

**Impact of macroeconomic variables and digital technology on economic growth in ASEAN-5 countries**

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**ABSTRACT**

**Purpose** — *This research aims to examine and analyze the impact of foreign direct investment (FDI), internet users, interest rates, and inflation on economic growth in the five founding ASEAN countries: Indonesia, Malaysia, Singapore, the Philippines, and Thailand.*

**Method** — *This research employs a quantitative approach using panel regression analysis to identify and measure the impact of macroeconomic variables and digital technology on economic growth in the five founding countries of ASEAN. The data, spanning the period from 2005 to 2022, is sourced from the World Bank and other relevant international databases.*

**Result** — *The research results indicate that foreign direct investment (FDI), internet users, and interest rates significantly influence economic growth in ASEAN countries. Conversely, inflation has a negative but insignificant effect on economic growth in the region. These findings underscore the importance of FDI, digital technology adoption, and effective interest rate management in driving economic growth. The insignificant impact of inflation suggests that it may not play a major role in the economic growth dynamics of the ASEAN-5.*

**Practical implications** — *The research has practical implications for ASEAN stakeholders. Governments can attract FDI and promote digital infrastructure to foster economic growth. Investors can target sectors that benefit from FDI and digital technology. Central banks can adjust interest rates to stimulate growth while managing inflation. Businesses can prioritize digital transformation for development. Collaboration among ASEAN states can further enhance regional growth. Aligning strategies with these findings can boost ASEAN's prosperity and competitiveness.*

**Keywords:** *economic growth, investment, internet usage, interest rates, inflation*

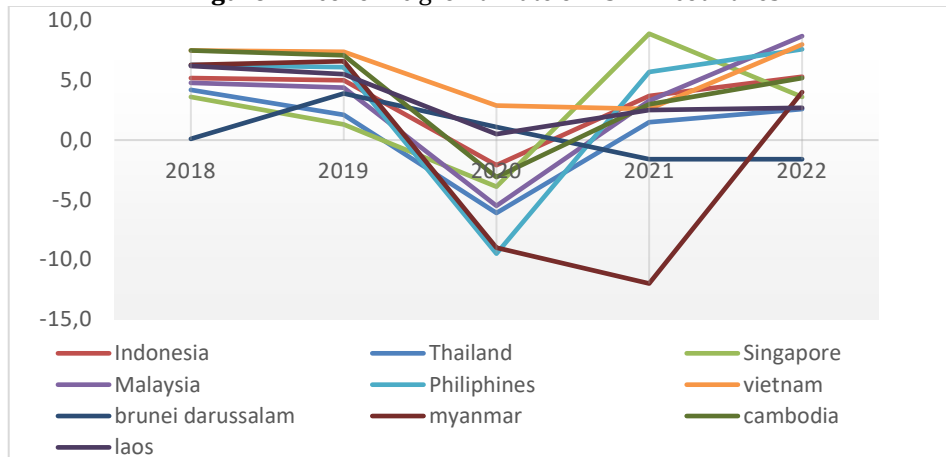
**INTRODUCTION**

Economic growth is a key objective for a country aiming to effectively implement economic development strategies, as the real impact of these policies is reflected in economic growth. Additionally, economic growth is often viewed as a mechanism to expand the economy's capacity, leading to increased national income (Menajang, 2014). From a macroeconomic perspective, a country's economic growth is typically measured using national income. Specifically, economic growth is defined as the increase in a country's national income or per capita income over a given period (Wau et al., 2022).

The Association of Southeast Asian Nations (ASEAN) was established in 1967 as a regional organization for Southeast Asian countries. Initially, ASEAN comprised five countries: Thailand, Indonesia, the Philippines, Malaysia, and Singapore. Over time, the membership has expanded to include ten countries. ASEAN's abundance of natural and human resources, strategic location, and increasing economic growth have integrated the region into global economic activities. Each ASEAN country aims to achieve high economic growth to remain competitive on the global stage. Among all ASEAN member countries, the five founding members significantly contribute to the regional GDP and are central to trade and investment.



**Figure 1. Economic growth rate of ASEAN countries**



Source: WorldBank Open Data (2024)

Based on Figure 1, it is evident that over the past five years, ASEAN member countries have generally exhibited a stable economic growth trend. This research focuses on the five founding countries of ASEAN to analyze the factors that can drive increased economic growth.

Among the 10 ASEAN countries, Singapore had the highest economic growth rate at 8.90% in 2021. This robust growth is attributed to Singapore's reliance on trade and state sectors. According to World Bank data, 12.4% of the population works in the service sector, and about 17% is employed in manufacturing. Singapore benefits from advanced and efficient infrastructure, a skilled labor force, and its ability to attract investment from over 7,000 multinational companies from Europe, the United States, and Japan. Almost all economic sectors in Singapore are dominated by foreign companies.

Conversely, Myanmar experienced the lowest economic growth, at -12% in 2021. This significant decline is mainly due to the impact of the COVID-19 pandemic and the political instability affecting Myanmar's economy (Indayani & Hartono, 2020).

A country's sustainable economic development can be bolstered by active foreign investment. Investment is assumed to have a positive impact on economic development by increasing production capacity (Aviantih, 2023). Several studies confirm that investment variables have a positive and significant effect on economic growth (Dinarjito & Dharmazi, 2020; Zaharah et al., 2023; Helmiyanti & Khoirudin, 2024; Dira et al., 2023). The Harrod-Domar theory posits that investment is a critical determinant of economic growth, playing a dual role in shaping the economy. Specifically, investment is positively correlated with national income, suggesting that an increase in capital stock boosts the economy's production capacity (Zaharah et al., 2023).

However, some studies present contrasting findings, indicating that investment does not always contribute positively to economic expansion. For instance, Wati & Khoiriawati (2023) concluded that there is no statistically significant positive correlation between investment and economic growth. Similarly, Fauzi & Suhaidi (2022) found that investment can negatively impact economic growth.

Macroeconomic variables such as interest rates and inflation also influence economic growth. Interest rates are crucial in determining investment decisions. Essentially, interest rates represent the cost of borrowing funds, affecting both demand and supply (Manan & Aisyah, 2023). Research by Asnawi & Fitria (2018) and Fahrika (2016) suggests that interest rates can affect economic growth. However, other studies indicate that interest rates do not significantly impact economic growth (Cakra et al., 2023). This lack of significant effect may be because many people, especially in the lower middle class, do not adjust their savings behavior in response to changes in interest rates, opting instead to use their income for basic needs.

Inflation, defined as a sustained increase in the overall cost of products and services, is another critical factor. Helmiyanti & Khoirudin (2024) describe inflation as a continuous rise in prices or a continuous depreciation of currency purchasing power. As prices rise, the currency's value decreases, often measured by the consumer price index (Pioh et al., 2021). Some studies suggest that moderate inflation can stimulate economic growth, while others argue that it can hinder expansion. For example, Amalia & Hasmarini (2024) found a positive correlation between inflation and economic growth in six ASEAN countries from 2018 to 2022, with controlled inflation fostering economic expansion. Conversely, Irving Fisher's theory of monetary neutrality posits that minimal inflation does not significantly affect economic growth, as it merely reflects an increase in the money supply without impacting real economic activity.

In summary, while foreign investment and macroeconomic variables like interest rates and inflation play significant roles in economic development, their impacts can vary. Therefore, a nuanced understanding of these factors is crucial for fostering sustainable economic growth.

In today's modern era, technological advancements have a positive impact on society. This is evident from the numerous conveniences and innovations that enable people to engage in various economic activities on a global scale. The development of the internet has facilitated easier and faster communication, both individually and organizationally. Technology helps overcome limitations related to facilities, time, and distance.

Technological advancements also significantly influence lifestyle changes, gradually transforming the mindset of traditional societies. Various sectors, including companies, banking, trade, education, and health, have adopted technology to function more efficiently and reduce costs. Previous studies support this, indicating that the number of internet users positively and significantly affects economic growth in Indonesia. In other words, as the number of internet users increases, economic growth also rises (Nasution et al., 2020).

Given the ongoing efforts to achieve economic growth and the conflicting or inconsistent findings on its determinants, this study aims to examine the factors influencing economic growth in the ASEAN-5 countries. These five countries, which are key members of the ASEAN organization, have consistently outperformed other ASEAN nations in terms of economic expansion.

## METHOD

This quantitative research utilizes panel data to analyze five ASEAN countries from 2005 to 2022: Indonesia, Singapore, Malaysia, Thailand, and the Philippines. Data for these countries were sourced from [www.worldbank.org](http://www.worldbank.org). These nations rank among the top 64 in the Global Competitive Index (GCI) for economic competitiveness, making them attractive to investors due to their substantial domestic market share and promising economic growth prospects.

The study examines several independent variables—such as inflation, investment, internet users, and interest rates—against economic expansion, which serves as the dependent variable. The analysis employs panel data regression to develop three models: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). This method helps overcome certain assumptions underlying model formation, such as constant intercepts across individuals and unrealistic time assumptions (Abdillah & Hartono, 2015). By using this approach, researchers can address omitted variables that might influence intercept changes; for instance, researchers can introduce dummy variables to account for these changes.

The panel data regression equation used in this study is as follows:

$$Y_{it} = \alpha + \beta_{1it} X_{1it} + \beta_{2it} X_{2it} - \beta_{3it} X_{3it} - \beta_{4it} X_{4it} + e$$

Description:

$\beta_0$	= Intercept
$\beta_1, \beta_2, \beta_3, \beta_4$	= Coefficient
Y	= Economic growth (Nominal)
$X_1$	= Investment/FDI (Nominal)

$X_2$	= Internet users (%)
$X_3$	= Interest rate (%)
$X_4$	= Inflation (%)
$i$	= Cross-sectional data for 5 countries
$t$	= Time series data during 2005-2022
$e$	= Confounding error (standard error)

## **Hypotheses development**

### ***Investment and economic growth***

The theoretical framework underpins the idea that Foreign Direct Investment (FDI) has a beneficial impact on economic growth through several mechanisms. Firstly, FDI boosts the production and sale of domestic goods, resulting in increased national income and economic expansion (Makiela & Ouattara, 2018). Secondly, FDI drives technological progress and innovation, which can spread across various sectors like industry and agriculture, further fueling economic growth. This notion aligns with the concept that FDI facilitates the transfer of knowledge and the adoption of best practices (Mahadiansar et al., 2021). Furthermore, FDI promotes job creation and skill development, thereby improving employment levels and educational standards, which in turn enhances labor quality and overall productivity. Moreover, FDI contributes to infrastructure development, such as roads and bridges, which benefits diverse economic activities and sectors, thereby fostering economic growth (Mahadiansar et al., 2021). Thus, considering these theoretical insights and empirical findings, it is reasonable to hypothesize a positive correlation between Foreign Direct Investment and economic growth.

H1: There exists a positive correlation between investment and economic growth

### ***Internet users and economic growth***

Theoretical frameworks suggest that the use of the internet and digital technology significantly boosts economic growth. This influence is evident across various aspects of the digital economy, such as the increasing value of digital transactions and their overall contribution to economic expansion. Abdillah (2024) emphasizes the diverse ways in which the internet fosters economic development. Firstly, it facilitates business transactions by providing efficient platforms for communication and commerce, thus improving market accessibility and connectivity. Secondly, it creates new job opportunities, especially in information technology-related sectors, which in turn boosts workforce participation and income. Additionally, the internet streamlines business operations through transactional conveniences and productivity-enhancing tools, optimizing resource utilization and operational efficiency. Therefore, based on these theoretical perspectives and empirical evidence, it is reasonable to assert a positive correlation between internet usage and economic growth.

H2: There is a positive correlation between internet usage and economic growth

### ***Interest rate and economic growth***

Theoretical understanding suggests that interest rates play a significant and negative role in influencing economic growth in Indonesia. When interest rates are high, they tend to hinder economic expansion by increasing borrowing costs. This, in turn, reduces the willingness of businesses and individuals to invest. Consequently, capital formation is constrained, leading to a slowdown in overall economic activity (Wigati & Wahid, 2022). On the other hand, lower interest rates can stimulate economic growth by encouraging investment and boosting economic activity. With reduced borrowing costs, businesses are more likely to undertake investment projects, which in turn stimulates capital formation, job creation, and consumption. This increased economic activity contributes positively to economic growth (Wigati & Wahid, 2022). Therefore,

based on this theoretical understanding and empirical evidence, it is reasonable to assert that there is a significant negative relationship between interest rates and economic growth in Indonesia.

H3: There is a negative relationship between interest rates and economic growth

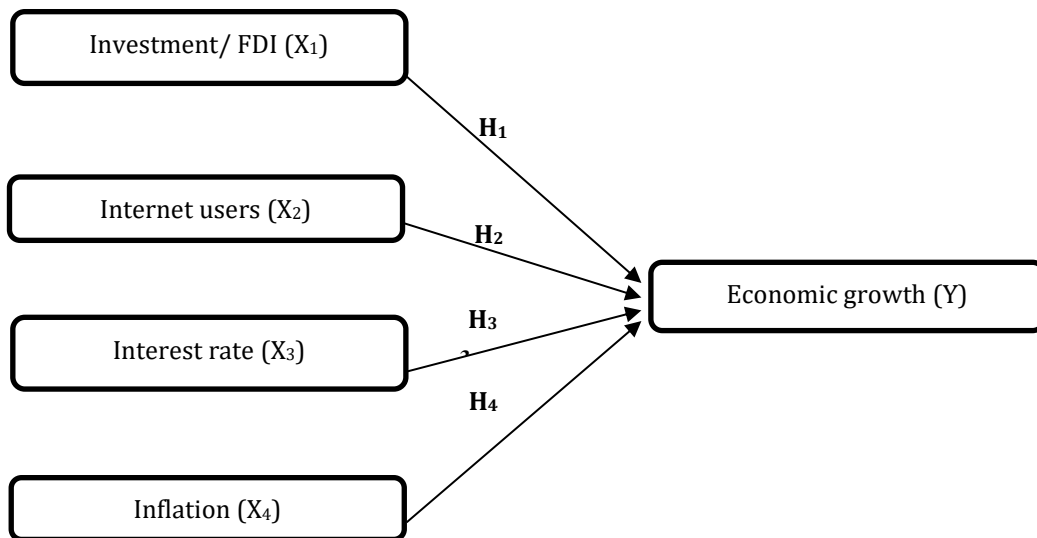
### ***Inflation and economic growth***

Theoretical analysis suggests that inflation generally hampers economic growth. High inflation rates increase production costs, diminishing business profitability and investment propensity. They also erode consumer purchasing power, reducing consumption levels and overall economic activity. This exacerbates economic instability and hampers growth prospects (Mayasari & Mahinshapuri, 2022).

Conversely, low and stable inflation rates can promote economic growth by ensuring price stability and boosting consumer confidence. In low inflation environments, businesses can plan investments more effectively due to fewer uncertainties about future costs. Moreover, stable prices enhance consumer purchasing power, enabling individuals to allocate resources toward investment and consumption, thereby stimulating economic activity (Mayasari & Mahinshapuri, 2022).

H4: There is a negative relationship between inflation and economic growth

**Figure 2.** Research model



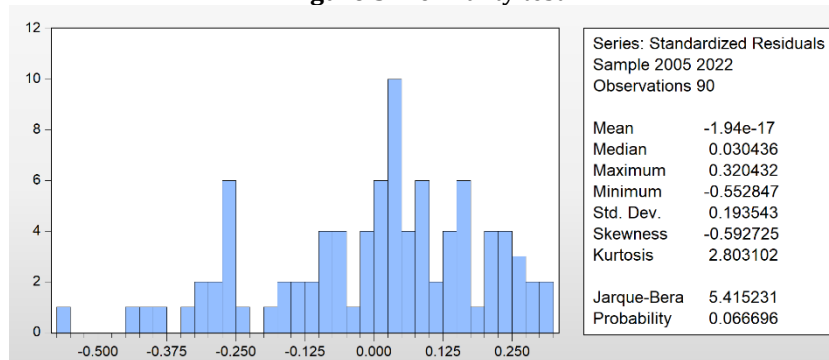
Source: Developed by the authors (2024)

## **RESULT AND DISCUSSION**

### **Normality test**

The normality test employs the t-test to ascertain the statistical significance of each independent variable (X) on the dependent variable (Y). A statement can be deemed valid if the residual conforms to a normal distribution.

**Figure 3. Normality test**



Source: Processed data (2024)

Based on the data in Figure 3, the results indicate that the Jarque-Bera test requirement has been met, with a Prob value exceeding 0.05. This suggests that the null hypothesis (H0) is accepted, indicating that the errors in the model follow a normal distribution.

### Multicollinearity test

The purpose of multicollinearity testing is to assess whether independent variables in multiple linear regression models are interrelated. An effective regression model is one where multicollinearity is absent.

**Table 1. Multicollinearity test results**

<b>Correlation</b>				
	X1	X2	X3	X4
X1	1.000000	0.556333	-0.063023	-0.251900
X2	0.556333	1.000000	-0.093786	-0.532253
X3	-0.063023	-0.093786	1.000000	-0.184009
X4	-0.251900	-0.532253	-0.184009	1.000000

Source: Processed data (2024)

The results of the multicollinearity test above indicate that there are no high correlation values among the independent variables. Therefore, it can be concluded that there is no multicollinearity present among the independent variables.

### Best model selection

Panel data regression is employed to analyze the impact of investment variables, internet users, interest rates, and inflation on economic growth across five ASEAN countries. Three models were derived from the panel regression, and three model selection tests were conducted to ascertain the most suitable model among the Common Effect Model, Fixed Effect Model, or Random Effect Model.

**Table 2. Chow and hausman test result**

<b>Name of test</b>	<b>Test summary</b>	<b>Statistic</b>	<b>Prob.</b>
Chow test	Cross-section F	120.165144	0.0000
Hausman test	Cross-section	480.660575	0.0000

Source: Processed data (2024)

The objective of the Chow test is to determine the suitability of the Common Effect Model (H0) or the Fixed Effect Model (H1). If the F value falls below 0.05, H0 is rejected. According to the data provided in Table 2, the calculated probability value for the Chow test is 0.0000, indicating significance below the 0.05 threshold. Thus, based on these results, it is concluded that the Fixed Effect Model is more appropriate for the research and the Common Effect Model is rejected.

The Hausman test, which compares the Random Effect Model (H1) with the Fixed Effect Model (H0), is employed to determine the superior model. H0 is accepted if the probability value exceeds 0.05, while H1 is favored if the probability value is less than 0.05. In our case, the calculated probability value from the Hausman test is 0.0000, indicating significance below 0.05. This leads us to accept H1 and reject H0, implying that the Fixed Effect Model is more suitable for this study. Based on the tests that have been carried out, the results show that the best model that can be used is the Fixed Effect Model (FEM).

**Table 3.** Fixed Effect Model (FEM)

Variables	Coefficient	Std. error	T-statistic	Prob.	Conclusion
Investment	1.989474	0.613787	3.241310	0.0017	H1 accepted
Internet users	5.00E+09	5.98E+08	8.362185	0.0000	H2 accepted
Interest rate	7.08E+09	3.70E+09	1.911371	0.0595	H3 rejected
Inflation	-1.54E+10	5.24E+09	-2.939659	0.0043	H4 accepted
R-squared	0.896356				
Adjusted R-squared	0.886120				
F-statistic	87.56527				
Prob(F-statistic)	0.000000				

Source: Processed data (2024)

## Discussion

### *The effect of FDI on economic growth of ASEAN-5 countries*

The finding reveals a statistically significant relationship between investment (FDI) and economic growth at a 0.05 significance level. The t-statistic for investment is 3.241310 with a probability value of 0.0017.

In the five ASEAN founding countries, foreign direct investment (FDI) has been found to exert a statistically significant and positive influence on economic growth. This finding aligns with the notion that foreign investment plays a pivotal role in stimulating economic expansion by providing access to additional resources such as capital and technology. The influx of foreign investment enables local businesses to expand their operations, generate new employment opportunities, and enhance global market competitiveness. Moreover, foreign investment has the potential to catalyze the growth of interconnected industries, fostering the development of additional infrastructure and services. Consequently, foreign investment significantly contributes to accelerating economic growth within a nation.

These findings corroborate the conclusions drawn from prior research studies conducted by Kambono & Marpaung (2020), Onafowora & Owoye (2019), and Makiela & Ouattara (2018), which also established a significant and direct relationship between foreign investment activity and a country's economic growth rate. Similar results were obtained in a recent study by Helmiyanti & Khoirudin (2024), further supporting the notion that investment plays a substantial and favorable role in driving economic expansion. Recognized widely for its capacity to stimulate economic growth across regions, investment is also acknowledged for its active contribution to augmenting regional own-source revenue.

### ***The effect of internet users on economic growth of ASEAN-5 countries***

The finding reveals a highly significant statistical relationship between internet users and economic growth at a significance level of 0.05. With a t-statistic of 8.362185 and a probability value of 0.0000, this underscores a positive impact of internet usage on economic growth.

In the context of the five ASEAN countries, the adoption of digital technology, exemplified by internet users, showcases a positive and notable influence on economic growth. This observation resonates with the findings of Nasution et al. (2020), emphasizing the positive correlation between economic growth and internet user numbers. The internet serves as a catalyst for economic expansion by facilitating access to information and business opportunities across organizations of varying scales. This inclusive digital landscape fosters economic growth by creating additional avenues for businesses, particularly within digital sectors such as e-commerce and internet-based services.

Moreover, the internet plays a pivotal role in advancing economic integration among the ASEAN-5 nations. Through enabling electronic commerce and cross-border investments, it propels the process of economic integration within the region. This heightened integration offers businesses in the five ASEAN countries enhanced market access and bolsters regional competitiveness. Consequently, harnessing the potential of the internet not only contributes to the overarching economic growth of ASEAN but also nurtures regional integration, presenting numerous opportunities for domestic economic advancement.

### ***The effect of interest rates on economic growth of ASEAN-5 countries***

The relationship between interest rates and economic growth demonstrates marginal significance, with a probability value of 0.0595. Although this indicates borderline statistical significance, the findings suggest that interest rates may still play a meaningful role in the economic development of the five ASEAN founding countries.

An increase in interest rates can have several positive impacts on economic growth, a notion supported by previous research. Fahrika (2016) found that positive interest rates can significantly influence economic development. High interest rates have several beneficial effects on economic growth, especially in controlling inflation. As borrowing costs increase, both consumer demand and investment tend to decrease, which can help curb inflation and maintain price stability. This inflation control is crucial for sustainable economic growth, as it prevents the economy from overheating and reduces the risk of hyperinflation.

Moreover, high interest rates can attract foreign investment. Global investors often seek higher returns, and countries with higher interest rates can draw in foreign capital. This influx of foreign investment can enhance liquidity within the domestic economy, supporting various economic activities and fostering growth. Increased foreign capital inflows can also lead to improved infrastructure, the development of new industries, and overall economic diversification.

High interest rates can also contribute to the stability of the domestic currency exchange rate. When interest rates are elevated, foreign capital inflows typically increase, leading to a stronger local currency. A stronger exchange rate can reduce the cost of imports and improve the trade balance, contributing positively to economic growth. A stable and strong currency valuation also boosts investor confidence and encourages further economic activities and investments within the country.

Consistent with previous research by Fahrika (2016), this study supports the notion that high interest rates, despite their complex and sometimes controversial nature, can have a significant positive impact on the economic growth of ASEAN countries. By controlling inflation, attracting foreign investment, and strengthening the domestic currency, higher interest rates can foster a more stable and conducive environment for economic development.



### ***The effect of inflation on economic growth of ASEAN-5 countries***

The finding indicates a statistically significant relationship between inflation and economic growth at a 0.05 significance level. The t-statistic for inflation is -2.939659, with a p-value of 0.0043, highlighting that inflation has a significant negative impact on economic growth in the five ASEAN founding countries.

The impact of inflation on economic growth in these countries is notably negative, suggesting that an increase in inflation can inhibit economic expansion. This finding aligns with research conducted by Syafi'i et al. (2021), which also states that inflation has a significant adverse effect on economic growth. The negative correlation between inflation and economic growth illustrates how a country's economy is influenced by various factors.

One key issue is that low inflation can signal underlying economic problems, such as weak demand or instability, which can further hamper economic activity. When the prices of goods and services decline, consumers may delay purchases in anticipation of even lower prices in the future. This behavior can reduce immediate consumption, slowing economic growth. Simultaneously, producers may experience declining profits and be less motivated to invest in new projects or expand operations due to lower profit expectations.

Moreover, prolonged periods of low inflation can suppress firms' incentives to invest in developing new production capacities or technological innovations. When firms anticipate lower returns due to stagnant or declining prices, their motivation to undertake long-term investments diminishes. This lack of investment can have a cascading effect on productivity and overall economic competitiveness, as firms are less likely to adopt new technologies or expand their production capabilities. Consequently, this can lead to slower economic growth and reduced economic dynamism.

### **CONCLUSION**

The primary aim of this study was to analyze the impact of various economic factors—foreign direct investment (FDI), internet usage, interest rates, and inflation—on economic growth in five ASEAN founding countries from 2005 to 2022. Using a Fixed Effect Model, this research sought to understand the significance and direction of these relationships, providing insights to inform policy decisions aimed at fostering economic development in the region.

The study revealed several key findings. Firstly, there is a statistically significant and positive relationship between FDI and economic growth. This indicates that investment in these countries substantially boosts economic expansion. Secondly, internet usage also exhibits a highly significant and positive impact on economic growth, underscoring the crucial role of digital technology in driving economic performance. Thirdly, the relationship between interest rates and economic growth, while marginally significant, suggests that interest rates can influence economic activity, albeit to a lesser extent. Lastly, inflation has a significant and negative impact on economic growth, indicating that higher inflation rates can inhibit economic progress.

These findings have several practical implications for policymakers in ASEAN countries. Promoting foreign direct investment is essential, as it significantly enhances economic growth. This can be achieved through policies that facilitate ease of doing business and provide incentives for foreign investors. Additionally, enhancing digital infrastructure and improving internet access can have substantial positive effects on economic growth. Governments should prioritize investments in digital technologies and promote digital literacy to maximize the benefits of the digital economy. While the impact of interest rates on growth is marginal, maintaining a balanced approach to interest rate management is crucial for controlling inflation and attracting foreign investment. Moreover, controlling inflation is vital, as high inflation rates negatively affect economic growth. Policymakers need to focus on strategies to maintain moderate inflation levels, such as implementing effective monetary policies and enhancing production efficiency.

For further studies, several areas could be explored to build on these findings. Conducting longitudinal studies over a more extended period might provide deeper insights into the long-term effects of these variables on economic growth. Additionally, investigating the impact of these economic factors on specific sectors within ASEAN economies could reveal more nuanced relationships and targeted policy implications. Future research could also include other potential determinants of economic growth, such as education, healthcare, and political stability, to offer a more comprehensive understanding of growth dynamics. Comparative studies that analyze ASEAN countries alongside other regions could highlight unique factors contributing to growth and the effectiveness of different economic policies in diverse contexts.

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