

Analysis of the Determinants of Economic Growth in ASEAN Countries

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ABSTRACT: This study aims to analyze economic growth and its determinants in the ASEAN-9 region using a quantitative approach within a macroeconomic production function framework. Annual panel data from 2008 to 2024 are utilized to capture both temporal and cross-country variations among the nine ASEAN member states. The analysis is conducted using Stata software through panel data regression with a fixed effect model to control for unobserved heterogeneity. The input variables include Gross Fixed Capital Formation, Labor Force Participation Rate, Electric Power Consumption, Trade (% of GDP), and General Government Final Consumption Expenditure, while the output variables are represented by GDP, GDP Growth, GDP per Capita, and GDP per Capita Growth. The results indicate that Gross Fixed Capital Formation significantly and positively affects economic growth, while the Labor Force Participation Rate is significant only for aggregate GDP. Electricity consumption per capita shows a positive effect on GDP levels but a negative effect on growth, reflecting inefficiency in energy use. International trade negatively influences GDP but positively affects growth, whereas government consumption expenditure has a significant negative effect on growth. Overall, the findings demonstrate that the efficiency of economic growth in the ASEAN-9 is shaped by the quality of investment, labor productivity, energy efficiency, and fiscal policy effectiveness, implying that governments should promote productive investments, enhance human capital, and direct energy and fiscal policies toward inclusive and sustainable economic development.

KEYWORDS: Good Fixed Capital Formation, Labor Force Participation Rate, Electric Power Consumption, Trade (% of GDP), General Government Final Consumption Expenditure, GDP

I. INTRODUCTION

Economic growth is a key indicator reflecting a country's ability to sustainably improve the well-being of its people. As part of the dynamic Southeast Asian region, ASEAN countries have undergone significant economic transformation in recent decades. Economic integration through the ASEAN Economic Community (AEC) since 2015 is expected to improve the efficiency of economic growth among its member countries by increasing trade, investment, and labor flows. However, disparities in economic growth and productivity levels among member countries remain a structural challenge hindering the achievement of regional economic convergence.

The ASEAN-9 countries, consisting of Indonesia, Malaysia, Thailand, Singapore, the Philippines, Vietnam, Cambodia, Laos, and Brunei Darussalam, exhibit heterogeneous growth patterns. Singapore and Malaysia are ranked as countries with high levels of economic efficiency, while Laos and Cambodia still face productivity constraints and limited infrastructure and capital. Meanwhile, Indonesia, as the region's largest economy, continues to face challenges in maintaining growth efficiency amid global dynamics, such as fluctuating commodity prices and external pressures on the trade sector.

In the context of economic growth theory, factors such as capital formation, labor, energy consumption, trade openness, and government spending are important determinants in explaining variations in growth across countries. The Solow-Swan growth model (1956) emphasizes the role of capital and labor accumulation as key factors in increasing national output. Meanwhile, endogenous growth theory (Romer, 1986; Lucas, 1988) adds the dimensions of innovation and public policy as variables capable of accelerating long-term growth.

One of the key variables in the study of economic growth efficiency is *Gross Capital Formation* (GFCF), which reflects the level of productive investment in a country. Increased physical investment, both from the public and private sectors, is believed to expand production capacity and strengthen the economic structure. Furthermore, the labor force participation rate is an important indicator of the extent to which human resources are involved in productive economic activities. High labor force participation is expected to increase total factor productivity and long-term economic growth.

On the other hand, electricity consumption (*Electric Power Consumption*) is a proxy for a country's level of economic activity and industrialization. Access to stable and efficient energy plays a crucial role in driving the growth of the modern manufacturing and service sectors. Countries with low electricity consumption generally have limited industrial capacity, making energy

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efficiency a strategic issue in managing sustainable development. International trade (*Trade Openness*) is also an important determinant because openness to global markets can accelerate the flow of capital, technology, and knowledge between countries. However, too high a level of openness can also lead to dependence on external demand. Meanwhile, government *final consumption expenditure* (*GFP*) plays a role in promoting macroeconomic stability through financing infrastructure, education, and health, although its impact on economic efficiency remains debated in the literature.

This research is novelty in several aspects. First, the research period covering 2008–2024 provides a long-term perspective on efficiency dynamics, including the impact of the global financial crisis, the COVID-19 pandemic, and post-pandemic economic recovery. Second, this research uses four main GDP indicators, namely; GFCF, labor, electricity consumption, and government expenditure, to describe comprehensive productive inputs in driving economic growth. This approach provides theoretical and empirical contributions to the literature on economic growth efficiency in the ASEAN region.

This research aims to analyze the determinant factors that influence economic growth in ASEAN-9 countries in the 2008–2024 period using an approach via a panel regression model. Through the results of this analysis, it is hoped that an overview of the economic performance of each country and policy recommendations will be obtained to increase growth efficiency in the ASEAN region in a sustainable manner.

II. RESEARCH METHODS

This research uses a quantitative approach with a focus on the determinants of economic growth in nine ASEAN member countries. The analytical framework is based on the macroeconomic production function, which evaluates the influence of input variables such as gross fixed capital formation (GFCF), labor force participation, electricity consumption per capita, trade openness, and government consumption expenditure on output indicators in the form of Gross Domestic Product (GDP), GDP per capita, and growth rate.

The data used is annual panel data for the period 2008–2024, which represents the time dimension (*time series*) and between countries (*cross section*). The analysis was conducted with the help of Stata software, using a panel regression model with a fixed effect approach (*Fixed Effect Model*) to control for unobserved heterogeneity between countries and time.

The study population covers all ASEAN member states, but the analysis focuses on nine countries: Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. Myanmar was excluded due to limited data availability throughout the observation period.

This study uses secondary data sourced from *the World Development Indicators (WDI)* published by *the World Bank* . All data are annual and cover the period 2008–2024. This data was selected for its consistency and completeness across countries and its relevance for analyzing the long-term dynamics of economic growth in the ASEAN region.

This study uses two groups of variables, namely the dependent variable as *output* and independent variables as *input* and efficiency determinants. Four main variables are used to represent economic growth, namely GDP (constant 2015 US\$), GDP Growth (annual %), GDP per Capita (constant 2015 US\$), and GDP per Capita Growth (annual %). All four describe macroeconomic performance, both in terms of the level and dynamics of growth (World Bank, 2023; Barro & Sala-i-Martin, 2004; Todaro & Smith, 2015).

Independent variables include Gross Fixed Capital Formation (GFCF) as an indicator of capital accumulation (Solow, 1956; Sahoo & Dash, 2012), Labor Force Participation Rate to reflect labor availability (Blanchard & Johnson, 2013; Mankiw et al., 1992), Electric Power Consumption as a proxy for productive energy utilization (Lee, 2005; International Energy Agency, 2019), Trade (% of GDP) which indicates economic openness (Frankel & Romer, 1999; Dollar & Kraay, 2004), and Government Final Consumption Expenditure (% of GDP) which describes the role of government in the economy (Barro, 1990; Afonso et al., 2010). All data are sourced from *the World Development Indicators (WDI)* and adjusted to constant 2015 prices.

Independent variables include Gross Fixed Capital Formation (GFCF) as an indicator of capital accumulation (Solow, 1956; Sahoo & Dash, 2012), Labor Force Participation Rate to reflect labor availability (Blanchard & Johnson, 2013; Mankiw et al., 1992), Electric Power Consumption as a proxy for productive energy utilization (Lee, 2005; International Energy Agency, 2019), Trade (% of GDP) which indicates economic openness (Frankel & Romer, 1999; Dollar & Kraay, 2004), as well as Government Final Consumption Expenditure (% of GDP) which describes the role of government in the economy (Barro, 1990; Afonso et al., 2010). All data comes from World Development Indicators (WDI) and is adjusted to constant 2015 prices.

The research method was analyzed using panel data regression to identify determinants of efficiency between countries and over time. Three approaches were used, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The selection of the best model is carried out using the Chow Test, Hausman Test, and Lagrange Multiplier (LM) Test (Srihardianti, 2016; Falah, 2016).

If FEM proves to be the most appropriate, then the final estimation is carried out with a fixed effects model using Stata software. This panel regression allows a comprehensive analysis of the level of economic growth and its determinants in nine ASEAN countries during the period 2008–2024.

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III.RESULT AND DISCUSSION

A. Research Result

ASEAN is a regional organization in Southeast Asia with significant economic potential. After weathering the 1997 Asian financial crisis and the 2008–2009 global financial crisis, the region emerged as one of the world's six largest economies in 2016, after the United States, China, Japan, Germany, and India (PwC Growth Markets Center, 2018). ASEAN's Gross Domestic Product (GDP) increased from US\$577 billion in 1999 to US\$2,551 billion in 2016, with GDP per capita exceeding US\$4,000.

According to the World Bank (2021), Southeast Asia's economic growth has consistently outpaced the global average, even during the 2008–2009 crisis. The COVID-19 pandemic in 2020 caused a sharp contraction, but the region's economic recovery accelerated in 2021. Overall, ASEAN's economic performance demonstrates structural resilience and long-term growth potential, despite continuing challenges from global uncertainty.

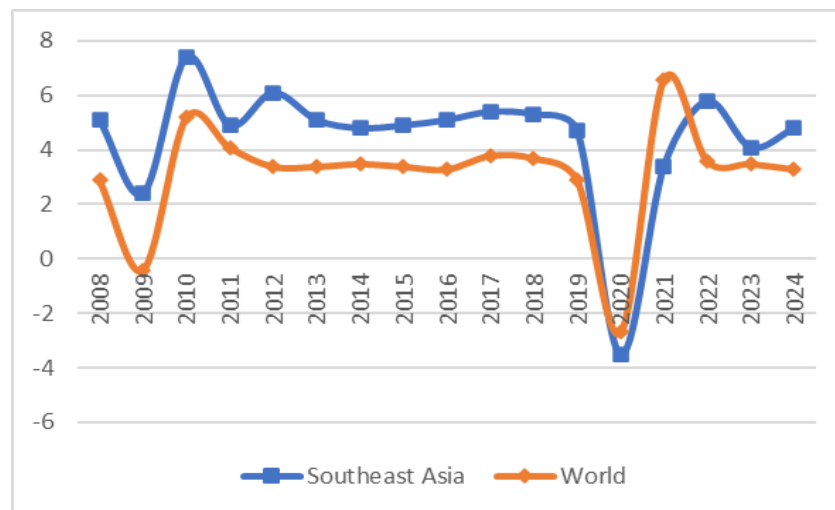


Figure 1. World and Southeast Asian Economic Growth 2008-2024

Source: World Bank 2021

ASEAN has a population of approximately 1.8 billion people, or 23% of the world's population (World Bank, 2021), making it the region with the third-largest labor force after China and India (PwC Growth Markets Center, 2018). Its large population and rapidly growing domestic consumption have made it the fourth-largest destination for foreign direct investment (FDI) in the world and the second-largest in Asia.

Poverty rates in ASEAN dropped dramatically from nearly 50% in 1990 to 14% in 2015, exceeding the *Millennium Development Goals target* (PwC Growth Markets Center, 2018). Significant declines also occurred in developing countries such as Cambodia, Laos, Myanmar, and Vietnam, where poverty fell from 66% to 18%.

Social progress is also evident in increased access to health care and education. The infant mortality rate fell to 26 per 1,000 births in 2016, with life expectancy increasing from 56 years (1967) to 71 years (2016). Primary education enrollment reached 96% in 2016, exceeding the global average of 89%. However, secondary education enrollment in ASEAN still lags behind other developing countries, highlighting the need to improve the quality of human resources.

This study analyzes the factors influencing economic growth in nine ASEAN countries during 2008–2024 using panel data. The dependent variables include real GDP, GDP growth, GDP per capita, and GDP per capita growth. The independent variables consist of gross fixed capital formation, labor force participation, electricity consumption per capita, international trade (% of GDP), and government consumption expenditure (% of GDP).

Table 1. Descriptive statistics

Variables	Observation	Mean	Std Dev	Min	Max
GDP (in natural logarithm)	153	25,6111	1,5279	22,8629	27,8447
GDP growth	153	4,2991	3,4149	-9,5183	14,5198
GDP per capita (in natural logarithm)	153	8,6830	1,1847	6.9945	11,1305
GDP per capita growth	153	2,9908	3,4771	-10,5489	14,4308
Gross Fixed Capital Formation (in natural logarithm)	153	24,3262	1.4756	21,6273	26,6849
Labor Force Participation Rate	153	4,2186	0.0935	4,0027	4.4478

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Variables	Observation	Mean	Std Dev	Min	Max
<i>Electric Power Consumption , kWh per capita (in natural logarithm)</i>	153	7,5353	1,1668	4,7311	9,3790
International Trade	153	4,7199	0.5606	3,4957	6,0807
<i>General Government Final Consumption Expenditure (in natural logarithm)</i>	153	2.4533	0.3993	1,5706	3,2763

Descriptive statistics show that most variables have been converted to natural logarithms to stabilize variance. The average GDP value of 25.61 with a standard deviation of 1.52 indicates economic disparities between countries. Indonesia has the highest GDP, while Laos and Brunei have the lowest. GDP and GDP per capita trends show sustained growth until 2024, with a sharp decline in 2020 due to the pandemic.

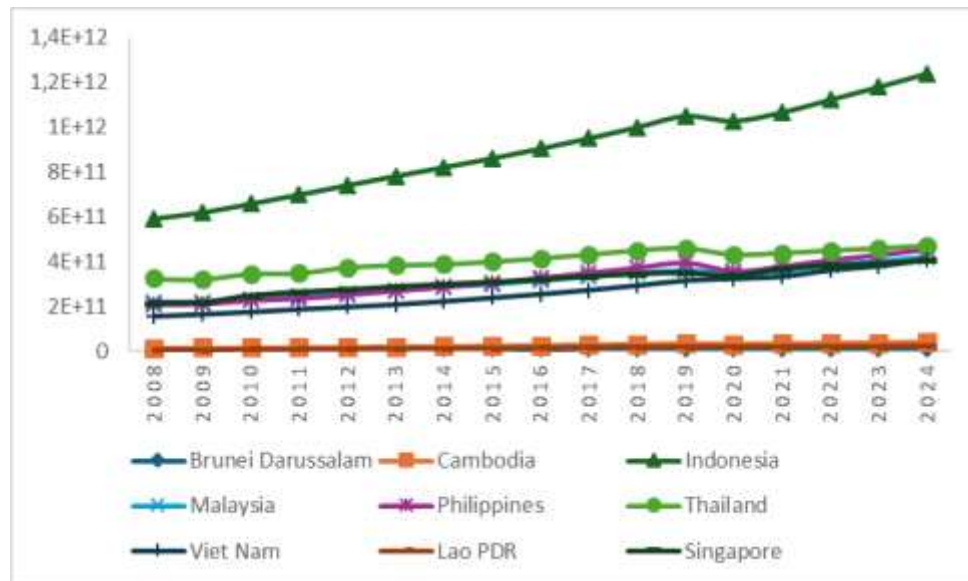


Figure 2. GDP (constant 2015 US\$) ASEAN 2008-2024

GDP growth averaged 4.29% per year with significant fluctuations, peaking in Singapore (14.52% in 2010) and falling to a low in the Philippines (-9.51% in 2020). Regional economic growth recovered rapidly after the pandemic, particularly in Vietnam, Malaysia, and Singapore.

Gross fixed capital formation (GFCF) and per capita electricity consumption are showing upward trends, reflecting improved investment and industrialization. Labor force participation remains relatively stable at around 67–68%, with a slight decline during the pandemic. Trade-to-GDP ratios indicate high economic openness, particularly in Singapore and Vietnam, while government spending varies, with Brunei accounting for the highest share (around 27% of GDP).

Three approaches are used for panel data estimation: Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM).

Table 2. Chow Test

Testing Phase	Estimation Form	
	Fixed Effect	Common Effect
Chow Test	Prob > F = 0.0000	

Source: data processed 2021

The Chow test produces $\text{Prob} > F = 0.0000 < 0.05 \rightarrow$ the best model is FEM.

Table 3. Hausman test

Testing Phase	Estimation Form	
	Fixed Effect	Random Effect
Hausman test	Prob>chi2 = 0.0000	

Source: data processed 2021

The Hausman test yields $\text{Prob} > \text{Chi}^2 = 0.0000 < 0.05 \rightarrow$ again confirming FEM as the most appropriate model.

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Table 4. Fixed Effect Model (FEM) regression results

Variables	GDP	GDP growth	GDP per capita	GDP per capita growth
<i>Ingross fixed capital formation</i>	0.371*** (0.0454)	2.267* (1,073)	0.326*** (0.0468)	2.267* (1,073)
<i>Inlabor force participation rate</i>	0.393* (0.202)	3,823 (8,939)	0.0162 (0.209)	3,823 (8,939)
<i>Inelectric power consumption per capita</i>	0.141*** (0.0316)	-3.178*** (0.623)	0.151*** (0.0327)	-3.178*** (0.623)
<i>Intrade</i>	-0.187*** (0.0514)	5,229*** (0.690)	-0.228*** (0.0530)	5,229*** (0.690)
<i>Ingeneral government final consumption expenditure</i>	0.0231 (0.0402)	-3.335** (1,182)	0.0126 (0.0416)	-3.335** (1,182)
Constant	14.58*** (1,319)	-61.56 (43.79)	0.571 (1,362)	-61.56 (43.79)
Observation	153	153	153	153
R-squared	0.951	0.593	0.910	0.593
Number of Countries	9	9	9	9

Source: data processed 2024

Standard errors are in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The Fixed Effect model estimation results show that Gross Fixed Capital Formation has a positive and significant effect on GDP and GDP per capita, indicating that increasing fixed asset investment can drive economic growth in ASEAN. Labor Force Participation Rate has a positive effect on GDP, but is not significant on GDP per capita growth, so that the increase in the workforce has not been fully followed by an increase in productivity. Electric Power Consumption has a significant positive effect on GDP, but is negative on GDP growth, indicating an inefficient energy dependence. Meanwhile, Trade (% of GDP) has a negative effect on GDP, but is significantly positive on economic growth, indicating that trade openness encourages long-term economic expansion. Meanwhile, Government Final Consumption Expenditure has a positive effect on GDP, but is significantly negative on GDP growth, reflecting that government spending supports economic stability, but can suppress growth efficiency if not managed productively.

The R^2 values of 0.951 for GDP and 0.910 for GDP per capita indicate that the model has very high explanatory power. Thus, ASEAN economic growth is primarily influenced by capital accumulation, energy consumption, and international trade, while government spending and labor force participation play a weaker role.

DISCUSSION

The analysis shows that *gross fixed capital formation* (GFCF) has a significant positive effect on output levels and economic growth across all measurement models, including GDP, GDP per capita, GDP growth, and GDP per capita growth. This confirms the crucial role of physical investment in expanding production capacity and increasing national productivity. This finding aligns with the Solow–Swan neoclassical growth model, which positions physical capital accumulation as the primary determinant of long-term growth (Solow, 1956; Barro & Sala-i-Martin, 2004).

Research by Sahoo and Dash (2012) also confirms that the GFCF in Southeast Asia contributes to *total factor productivity* (TFP) through increased manufacturing and infrastructure efficiency. However, this positive effect is highly dependent on the efficiency of capital allocation. As Restuccia and Rogerson (2008) note, large investments can lose their effectiveness if *misallocation occurs* or if capital is concentrated in low-productivity sectors.

Furthermore, endogenous growth theory explains that physical investment will have a greater impact if it is directed towards knowledge accumulation and technological innovation (Romer, 1990). Therefore, the quality and direction of investment are crucial, not just volume. Sustainable economic development requires investment diversification into high-value-added sectors, not just capital-intensive sectors such as construction or natural resource extraction. An inclusive and innovative investment strategy will strengthen economic resilience and mitigate the risks of commodity cycles.

labor force participation rate (LFPR) variable showed a significant positive effect on GDP, but not on GDP per capita or its growth. This result illustrates that increasing labor force participation can boost aggregate output, but is not effective in increasing individual productivity. In exogenous growth models, labor does play a role in increasing output, but its contribution tends to decline (*diminishing returns*) if it is not accompanied by improvements in quality (Mankiw, Romer, & Weil, 1992).

This phenomenon indicates *hidden unemployment* and *underemployment*, which are common in developing countries. Fields (2011) explains that high labor productivity without adequate productivity is often caused by skills mismatches, a large informal

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sector, and stagnation in labor-intensive industries. Therefore, labor policy needs to be directed not only at increasing the quantity but also the quality and competitiveness of the workforce through vocational education, technological training, and labor market reform.

Increasing labor force participation without increasing efficiency has the potential to weaken long-term economic growth. Therefore, employment strategies must be synergized with investment and industrial policies to ensure the workforce is absorbed into high-productivity sectors.

Per capita electricity consumption shows ambivalent results: significantly positive on GDP and GDP per capita, but significantly negative on GDP growth and GDP per capita growth. This pattern confirms that energy consumption is a significant indicator of economic activity, but does not necessarily drive growth.

According to the *energy-led growth hypothesis*, energy consumption plays a role in driving the production and distribution of goods and services (Apergis & Payne, 2010). However, the negative relationship with growth suggests that increasing electricity consumption may reflect an energy dependence *trap*, which causes the economy to grow extensively rather than intensively. This phenomenon indicates inefficient energy use and weak energy technology innovation.

Bergh (2011) highlighted the possibility of a *rebound effect*, whereby increased energy efficiency actually drives total consumption higher, thereby reducing the benefits of energy productivity. Therefore, energy policy needs to focus on the transition to clean energy, efficient production systems, and diversification of energy sources to avoid pressure on long-term growth. Efficient and productive electricity consumption will be a catalyst for innovation-oriented economic transformation.

trade openness variable shows a significant negative coefficient on GDP and GDP per capita, but a significant positive coefficient on GDP growth and GDP per capita growth. These results demonstrate the complexity of the relationship between trade openness and domestic economic dynamics. A negative effect on GDP levels could indicate a dependence on imports, weak import substitution industries, or *premature deindustrialization*—the loss of a manufacturing base before reaching high incomes (Rodrik, 2016).

However, the positive impact on growth supports the *export-led growth hypothesis*, which emphasizes the role of trade in fostering specialization, economies of scale, and technological diffusion (Frankel & Romer, 1999). However, the benefits of trade do not automatically occur without structural transformation of industries. Countries with raw commodity-based exports tend to have low competitiveness and limited long-term growth (Hausmann, Hwang, & Rodrik, 2007).

Trade openness needs to be accompanied by industrialization policies that strengthen the added value of domestic products. Increasing manufacturing competitiveness, diversifying exports, and integrating into global supply chains will determine how much trade openness contributes to inclusive economic growth.

general government final consumption expenditure variable showed a significant negative effect on GDP growth and GDP per capita growth, but was insignificant on GDP level or GDP per capita. These results indicate that consumptive government spending has a limited impact on long-term productivity. Barro (1991) stated that unproductive government spending can reduce private investment through a *crowding-out effect*.

The effectiveness of government spending is largely determined by its composition. In many developing countries, a large portion of spending is still directed towards subsidies, bureaucracy, and social transfers, which have minimal multiplier effects on growth (Tanzi & Schuknecht, 2000). If spending is not focused on productive sectors such as infrastructure, education, and research, its contribution to growth can be negative, especially if financed by debt. Therefore, fiscal reforms need to be directed towards public spending efficiency, strengthening productive public investment, and controlling the deficit to prevent it from eroding macroeconomic stability.

The overall results show that economic growth is the result of a complex interaction between physical investment, labor, energy, trade, and fiscal policy. The GFCF has proven to be a key driver of growth, but its impact is optimal when supported by a productive workforce and energy efficiency. High labor force participation without skills development has the potential to depress per capita productivity. Similarly, high energy consumption without efficiency innovation can weaken industrial competitiveness. Trade openness has a dual effect: expanding markets while simultaneously exposing them to the risk of dependency. Therefore, trade strategies must be accompanied by innovation-driven industrialization to ensure sustainable benefits. Meanwhile, government spending should be directed toward strengthening infrastructure, education, and research as prerequisites for inclusive and sustainable long-term growth. Theoretically, these findings confirm the combination of the Solow–Swan model and endogenous growth theory (Romer, 1990), where economic growth is determined not only by the accumulation of capital and labor, but also by the quality of investment, innovation, and the effectiveness of public policies.

V. CONCLUSIONS

This study shows that Gross Fixed Capital Formation (GFCF) has a positive and significant effect on output levels and economic growth, confirming the role of physical investment in driving the expansion of national production capacity. The Labor Force Participation Rate (LFPR) has a positive effect on GDP, but not significantly on GDP per capita and its growth, indicating that the increase in the workforce has not been followed by an increase in individual productivity.

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Furthermore, per capita electricity consumption has a dual relationship to the economy: significantly positive to GDP and GDP per capita, but negative to the growth rate of both, reflecting inefficient energy dependence. International trade shows a similar pattern, with trade openness having a negative impact on output levels but a positive impact on economic growth, indicating the long-term benefits of global economic integration.

Meanwhile, government final consumption expenditure had a significant negative effect on economic growth, indicating that consumptive public spending has not been able to support long-term productivity. Overall, these results underscore the importance of investment efficiency, improving workforce quality, optimizing energy, trade reform, and improving the structure of government spending as key factors for sustainable economic growth.

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