, there are mixed findings regarding long-term effects. Sarker and Khan (2020) identified a long-term FDI–GDP association in Bangladesh. However, Hobbs, Paparas, and Abo Eloud (2021) found no long-term dependence between FDI and GDP in Albania. In Malaysia, Hussin, Ros, and Noor (2013) reported no significant long-term impact of FDI on economic growth, whereas Salim, Mustafa, and

Hanafiah (2015) identified a positive but statistically insignificant relationship. In contrast, research by Raja Aziz and Azmi (2017), as well as a study by Abang Abdul Rahman et al. (2017), confirmed a significant long-term impact of FDI on Malaysia's GDP. Other studies on Malaysia have also highlighted the interaction between FDI and macroeconomic indicators such as exchange rates, trade openness, and inflation (Amin, Ghazali, and Habibullah, 2020). These studies have suggested that the benefits of FDI are conditional upon stable macroeconomic environments and effective policy frameworks, providing relevant insights for Malaysia's growth path. Additionally, Nguyen (2022a) identified a substantial long-run relationship between FDI and economic growth in South Asia, further supported by Nguyen (2022b), who found that FDI positively impacted economic growth based on before and after threshold values. Research by Mawutor, Sogah, Christian, and Aboagye (2023) in Ghana affirmed the presence of positive cointegration, while El-Rasheed (2022) demonstrated that FDI stimulates growth in Nigeria. Kumari, Shabbir, Saleem, Yahya Khan, Abbasi, and Lopez (2023) reported bidirectional FDI–GDP causality in India, whereas Sarker and Khan (2020) identified unidirectional causality of Bangladesh. Collectively, these findings indicate that FDI's impact on economic growth varies across countries and financial conditions. FDI is also argued to enhance economic growth through various transmission channels. In a study on the EU, Zonta (2025) highlighted that FDI strengthens competitiveness, promotes efficiency, and facilitates technology transfer, mechanisms that remain relevant in explaining the FDI–growth nexus more generally. Specifically, their findings showed that by pressuring local firms to improve production methods and quality, FDI raises productivity and GDP contributions. It

also brings innovation spillovers and managerial know-how, while training initiatives enhance human capital.

Household consumption is another key determinant of GDP growth. Studies by Ridzuan, Razak, Ibrahim, Mohd Noor, and Ahmed (2014) and Yazdi (2019) demonstrated that increased household consumption positively influences GDP in both the short and long term. Similarly, Sudibyo (2024) emphasized that rising household consumption drives demand, production, and investment, thereby stimulating economic growth. Empirical analyses by Chowdhury, Hamid, and Akhi (2019), as well as Darman and Aryusmar (2020), also found a strong positive correlation between household consumption expenditure and GDP, reinforcing the notion that consumer spending stimulates economic expansion. Furthermore, Rumbia, Muthalib, Abbas, Adam, Millia, Saidi, and Azis (2020) confirmed a closely integrated and long-term relationship between household spending and GDP across Southeast Asia. Hu and Wang (2024) further discovered that higher household consumption enhances the positive impact of public health spending on economic growth, creating a reinforcing cycle wherein increased consumption drives demand and supports economic expansion. In the Indonesian context, Thawley, Crystallin and Verico (2024) discovered that aggregate demand factors such as household consumption have contributed to the country's steady growth performance. They also noted that sustaining higher long-term growth requires parallel improvements on the supply side through enhanced productivity, increased investment, stronger competitiveness, and institutional development, which expand the economy's capacity to respond effectively to shifts in demand. However, findings reported by Konyuncu and Unal (2020) suggest no short-term impact of household expenditure on GDP

in Turkey. Additionally, as noted by Elias Elwer and Saqfalhait (2023), during periods of economic crisis reduced household spending, particularly in transportation, can slow economic growth. Despite these variations, the overarching consensus remains that household consumption is a crucial driver of economic expansion, with its effects varying across different regions and economic conditions.

METHOD, DATA AND ANALYSIS

1. Unit Root Tests

Before conducting cointegration analysis, unit root tests were applied to determine the stationarity properties of the data. Specifically, the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests were utilized. The ADF test (Dickey & Fuller, 1979; 1981) examines the null hypothesis of non-stationarity (i.e., the presence of a unit root). The PP test (Phillips & Perron, 1988) extends this framework by addressing potential serial correlation and heteroscedasticity in the time series regression through non-parametric corrections. In contrast, the KPSS test (Kwiatkowski et al., 1992) adopts the opposite null hypothesis, assessing whether the time series is stationary around a mean or linear trend, with non-stationarity arising from the presence of a unit root. Employing multiple unit root tests strengthens the robustness of the results, as each test captures different econometric issues such as autocorrelation, heteroscedasticity, or trend stationarity. By triangulating evidence across these approaches, the reliability of the stationarity assessment was significantly enhanced in the current study.

2. Cointegration Tests

Following the detection of unit roots in the variables, a multivariate cointegration technique

developed by Johansen and Juselius was implemented to evaluate the existence of long-run relationships between two or more variables. Johansen (1988) and Johansen and Juselius (1990) introduced two complementary methods for testing cointegration: the trace statistic and the maximum eigenvalue test, both of which help determine the number of cointegrating vectors and confirm whether a stable, long-term equilibrium exists among the variables. In this case, the Johansen–Juselius (JJ) approach was preferred because it allows for the identification of multiple cointegrating vectors in a multi-variate system, whereas the Engle–Granger two-step procedure is limited to a single cointegration relationship (Engle & Granger, 1987). In addition, the JJ method is derived from a Vector Autoregressive (VAR) framework, enabling the joint estimation of all cointegrating relationships and capturing feedback effects that may exist among the variables. This is especially useful when analyzing macroeconomic data, where interdependencies are complex and dynamic.

Furthermore, the JJ procedure facilitates the estimation of a Vector Error Correction Model (VECM), which not only reveals the speed of adjustment toward long-run equilibrium but also enables further dynamic analysis through impulse response functions (IRF) and variance

decomposition (VDC). These features provide richer insights into both short-run fluctuations and long-run equilibrium dynamics (Johansen, 1995; Enders, 2015). The JJ method was therefore particularly relevant in this study as it enabled a comprehensive analysis of the interplay among the selected macroeconomic variables, accounting for both equilibrium relationships and dynamic interactions.

3. Granger Causality Test

According to Engle and Granger (1987), if cointegration is identified, a corresponding error-correction representation must exist. This representation implies that changes in the dependent variable are influenced by both the disequilibrium level in the cointegrating relationship, captured by the error-correction term (ECT), and changes in other explanatory variables. Therefore, in a cointegrated model, the Granger causality test can be conducted within a Vector Error Correction Model (VECM) framework. The existence of a long-run cointegrated relationship between the variables in our study allowed the residuals from the cointegration equation to serve as the ECT for further analysis, as shown in the following equations:

$$LRGDP_t = \alpha_0 + \sum_{i=1}^n \beta_1 \Delta LRGDP_{t-i} + \sum_{i=1}^n \beta_2 \Delta LINF_{t-i} + \sum_{i=1}^n \beta_3 \Delta LINT_{t-i} + \sum_{i=1}^n \beta_4 \Delta LFDI_{t-i} + \sum_{i=1}^n \beta_5 \Delta LHCE_{t-i} + \gamma_1 \Delta ECT_{t-i} + \varepsilon_t \quad (1)$$

$$LINF_t = \varphi_0 + \sum_{i=1}^n \varphi_1 \Delta LINF_{t-i} + \sum_{i=1}^n \varphi_2 \Delta LRGDP_{t-i} + \sum_{i=1}^n \varphi_3 \Delta LINT_{t-i} + \sum_{i=1}^n \varphi_4 \Delta LFDI_{t-i} + \sum_{i=1}^n \varphi_5 \Delta LHCE_{t-i} + \gamma_2 \Delta ECT_{t-i} + \mu_t \quad (2)$$

$$\Delta LINT_t = \rho_0 + \sum_{i=1}^n \rho_1 \Delta LINT_{t-i} + \sum_{i=1}^n \rho_2 \Delta LRGP_{t-i} + \sum_{i=1}^n \rho_3 \Delta LINF_{t-i} + \sum_{i=1}^n \rho_4 \Delta LFDI_{t-i} + \sum_{i=1}^n \rho_5 \Delta LHCE_{t-i} + \gamma_3 \Delta ECT_{t-i} + u_t \quad (3)$$

$$\Delta LFDI_t = \eta_0 + \sum_{i=1}^n \eta_1 \Delta LFDI_{t-i} + \sum_{i=1}^n \eta_2 \Delta LRGP_{t-i} + \sum_{i=1}^n \eta_3 \Delta LINF_{t-i} + \sum_{i=1}^n \eta_4 \Delta LINT_{t-i} + \sum_{i=1}^n \eta_5 \Delta LHCE_{t-i} + \gamma_4 \Delta ECT_{t-i} + \theta_t \quad (4)$$

$$\Delta LHCE_t = \delta_0 + \sum_{i=1}^n \delta_1 \Delta LHCE_{t-i} + \sum_{i=1}^n \delta_2 \Delta LRGP_{t-i} + \sum_{i=1}^n \delta_3 \Delta LINF_{t-i} + \sum_{i=1}^n \delta_4 \Delta LINT_{t-i} + \sum_{i=1}^n \delta_5 \Delta LFDI_{t-i} + \gamma_5 \Delta ECT_{t-i} + e_t \quad (5)$$

Where, Δ = the lag operator, $\alpha_0, \varphi_0, \rho_0, \eta_0, \delta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \varphi_1, \varphi_2, \varphi_3, \varphi_4, \varphi_5, \rho_1, \rho_2, \rho_3, \rho_4, \rho_5, \eta_1, \eta_2, \eta_3, \eta_4, \eta_5, \delta_1, \delta_2, \delta_3, \delta_4$, and δ_5 are the estimated coefficients, n is the optimal lags of the series GDP, INF, INT, FDI, and HCE, $\varepsilon_t, \mu_t, u_t, \theta_t$, and e_t are the serially uncorrelated random error terms while $\gamma_1, \gamma_2, \gamma_3, \gamma_4$, and γ_5 are a single period response to departure from equilibrium.

4. Data Description

For analytical purposes, the interaction between annual macroeconomic variables and Real Gross Domestic Product (RGDP) from 1990 to 2019 was examined. The data were collected from World Development Indicators (World Bank) and CEIC data. The analysis reported in this paper focused on the interaction between macroeconomic variables and the real gross domestic product (RGDP) in Malaysia. The explanatory variables used were inflation (INF), real interest rates (INT), foreign direct investment (FDI), and household consumption expenditure (HCE). The following functional form was employed in analyzing the effect of these macroeconomic variables on RGDP in Malaysia. The model for RGDP can be expressed as follows:

$$RGDP_t = \beta_1 + \beta_2 INF_t + \beta_3 INT_t + \beta_4 FDI_t + \beta_5 HCE_t \varepsilon_t \quad (6)$$

Where, $RGDP_t$ = Malaysia's Real Gross Domestic Product; INF_t = Inflation, β_2 ; INT_t = Real interest rate, β_3 ; FDI_t = Foreign Direct Investment, β_4 ; HCE_t = Household Consumption Expenditure, β_5 ; $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 are the coefficients of the INF, INT, FDI, and HCE, respectively; β_1 is the constant parameter; ε_t represents the error term, and lastly, t refers to the period.

The above-mentioned independent variables were selected due to their relevance to measuring a country's overall economic performance and health, particularly after adjusting for price changes (Ebimobowei, 2022; Katoka & Dostal, 2022). These variables provide a more precise estimate for assessing long-term national

economic growth (Zhao et al., 2022). Economic growth, for instance, is typically associated with lower unemployment rates and rising wages as firms' demand for labor increases in response to a growing economy. This, in turn, drives higher consumer spending, which boosts national revenue.

Inflation is commonly measured using the Consumer Price Index (CPI), which tracks percentage changes in the cost of a set basket of goods and services consumed by households. Real interest rates, calculated as the nominal interest rate adjusted for inflation, are also critical. High real interest rates encourage savings by shifting money away from consumption, while low rates promote investment and spending (Caggese & Pérez-Orive, 2022; Kashyap & Stein, 2023; Uddin and Ullah, 2024; Mark, 2024). Maintaining low and stable inflation is vital to fostering healthy economic growth (Girdzijauskas et al., 2021; Stiepany & Jalunggono, 2022; Chrisharja & Ali, 2023).

Foreign Direct Investment (FDI) was included due to its critical role in supporting long-term economic growth, particularly in emerging economies (Sarker & Khan, 2020). Beyond providing essential capital, FDI also generates employment, facilitates access to advanced technologies, and creates beneficial spillovers (Ndlovu, 2024). As a key source of financing, FDI stimulates domestic investment and employment opportunities in both the short and long term (Khan et al., 2023). Efforts to attract FDI are essential for sustaining economic activity in low- and middle-income countries (Dinh et al., 2019). Household consumption expenditure is another important variable as it drives economic growth through increased spending. Higher household spending accelerates economic activity and generates additional revenue for the country (Sudibyo, 2024). In Malaysia, household consumption plays a critical role in sustaining growth and stimulating the economy, as highlighted by Ridzuan et al. (2014).

Figure 1. Drivers of Economic Growth

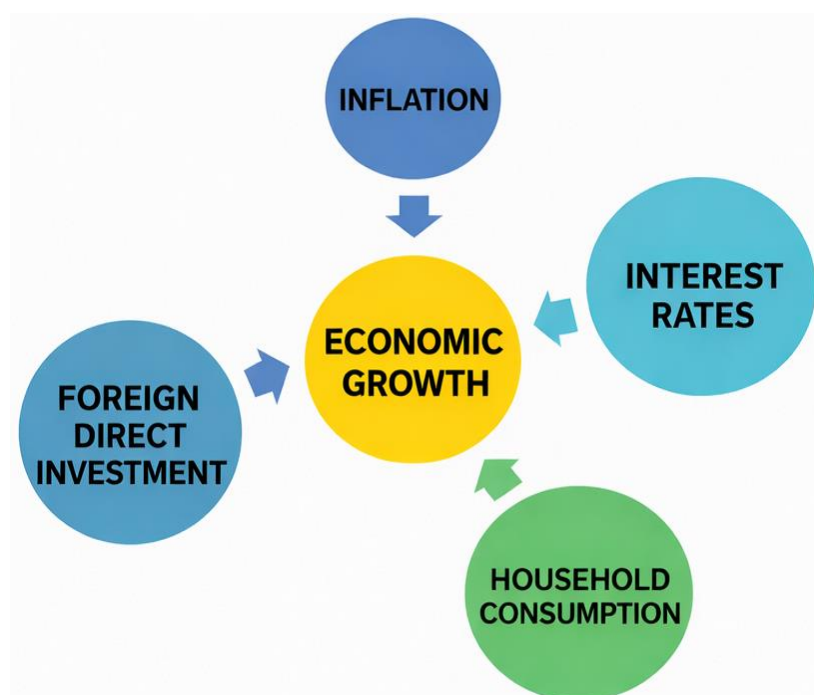


Figure 1 illustrates four key macroeconomic variables, namely inflation, interest rates, foreign direct investment (FDI), and household consumption, and their collective influence on economic growth, as discussed extensively above. As shown, each variable acts as an independent driver feeding into the growth dynamics of an economy. Classical theories (Smith, 1776; Solow, 1956) stress capital, savings, and investment while modern theories (Romer, 1986; Lucas, 1988) highlight human capital, innovation, and consumption as key growth force dynamics that reinforce productivity and technological advancement through market expansion.

RESULT AND DISCUSSION

Before testing cointegration, ADF, PP and KPSS tests were conducted to establish the order of integration for each variable. This step ensures the validity of the cointegration test, prevents spurious regression, and guides the appropriate choice of econometric model. Only after confirming that variables are $I(1)$ (or mixed $I(0)/I(1)$ in ARDL), can a reliable long-run relationship be established (Engle & Granger, 1987; Johansen, 1995; Pesaran, Shin, & Smith, 2001). The results of the ADF, PP and KPSS tests collectively indicated that the selected variables is in the first order of integration $I(1)$. To conserve space, the results of ADF, PP and

KPSS tests are not presented here but they are available upon request from the authors.

The number of cointegrating vectors was determined using two likelihood ratio (LR) test statistics: the trace test and the maximum eigen value test. Table 1 presents the results of the preferred Johansen (JJ) cointegration procedure, as detailed above in Section 3. At the 5% significance level, the null hypothesis of no cointegrating vector is rejected, indicating the presence of two cointegrating vectors. This finding confirms a long-term equilibrium relationship among the variables in Malaysia. Thus, inflation (INF), interest rates (INT), foreign direct investment (FDI), household consumption expenditure (HCE), and economic growth are confirmed as intricately linked in the long run. The Vector Autoregressive (VAR) system served as a framework to explore both the short- and long-run causal relationships among the variables through Granger causality testing within a Vector Error Correction Model (VECM). This model incorporates the Error Correction Term (ECT) and employs the Wald test to clarify the causal dynamics while mitigating issues of misspecification. Crowder and Wohar (1998) argued that increasing the number of cointegrating vectors in a model enhances the degree of convergence among the variables, further supporting the robustness of the long-run relationships identified.

Table 1. Cointegration Test

Null	Alternative	k=2 r=2			
		λ max		Trace	
		Unadjusted	95 percent C.V.	Unadjusted	95 percent C.V.
r = 0	r = 1	54.06596*	33.87687	110.4685*	69.81889
r ≤ 1	r = 2	27.96230*	27.58434	56.40249*	47.85613
r ≤ 2	r = 3	16.74871	21.13162	28.44019	29.79707
r ≤ 3	r = 4	11.29953	14.26460	11.69148	15.49471
r ≤ 4	r = 5	0.391955	3.841466	0.391955	3.841466

Notes: Asterisks (*) denote statistical significance at the 5 percent level. k is the lag length and r is the cointegrating vector(s). Chosen r : number of cointegrating vectors that are significant under both tests.

Table 2. Granger Causality Results

Dependent Variable	Δ LRGDP	Δ INF	Δ INT	Δ FDI	Δ HCE	ECT (1)		ECT (2)	
			χ^2 -statistics			Coefficient	t-ratio	Coefficient	t-ratio
Δ RGDP	-	3.613623 (0.1642)	.626594 (0.7310)	6.838255* (0.0327)	3.671958 (0.1595)	-0.282	-2.294*	0.00091	0.105
Δ INF	0.232842 (0.8901)	-	3.871296 (0.1443)	6.661952* (0.0358)	0.320460 (0.8519)	-1.666	-0.419	-0.694	-2.485*
Δ INT	5.259999 (0.0721)	1.759681 (0.4148)	-	13.13099* (0.0014)	2.913948 (0.2329)	0.161	0.015	-0.232	-0.314
Δ FDI	3.837249 (0.1468)	0.190299 (0.9092)	.369841 (0.5041)	-	0.661939 (0.7182)	-28600	-3.866	24400	0.468
Δ HCE	5.109982 (0.0777)	1.564758 (0.4573)	1.712094 (0.4248)	13.33723* (0.0013)	-	-50100	-1.468	-22000	-0.936

Notes: The χ^2 -statistic tests the joint significance of the lagged values of the independent variables, and the significance of the error correction term (s). Δ is the first different operator. Asterisks (*) indicate statistically significant at 5 percent level.

In a five-variable system such as the modeling for this research, the presence of two cointegration vectors suggests there are two distinct long-run equilibrium relationships, while the adjustment paths of the remaining variables remain less defined. In the case of Malaysia, the cointegrating equations were derived through the Error Correction Term (ECT), which captures the speed and direction of adjustment toward equilibrium. As shown in Table 2, ECT(1) for RGDP is statistically significant with the correct negative coefficient sign, confirming the existence of a long-run cointegration relationship between economic growth and the other variables. The coefficient indicates that approximately 28.26% of short-run disequilibria are corrected each year, implying that Malaysia's GDP takes about 3.5 years to fully return to its long-run equilibrium after a shock. This gradual pace reflects the structural nature of Malaysia's economy, where adjustments in growth are influenced by investment, consumption, and external trade factors that require time to realign.

Similarly, ECT(2) for INF is also statistically significant with the expected negative sign, signifying a second long-run cointegration

relationship. The adjustment speed for inflation is notably faster at 69.43% per year, meaning deviations are largely corrected within about 1.44 years. This stronger response highlights inflation's sensitivity to shocks and the relative effectiveness of Malaysia's monetary and fiscal policy instruments in restoring price stability.

Together, the two ECTs confirm that Malaysia's macroeconomic system is characterized by dual long-run equilibrium relationships: one anchored in output (RGDP) and the other in price stability (INF). This dual adjustment mechanism is particularly relevant for Malaysia as it illustrates how growth and inflation jointly underpin the economy's long-run trajectory. While GDP reflects the gradual structural realignments of the economy, inflation embodies a faster channel of adjustment, ensuring that stability is restored more quickly. Identifying these dynamics provides critical insights for policymakers seeking to balance growth sustainability with price stability in the Malaysian context.

Additionally, Figure 2 presents the results of the short-run causality test, highlighting unidirectional causality from FDI to the other variables: GDP, INF, INT, and HCE.

This indicates that changes in FDI significantly influence Malaysia's macroeconomic environment both in the short and long run, whereas GDP, inflation, interest rates, and household consumption do not Granger-cause FDI in return. The magnitude of this effect suggests that FDI plays a leading role in shaping economic outcomes, consistent with Malaysia's reliance on external capital inflows. These results align with the positive relationship between FDI and economic growth identified in previous studies (Raja Aziz & Azim, 2017; Abang Abdul Rahman et al., 2017; Nguyen, 2022b; Mawutor et al., 2023; Uddin and Ullah, 2024; Jiao et al., 2024). Furthermore, the impact of FDI on economic growth strengthens when financial development surpasses a specific threshold. From a policy perspective, this highlights the importance of maintaining investment-friendly policies, strengthening financial markets, and improving institutional quality to maximize the spillover benefits of FDI across different sectors. These results are also consistent with previous findings, reaffirming unidirectional causality between FDI and exports, FDI and GDP, and GDP and exports (Hobbs, Paparas, & AboElsoud, 2021; Salim, Mustafa, & Hanafiah, 2015; Uddin and Ullah, 2024).

The finding that only FDI Granger-causes the other macroeconomic variables suggests that external capital inflows remain a critical driver of Malaysia's economic dynamics. Unlike GDP, inflation, interest rates, or household consump-

tion, which are largely outcomes of domestic demand and policy interventions, FDI serves as an exogenous source of growth that injects new technology, managerial expertise, and international market access into the economy (Borensztein, De Gregorio, & Lee, 1998; UNCTAD, 2023). This further highlights the asymmetric role of FDI: while domestic variables respond to shifts in foreign investment, they lack the capacity to influence investor inflows in return. For policymakers, it is therefore important to design long-term strategies that enhance Malaysia's attractiveness as an investment destination. Even more importantly, channeling FDI into high-value sectors such as advanced manufacturing, green energy, and digital services can amplify its spillover benefits, reducing over-reliance on low-cost production and moving Malaysia closer to achieving its high-income aspirations (EPU, 2021; Bank Negara Malaysia, 2023).

To enhance the empirical evidence from the causality analysis, a dynamic analysis of the system was conducted using Variance Decomposition (VDC). This technique evaluates the relative importance and strength of the variables by quantifying their contributions to forecast error variance over a specific time horizon. The VDC analysis decomposed the forecast error variance for each variable over a 50-quarter horizon in Malaysia, providing insights into the interdependencies and influence between the variables. The detailed results are presented in Table 4.

Figure 2. Short Run Causality Direction

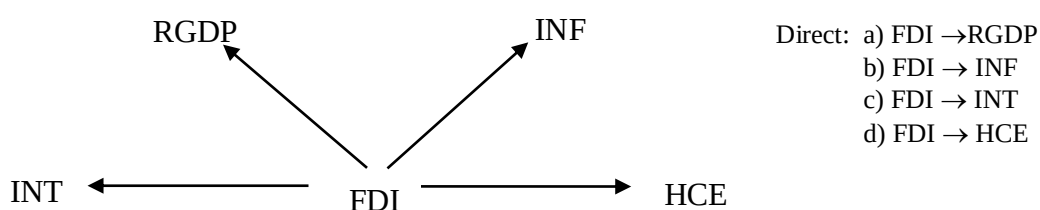


Table 4. Variance Decomposition

Percentage of variations in	Horizon (Years)	Due to Innovation in:					
		ΔGDP	ΔINF	ΔINT	ΔFDI	ΔHCE	ΔCU
Relative Variance by Years in: ΔRGDP							
	1	100	0	0	0	0	0
	4	73.55715	3.499219	14.68027	6.575633	1.687726	26.442848
	8	71.21736	5.304561	11.52861	10.72593	1.223549	28.782650
	12	70.43318	5.898704	10.21284	12.45504	1.000235	29.566819
	20	69.97231	6.236009	9.144607	13.92049	0.726579	30.027685
	30	69.51904	6.487792	8.618028	14.80520	0.569938	30.480958
	40	69.35160	6.590753	8.372117	15.20996	0.475570	30.648400
	50	69.27558	6.646716	8.224077	15.43750	0.416127	30.724420
Relative Variance by Years in: ΔINF							
	1	2.505688	97.49431	0	0	0	2.5056880
	4	3.254067	66.41859	8.611501	10.99020	10.72564	33.581408
	8	5.508062	67.88818	8.216898	8.849632	9.537233	32.111825
	12	6.652665	67.53179	9.076042	8.427132	8.312367	32.468206
	20	7.916148	67.96483	9.763814	7.910738	6.444469	32.035169
	30	9.001526	68.96520	9.571955	7.526792	4.934528	31.034801
	40	9.591685	69.68610	9.498167	7.281425	3.942626	30.313903
	50	9.952490	70.17362	9.481481	7.134886	3.257524	29.826381
Relative Variance by Yearsin: ΔINT							
	1	6.253469	71.35377	22.39276	0	0	77.607239
	4	7.726846	54.32064	15.14496	16.99714	5.810411	84.855037
	8	8.762761	47.11013	13.56529	17.31421	13.24760	86.434701
	12	8.132459	45.55422	11.26461	17.80736	17.24136	88.735399
	20	9.150988	43.65817	8.481262	19.25091	19.45867	91.518738
	30	9.476425	42.94321	6.337053	20.70712	20.53619	93.662945
	40	9.781673	42.74520	5.086604	21.55509	20.83143	94.913393
	50	10.00925	42.66777	4.253783	22.08523	20.98397	95.746220
Relative Variance by Yearsin: ΔFDI							
	1	2.515007	31.80722	0.553564	65.12421	0	34.875791
	4	8.873740	10.28526	23.93639	25.45728	31.44733	74.542720
	8	12.47749	10.22232	19.62401	27.63664	30.03954	72.363360
	12	14.09590	8.753698	18.02960	30.56007	28.56074	69.439938
	20	14.46647	6.533243	16.28447	33.57904	29.13677	66.420953
	30	15.33903	5.370177	15.95071	34.96238	28.37771	65.037627
	40	15.79976	4.597845	15.72202	36.00711	27.87327	63.992895
	50	16.13074	4.078037	15.50225	36.83864	27.45033	63.161357
Relative Variance by Years in: ΔHCE							
	1	16.36671	1.512685	9.170174	30.84862	42.10181	57.898189
	4	3.308804	2.808979	21.27964	29.50437	43.09821	56.901793
	8	4.922621	3.832118	16.65894	34.80117	39.78515	60.214849
	12	5.923966	4.202529	15.02754	36.47716	38.36881	61.631195
	20	6.864810	4.578926	13.58937	37.83179	37.13510	62.864896
	30	7.284507	4.759204	12.94494	38.39312	36.61823	63.381771
	40	7.481028	4.840544	12.64896	38.65475	36.37472	63.625282
	50	7.594719	4.886178	12.48075	38.80458	36.23378	63.766227

Notes: The last column provides the percentage of each variable's forecast error variance explained collectively by the other variables. The column in bold represent the impact of each variable's own shock.

First, the results from the Variance Decomposition (VDC) analysis indicate that GDP is the most interactive variable in the system. As shown in Table 4, by the end of the 50-quarter horizon approximately 31% of the forecast error variance for GDP can be explained by inflation (INF) at 7%, interest rates (INT) at 8%, foreign direct investment (FDI) at 15%, and household consumption expenditure (HCE) at 0.4%. This suggests that GDP does not significantly contribute to explaining the other variables in the long run. Second, the VDC results for INF show that around 30% of the forecast error variance can be explained by GDP (10%), INT (9%), FDI (7%), and HCE (3%) by the end of the 50-quarter horizon. The remaining 70% is explained by its shock, indicating that INF acts as an exogenous variable. It contributes little to explaining the other variables in the long run, as the majority of the variance is explained by its shocks.

The VDC results for INT reveal that only about 4% of its variation is explained by its own shock. The remaining 95% of the forecast error variance by the end of the 50-quarter horizon is attributed as follows: 10% from GDP, 42% from INF, 23% from FDI, and 21% from HCE. Given that INT explains the smallest proportion of its own fluctuations, it can be considered an endogenous variable, influenced by other macroeconomic factors in the long run. Additionally, the VDC results show that by the end of the 50-quarter horizon, RGDP (16%), INF (4%), INT (16%), and HCE (27%) explain roughly 63% of the forecast error variance for INT, while its own shocks account for the remaining 36%. For HCE, its own shocks account for 36% of the forecast error variance, while 64% is explained by GDP (8%), INF (5%), INT (12%), and FDI (39%). This confirms that household consumption is highly sensitive to FDI inflows, suggesting that foreign capital investment drives domestic demand in Malaysia.

FDI emerged as the most significant variable impacting HCE, highlighting direct causality from FDI to HCE in the long run.

The Impulse Response Functions (IRFs) presented in Figure 3 illustrate the dynamic relationships between the five variables over a 50-quarter horizon, showing how each variable responds to a shock to itself or other variables within the system. There are 25 possible scenarios for each variable, and the IRFs provide a visualization of these interdependencies.

First, the IRF analysis reveals that inflation (INF), interest rates (INT), foreign direct investment (FDI), and household consumption expenditure (HCE) all respond negatively to a shock in real GDP (LRGDP). This finding aligns with the Variance Decomposition (VDC) results, where GDP was found to be primarily influenced by external variables (INF, INT, FDI, and HCE), with limited self-impact. The negative response of these variables to LRGDP shocks suggests that when economic growth is disrupted (as measured by GDP), inflation, interest rates, investment flows, and consumption all experience contractionary effects. The results reinforce the idea that these variables are interconnected in the long run, with their fluctuations often occurring in response to changes in the broader economy.

Second, when INF experiences a shock, interest rates (INT) and household consumption expenditure (HCE) respond negatively, while real GDP (LRGDP) and FDI exhibit a positive response. This suggests a divergent relationship between inflation and economic growth, as well as between inflation and investment. Inflationary shocks tend to reduce household spending and increase uncertainty, which negatively impacts consumption and investment behavior, but they may lead to higher GDP and investment in the longer run as firms adjust to price changes. This relationship is consistent with the results from

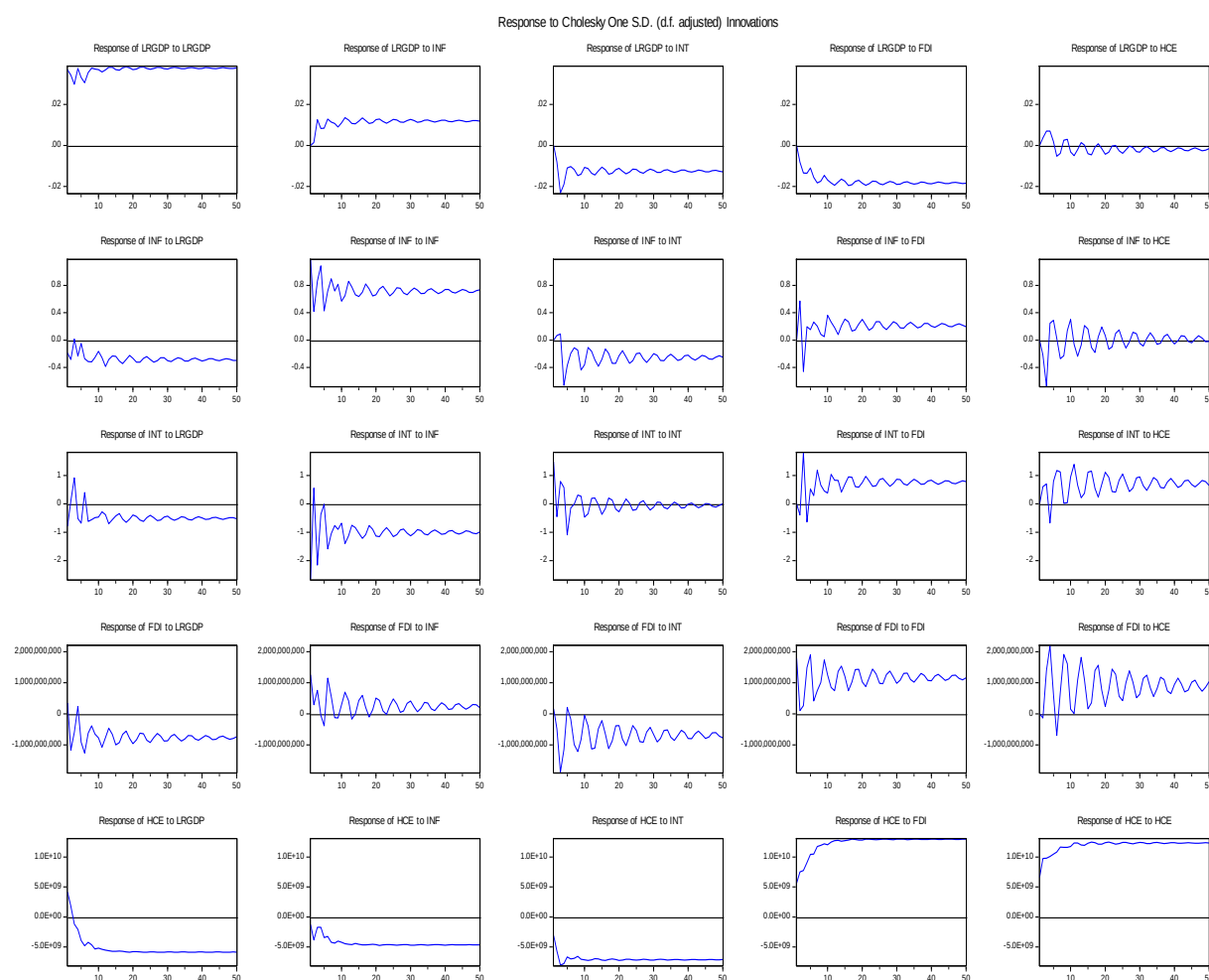
the VDCs, where INF was found to be an exogenous variable, with the majority of its forecast error variance explained by its own shock.

Third, when interest rates (INT) face a shock, the other variables (LRGDP, INF, FDI, and HCE) respond negatively. This finding suggests that rising interest rates (which are typically used to combat inflation or control the money supply) have contractionary effects on economic activity across the board, curbing economic growth, reducing consumption, decreasing investment, and reducing inflation levels in the system. The low forecast error variance explained by INT in the VDC results (only about 4%) further supports its role as an

endogenous variable, influenced by changes in other factors rather than driving changes itself.

Fourth, shocks in FDI produce contrasting results. While LRGDP responds negatively to FDI shocks (as expected from the VDC results, which indicated that FDI has a positive but indirect effect on economic growth), all other variables (INF, INT, and HCE) respond positively. This suggests that an influx of foreign investment generally fosters economic activity in the short term, stimulating consumption and improving financial conditions, even though it may lead to challenges for economic growth (LRGDP). This response underscores the significant role of FDI in Malaysia's economy, as noted in the earlier VDC results, where FDI had the greatest impact on HCE.

Figure 3. Impulse Response Function



Lastly, when HCE experiences a shock, LR GDP and INF show a muted response, with LR GDP exhibiting a slightly negative relationship with HCE and INF showing a slightly positive relationship. This implies that while household consumption is a key driver of economic activity, it has a limited influence on other macroeconomic variables such as GDP and inflation in the long run. However, HCE has a strong positive relationship with FDI, further indicating that increases in household spending may attract more foreign investment, which in turn drives further consumption and economic growth. These IRF results offer a comprehensive view of the complex interactions between Malaysia's macroeconomic variables over time, reinforcing the findings from the VDC analysis. While the VDC results showed the extent to which each variable explained the forecast error variance of the other variables, the IRFs shed light on the dynamic responses of these variables to shocks. Collectively, both analyses illustrate the interdependence of these variables and highlight the critical role of factors such as FDI, consumption, and inflation in shaping Malaysia's long-term economic trajectory.

CONCLUSION, POLICY RECOMMENDATIONS, AND LIMITATIONS

This study has examined the relationship between economic growth (LR GDP) in Malaysia from 1990 to 2019 and the macroeconomic variables of inflation (INF), real interest rates (INT), foreign direct investment (FDI), and household consumption expenditure (HCE). The findings underscore their critical role in shaping Malaysia's economic growth. The study results point to several specific policy measures to promote sustainable economic development.

To further enhance Malaysia's ability to attract FDI, the government could streamline its

regulatory environment and introduce tax incentives for foreign investors, particularly in high-tech and green industries. Tax exemptions or reductions for companies that invest in research and development (R&D) or sustainable practices would make Malaysia a more attractive destination for foreign capital. At the same time, simplifying business registration procedures and reducing bureaucratic hurdles would help reduce the cost of doing business, alongside improving intellectual property protection to build investor confidence in the security of their investments. Additionally, a government focus on attracting FDI in sectors such as renewable energy, digital technologies, and biotechnology would ensure future economic sustainability.

Promoting technology transfer and fostering innovation are key to driving long-term growth. Establishing innovation hubs and technology parks to facilitate collaboration between foreign investors and local firms would help integrate cutting-edge technologies into the Malaysian economy. Supporting public-private partnerships (PPP) to build these ecosystems would stimulate growth in industries such as renewable energy, digital manufacturing, and healthcare. Moreover, financial incentives for R&D, as well as initiatives to encourage foreign firms to establish local R&D centers, would not only boost technological capacity but also create high-quality jobs and enhance industrial competitiveness.

Controlling inflation is another critical aspect of ensuring economic stability. To achieve this, the government could implement policies through the Central Bank of Malaysia to target inflation, adjusting interest rates to control inflationary pressures without hindering growth. Alongside this, the government should focus on reducing dependency on imports by promoting domestic production, particularly in agriculture and essential goods. Introducing strategic subsidy reforms and encouraging local supply

chains will mitigate supply-side inflation and reduce reliance on external markets.

Another suggestion is encouraging domestic investment through investment-friendly policies, such as offering tax relief or investment credits for businesses investing in infrastructure, innovation, and sustainability. Government subsidies for energy-efficient technologies would incentivize companies to invest in green initiatives, further driving sustainable growth. In addition, public-private partnerships could be leveraged to improve infrastructure and create new business opportunities, ensuring a competitive edge for Malaysian companies in the global market.

The results of this study also have implications for aligning economic policy with national development strategies such as the Twelfth Malaysia Plan (2021–2025), which emphasizes sustainable growth, digital transformation, and inclusive socio-economic development (EPU, 2023). By linking macroeconomic management with national policy agendas, Malaysia can ensure that FDI, inflation control, and innovation strategies reinforce broader development priorities.

By implementing these targeted policy measures, Malaysia can achieve sustainable economic growth while enhancing its global competitiveness. Strengthening FDI inflows, fostering innovation, maintaining economic stability, encouraging domestic investment, and reinforcing institutional governance are essential pillars for long-term prosperity. A well-coordinated policy framework that integrates these elements will position Malaysia as a dynamic and resilient economy capable of navigating global economic challenges and ensuring sustainable development for future generations.

Alongside its strengths, this study has certain limitations. The analysis is confined to the period 1990–2019 to capture long-run structural

trends in Malaysia's economic growth without distortion from the extraordinary disruptions of COVID-19 and post-pandemic recovery policies. While this timeframe provides a stable foundation for long-run analysis, it does not reflect the more recent shocks from the pandemic itself and ensuing global supply chain crises, or ongoing geopolitical uncertainties. Future research could extend the dataset beyond 2020 and adopt sectoral perspectives or cross-country comparisons within ASEAN to generate more comprehensive insights into Malaysia's growth dynamics (World Bank, 2024).

RELEVANCE AND IMPLICATIONS FOR THE INDONESIAN CONTEXT

The study, although centred on Malaysia, offers important insights for Indonesia due to their shared characteristics as upper-middle-income ASEAN economies undergoing structural transformation. Both countries rely on a mix of resource-based activities, manufacturing and expanding service sectors but Indonesia's larger scale and regional disparities create additional policy complexity. A key takeaway is the importance of improving the quality of foreign direct investment (FDI), not just its volume. For Indonesia, this means directing FDI into high-value sectors such as digital industries, renewable energy and advanced manufacturing to reduce dependence on commodities and support a transition toward innovation-driven growth.

The study also highlights the critical role of macroeconomic stability, particularly inflation and interest rate management, in sustaining growth. Indonesia's inflation-targeting framework has been relatively effective, but vulnerabilities to supply-side shocks remain. The Malaysian experience suggests that inflation control should be complemented by structural measures such as strengthening supply chains

and improving productivity. Similarly, interest rate policies must strike a careful balance: overly tight policies may suppress investment and consumption, while overly loose policies risk inflation. In parallel, household consumption, already the backbone of Indonesia's economy, must be supported through policies that address income inequality, enhance wages and strengthen social protection to ensure inclusive and resilient domestic demand.

Finally, the study underscores the importance of innovation, technology transfer and public-private collaboration in achieving long-term growth. Indonesia's progress in digitalisation is notable, but gaps remain in upgrading traditional industries. Lessons from Malaysia point to the need for stronger R&D incentives, innovation ecosystems, and linkages between foreign investors and domestic firms. More broadly, the study advocates for an integrated policy framework that aligns FDI, macroeconomic stability, domestic demand, and innovation. Such coordination is essential for Indonesia to advance its development agenda, strengthen competitiveness, and achieve sustainable and inclusive economic growth.

Acknowledgement (if any)

This research was supported by the Universitas Muhammadiyah Yogyakarta (UMY) Research Fellowship Program July-December 2025.

Declaration of AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the author(s) used **ChatGPT** in order to **Improved the grammar and structure of the sentences especially the abstract and introduction**. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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