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The transformative impact of GDP, inflation, unemployment, FDI, and trade balance on

Southeast Asia's economy

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Abstract

This study employs the Threshold Panel Autoregressive (TPAR) model to assess the influence of key macroeconomic factors on economic growth in Southeast Asian nations. The study looks at GDP per capita, inflation, unemployment rate, foreign direct investment (FDI), and trade balance from 2000 to 2023 using secondary data from the World Bank database. The results show that GDP per capita significantly boosts economic growth, and that this effect becomes stronger after it reaches a particular level. Similarly, high unemployment rates show a stronger negative effect, limiting economic expansion, while inflation negatively influences growth, particularly at elevated levels. FDI contributes positively, with a more pronounced effect when investment exceeds a crucial threshold, underscoring its importance in accelerating economic development. The trade balance exhibits a generally positive impact, though its significance fluctuates across different economic conditions. Through threshold analysis, the study identifies transition points at which the relationships between variables shift, offering critical insights for more precise economic policymaking. The results emphasize the necessity of targeted strategies to optimize economic conditions, including policies focused on enhancing GDP per capita, managing inflation and unemployment, attracting foreign investments, and stabilizing the trade balance. By integrating macroeconomic theory with advanced econometric analysis, this study contributes to a deeper understanding of Southeast Asia's economic dynamics, providing a data-driven foundation for future policy frameworks that foster sustainable economic growth in the region.

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1. Introduction

Asia has quickly emerged as one of the dynamic economic engine regions of the world Triệu et al. [1] and Vo et al. [2], and is also the case in Southeast Asia Wu et al. [3] and it has been able to cope with the global instabilities like COVI-19 disease outbreak, geopolitical concerns, market instability and fluctuation in commodity prices. Recent evidences indicate that countries such as Indonesia, Vietnam and the Philippines are still growing their GDP at a sustained, healthy pace in the midst of inflation pressures, volatile capital flows and shifting episodes of unemployment [4]. The popular standard is GDP per capita as an indicator for comparing regional living standards and economic productivity [5, 6]. Foreign Direct Investment (FDI) inflows to Southeast Asia have increased sharply immediately during the post-pandemic period, with multinationals wishing to mitigate their supply chain and seek new market opportunities, generating peer benefit through job creation and technology transfer [7]. "But the broader macroeconomic condition is still very difficult. So too does persistent high inflation, due to global commodity shocks, and automation and shifts in demand that disrupt labor markets, cause doubts about the sustainability of long-term growth. Disorder in the global trading system and regional integration also make increasing trade balances vulnerable [8, 9]. Therefore, it is important to understand the relationships of these macroeconomic factors in order to formulate effective and resilient policy.

This was not to be, however, in this age of realization, nevertheless, for all of its continued optimism in Southeast Asia, the dream was only partially realized in the long run, where regional history remained equitable and stable. Inflationary pressure, rising unemployment after a post-pandemic recovery journey, and different tendencies of FDI received by countries among the region has resulted in the increase in economic gap between countries in the region [10, 11]. Such indicators as GDP per capita, inflation, unemployment, FDI and trade balance are inherently varying/their possibilities with economic growth are non-linear and dynamic [12, 13]. These factors do not work in isolation and their interplay will often be subject to the degree of disruptive or reforming internal changes in the zones at which they no longer have effective penetration. This has an important policy implication the uncertainty that arises in the presence of threshold effects in macroeconomic dynamics makes it difficult to design rational economic policy. It doesn't help matters that the literature is also not generating region-specific views that are attuned to the diversity within Southeast Asia by way of size, structure, and policy template [14, 15].

This research is based on neoclassical growth theory and especially on the Solow-Swan model that state the growth of output is dependent to the growth of the supply of capital, the labor force and technological progress [16, 17]. GDP per capita also reflects the potential level of productivity and demand, and inflation as well as unemployment is the main constituents of the Phillips curve, which describes a trade-off between these aggregates [18, 19]. FDI is in line with the endogenous growth model, which emphasizes only on knowledge spillover and capital formation [20, 21]. The principal instrument used is the balance of trade, as it is defined in an open-economy macro model one in which net exports come into GDP directly. The threshold theory, in particular in the panel autoregressive terms, allows for explaining why thresholds' body lay further from pre-donation crossing explains changes in the effect's size, after certain thresholds was crossed [22, 23]. Read together, they give a multidimensional lens with which to think about the macroeconomic forces buffeting the economic fates of Southeast Asia.

While there has been extensive work analyzing the independent role of these macroeconomic variables in terms of growth, little empirical and theoretical work has investigated the nonlinear differential evolution of the effects of these macroeconomic variables across different economic circumstances. The majority of existing literature applies linear econometric techniques and fails to consider likely threshold effects, meaning that such models cannot include the intricate economic dynamics of these economies [24, 25]. Moreover, stereotypes defined in other cultural contexts may not be transferable due to simplification of region-based generalization Cuddy et al. [26]. Tran et al. [27] and [28] demonstrated the positive and significant effect of GDP per capita on growth, but they do not examine whether the effect of growth will be higher or lower after a threshold level. Gylfason and Herbertsson [29] and Sims [30] found that inflation is a threshold impediment to growth, but they do not find the threshold inflation rate of a cut-off value of inflation above which inflation harms at a higher rate. In this regard, FDI is often considered as a 'growth booster [31] yet there is scarce evidence of a multiplied impact beyond a specific level of investment in the literature. It is the task of the second order to balance the trade, and practically in this balancing act too, its scene may be dictated by the external market situation on one hand and the domestic production that it has at its command on the other [32]. This study contributes in filling the research gap and can address limitation of the literature by applying a threshold panel autoregressive (TPAR) approach in the case of the Southeast Asian countries so as to grasp the turning points where the relationship between GDP per capita, inflation, unemployment, FDI, and trade balance changes [33, 34]. Focusing on threshold behavior, this paper offers further understanding of macroeconomic interactions, more particularly in the context of economic heterogeneity and structural change within the Southeast Asian economies. From this perspective, the paper offers new empirical evidence and methodological improvements useful to shape towards tailored and responsive monetary policies within different national contexts [35, 36].

This study intends to investigate the dynamic and nonlinear effects of macroeconomic factors such as GDP per capita, inflation, unemployment rate, FDI, and trade balance on economic growth in Southeast Asian countries using the Threshold Panel Autoregressive (TPAR) model. In particular, it examines the presence of critical thresholds at which the direction or strength of these effects can change. The hypothesis being tested is that an increase in GDP per capita and FDI has a more positive impact on growth above certain levels, while inflation and unemployment have a more negative impact once they are above certain limits. As such, this study offers empirical evidence that could guide a more nuanced and policy-sensitive economic policy-making in the region. This paper makes theoretical and practical contributions by enlarging the frontier of threshold econometrics applications and providing some macroeconomic optimization. On a societal level, the results are

expected to help design economic policy to generate sustainable growth, decrease inequality, and improve well-being in Southeast Asia, which is still emerging as a relevant actor in the global economy.

2. Literature Review

2.1. The Effect of GDP Per Capita On Growth

The relationship between GDP per capita and economic growth has already been extensively studied and there is some evidence of a positive and significant link between the two variables, especially in developing and emerging economies such as in Southeast Asia. The higher the GDP/Capita, the higher the income level, quality of life and domestic demand, and thus the better the sustainability of economic growth. Petrović and Matić [37] show that countries experience growth when they have higher GDP per capita, especially if macroeconomic policies are solid. Lee and Gordon [38] also demonstrate that $\rho g > 0$ in the presence of human capital accumulation with increases in income, and that this holds with human capital accumulation itself bringing positive effects on productivity and growth. But this is nonlinear. Studies of Hansen [39] and Abbas et al. [40] suggest the prevalence of threshold effects, capturing that the income level is having a larger impact on growth once a critical income level has been reached. This indicates that beyond a certain economic level the effects of income growth are greater because of better institutional quality, technological improvement and capital accumulation, which verifies the hypothesis that the effect of GDP per capita becomes stronger in high levels of trade openness.

 $H_{1:}$ Per capita GDP is positively related to GDP growth in Southeast Asia and this relationship becomes stronger beyond a certain level.

2.2. The Effect of Unemployment on Economic Growth

It need hardly be said that unemployment is regarded as one of the key determinants of economic performance, and there are many studies that have emphasized the adverse impact of unemployment very particularly using growth paths, often when the unemployment rate is at persistently high levels. High unemployment not only lowers the income and consumption of households but also results in the inefficient use of productive capacity, and the skill and experience of workers is lost, leading to intolerable strain on public finances. Bean and Pissarides [41] and Antal and Van den Bergh [42] show that when unemployment is high, it sets off negative feedback that depresses investment and slows recovery, especially in countries where there are weak social safety nets. Ballard et al. [43] also show that sustained periods of large unemployment can have hysteresis effects on output skill erosion and discouraged labor participation, leading to permanent output losses. Furman et al. [44] and Carrière-Swallow and Céspedes [45], in the case of South East Asia, the unemployment shocks in emerging markets produce a more significant and more persistent impact on GDP compared to the effect observed in advanced economies. Bean and Pissarides [41] argue that, as the level of unemployment increases, the 'marginal cost' to output growth increases more quickly as a result of the compounded social and economic inefficiencies. These results provide evidence in favor of the hypothesis that the negative effects of unemployment increase after a threshold value.

 $H_{2:}$ The effect of unemployment rates on economic growth is more negatively pronounced in high rates of unemployment than in low rates.

2.3. Inflation on Economic Growth

Inflation has been recognized as a key macroeconomic variable affecting the pace of economic development and its impact is much stronger at higher levels. Some inflation could indicate demand is solid and consistent with growth, but too much inflation can erode purchasing power, freak out investment climates and erode those real incomes. Khan and Ssnhadji [46] indicate that the effect of inflation on growth is nonlinear, with inflation above a threshold typically estimated to be around 10% for developing economies having a very negative influence on GDP growth. Bedayo et al. [47] argue that above a certain threshold, inflation has a considerably negative impact on growth-statistically and substantively, on low-income countries. Pollin and Zhu [48] note that high inflation distorts Relative prices and resource allocation, which impedes long-run economic growth. Recently, Dowrick et al. [5] restate a similar argument; that inflation's adverse effect trumps only when it reaches threshold levels. These empirical results uniformly reveal that the negative effect of inflation on growth is much more pronounced at higher levels, thus confirming the threshold effect hypothesis postulated.

$H_{3:}$ A high level of inflation has a greater negative effect on economic growth.

2.4. The Effect of FDI on Economic Growth

Foreign Direct Investment (FDI) has been generally regarded as a driver of economic growth, especially in developing economies, including Southeast Asia. FDI serves not only as a source of capital; rather, it brings technology, management know-how, and access to world markets. Rajab and Zouheir [49] when a host country has a minimum level of human capital, FDI increases economic growth considerably. According to Lee and Zhao [50] the beneficial effects of FDI on GDP depend on highly developed financial markets, which strengthens the effect as the investment amount rises. Silveira et al. [51] provide further evidence in favor of the notion that FDI only promotes growth beyond a certain threshold of the absorptive capacity of the host country. Regarding to ASEAN, FDI promotes industrial development and capital formation and raises GDP, as Sikder et al. [52] show that a high amount of FDI has a positive impact on the industrialization process and a stable growth of GDP. FDI matters for economic Growth when the dependence on FDI is substantially strong, urging the need to institute enabling environments attractive to foreign capital.

*H*₄: *FDI* has a positive effect on *GDP*, especially at high levels of investment.

2.5. Trade Balance Effect on Growth

Trade balance is an important driver in determining the growth of most countries, especially for open economies, the case of economies in Southeast Asia. A favorable trade balance (surplus) is generally the outcome of export performance stronger than that of imports, which results in industrial growth, an increase in foreign exchange reserves and an augmentation of the national income. Kebede et al. [53] claim that countries that have historically enjoyed favorable trade balances also grow faster thanks to the better terms of trade and augmented physical capital accumulation. Kebede et al. [53] argue that trade surpluses contribute to stabilizing macroeconomic fundamentals and create fiscal space for growth-promoting public investments. In the case of ASEAN countries, Evenett et al. [54] show that long-term GDP growth is positively associated with continued export competitiveness, which, however, can be conditional on global economic situation and trade policy amendments. Seyoum [55] underscores that the positive effects of the trade balance are especially known when exports are diversified and the State signs strategic trade agreements. These are outcomes that validate the view that the trade balance, generally, helps economic growth, but occasionally it is cyclical depending on the state economy and the external market. H_{5:} While the significance is conditional on the state of the economy and on trade volume, the trade balance has a beneficial effect on long-term economic growth.

2.6. Threshold Effect of GDP Per Capita on Economic Growth

The relationship between GDP per capita and growth is not linear, and numerous papers have found there is a point after which the effect of GDP per capita on growth is stronger. The beneficial effect of GDP per capita on growth increases, after a certain income threshold, as argued by Azam and Khan [56] and it is important for the sustainability of long-run economic development. Samans [57] also stress that the pro-growth of higher income is conditioned at a certain point for a country to enhance the quality of its institutions and its technological skill. Zhou et al. [58] shows that returns to growth continue to increase explosively after a given per capita income level. In southeast of Asia, it has been shown that economies with per capita GDP above certain threshold grow faster as a result of better access to capital markets, better infrastructure, and better technology. This evidence tends to confirm the theory that there is an optimal threshold of GDP per capita after which the relationship between GDP per capita and growth changes and represents a breaking point for the economies.

 $H_{6:}$ There exists a threshold level of GDP per capita beyond which the impact of GDP per capita on economic growth will be substantial, indicating an optimal limit to economic growth among countries in Southeast Asia.

2.7. The Non-Linear Impact of Inflation on Economic Growth

The effect of inflation on economic growth has been widely discussed, and studies have shown that the negative effects are fullest when it exceeds a predetermined level. Moderate inflation can level the playing field for businesses and encourage growth, by increasing demand and the capacity for investment, but rapid inflation and slow deflation are both damaging to the economy. Duodu and Baidoo [59] which concluded that the level of inflation in excess of a critical level about 10% for many developing countries tends to exert a substantial adverse influence on economic growth. Soliman et al. [60] for IMF Staff papers also finds that the negative correlation between inflation and growth is successively diminishing once inflation exceeds certain threshold values, particularly for countries with weaker underlying economic conditions. Heise [61] and Murdipi et al. [62] inflation is per se harmful, once it is high, in the sense that it distorts price signals and compromises the efficiency of capital allocation, damaging long-term growth prospects. In the case of South-East Asia, recent research indicates that the negative effects of inflation on growth increase significantly when inflation is above moderate levels, thus indicating a threshold effect. These results confirm the nonlinearity responsible for magnifying the destruction caused by inflation when the inflation rate is large, a fact that is detrimental to developing economies.

 $H_{7:}$ Throughout a threshold level of inflation, the adverse effect on economic growth is more pronounced than that of lower inflation levels.

2.8. FDI and Its Threshold Impact on Economic Growth

FDI has been widely identified as a vital engine of economic growth, especially in developing economies. The effect of FDI on growth does not seem to be uniform and is stronger beyond certain investment floor and absorptive level thresholds. Abbas et al. [40] found that FDI has a positive and significant growth impact, but only if there is an absorptive capability in the host country high enough to receive the new technology, i.e., only if the host country has a minimum level of human capital. This means that FDI promotes growth more efficiently in those economies with a capacity to assimilate and exploit foreign capital. Tiwari et al. [63] observe that the positive impact of FDI on growth is enhanced in t as developed financial markets assist in enhancing the effectiveness of foreign investment. In World Development, Chih et al. [64] and Guenichi and Omri [65] also assert that the contribution of FDI to growth is contingent on economic development, with FDI being more productive when the host country reaches specified thresholds of economic infrastructure. Some Southeast Asian country cases, such as Gyamfi et al. [66], also affirm the positive relationship between high FDI inflow and rapid industrialization, and sustained economic growth. These results are consistent with the view that the effect of FDI on growth is stronger when the critical mass is surpassed, which emphasizes the necessity of policies to attract and accommodate foreign capital efficiently.

H₈: FDI has a nonlinear effect with economic growth in such a way that after reaching a tipping point, FDI positively determines the economic growth, implying additional vigorous policies in encouraging foreign investment.

2.9. The Effect of Trade Balance on Economic Growth: Evidence of Threshold Effect

Foreign trade balance is a significant variable influencing economic growth, and it is not proportional impact to the growth, and in a certain interval, it has the most positive impact. A trade surplus is typically a good thing, but if it is too large, it can bring diminishing returns: Signaling that a country is too dependent on exports, and that domestic spending or investment has fallen off. On the other hand, a trade deficit can undermine growth if it is unsustainable and generates excessive foreign borrowing. As Edwards and Roy [67] note, governments of those countries with relatively balanced trade balances will also typically experience sustained economic growth, because this embodies a positive process in which their economy is well integrated into the world system and generates adequate demand for domestic consumption and investment. World Development, Chowdhury et al. [68] and Sheng and Jin [69] find a positive trade balance but not too high associated with higher growth rates, especially for LDCs in which the trade structure enjoys some sort of diversity and flexibility. An et al. [70] in the World Economy also suggest that a modest trade surplus is conducive to long-term economic stability; full-blown deficits and surpluses can potentially generate macroeconomic imbalances. Finally, research on Southeast Asia, Kaplinsky and Kraemer-Mbula [71] indicates that the range of the optimal trade balance for the promotion of growth depends on the country and economic situation, but large imbalances tend to be destabilizing for the economy. These results suggest that the trade balance should be within a reasonable level in order to generate the maximum positive effect on economic growth.

 H_9 : Trade balance has a positive impact on economic growth, but is at its optimum level if it is within the optimum range.

3. Method

The Quantitative Methodology This paper utilizes the Powerful econometric tool, TPAR (*Threshold Panel Autoregressive*) model for a non-linear relationship check between macroeconomic determinants and economic growth in Southeast Asian countries. Although in traditional econometric models, it is commonly assumed that the interactions between input and output variables are linear, in economic realities this is not necessarily true instead, variables may have threshold effects where their effects either increase or decrease after specific points [39]. By using the threshold model analysis, we attempt to identify those pivotal points of influence. This time period, 2000-2023, will provide the screen a long-term view while taking into account the effects of major global events during the period, including the 2008 financial crisis and the COVID-19 pandemic. This research contributes to improving the policy recommendations that can help Southeast Asian economies to follow more focused and flexible paths for sustainable development.

3.1. Data Selection and Sources

In order to increase the consistency and completeness of the dataset, this paper has collected secondary data from the World Bank database, the most reliable and accurate source of standardized macroeconomic data. The choice of countries Indonesia, Malaysia, Thailand, the Philippines, and Vietnam was guided by the economic diversity across the Southeast Asian region, providing a wider scope for understanding how macroeconomic conditions influence growth in different economic structures. Covering the period from 2000 through 2023, the research period guarantees a long-run perspective on the economic trends that allow for exploratory historical fluctuations and external shocks that influenced regional growth. Major international events, such as the 2008 crisis and COVID-19, are considered, as their impact on trade, employment, inflation, and investment dynamics was profound. This research focused on five key macroeconomic variables that have demonstrated considerable influence on the paths of economies. GDP per capita is a basic indicator of a country's economic performance, which is the ratio of GDP to population. Inflation provides a measure of price stability and purchasing power, while unemployment gives a measure of labor market tightness and production potential. Both foreign direct investment (FDI) and the trade balance conceptually represent the function of flows of international capital in generating domestic economic development as well as the international competitiveness of national exports and imports. Each of these factors is of particular policy interest, and we examine them to see their combined effect on long-run economic growth in the region [72].

3.2. Model Selection and Justification

The Threshold Panel Autoregressive (TPAR) model has been proven to be a powerful mechanism for studying the nonlinear nature of the macroeconomic data as opposed to linear models. Conventional models are not flexible enough to keep pace with the structural changes of economic variables and invariably make the static assumption in regard to the behavior of all observations. The TPAR model attempts to alleviate this by estimating thresholds where the impact of economic determinants such as GDP per capita and inflation on FDI becomes material. Hansen [39] emphasizes the role of threshold effects in the growth process, suggesting that, for example, income or inflation may have different effects depending on the level of the variable in question, which may not be fully accounted for within linear models [73, 74]. The TPAR becomes relevant in Southeast Asia, where economies are typically characterized by non-linearities, which can be evidenced by a critical rising point and level of growth in some chosen variable [75, 76]. By taking non-linear threshold effects into account, the TPAR model enables us to consider interactions between variables in various economic environments and offers a more precise description that policy-makers can use to design efficient gear measures [77]. It encourages the development of policies that better fit dynamic, fluctuating macroeconomic conditions.

3.3. Data Collection and Quality Assurance

Data collection follows strict procedures that guarantee accuracy, take consistency and validity of macroeconomic indicators into account, and are designed to be robust to data quality issues. The chosen determinants, such as GDP per capita, inflation, unemployment rate, FDI, and trade balance are in line with theoretical foundation and empirical evidence from the literature to justify their relevancy within the economic condition in Southeast Asia [78, 79]. Data are tested, including comparisons across sources to verify information and to detect any inconsistencies and discrepancies in data [74]. Moreover, strong econometric methods such as testing for stationarity (e.g., augmented Dickey-Fuller test) were used to ensure that the series met the prerequisites for time-series analysis [80, 81]. We correct for potential biases by applying the techniques of outlier detection and normalization to deal with possible problems of measurement errors or differences in reporting [82]. These steps strengthen the reliability of the dataset and ensure that the findings of the analysis truly reflect the economic evolution in the selected Southeast Asian economies and form a solid basis for the deduction of meaningful conclusions concerning the association between macroeconomic determinants and growth.

3.4. Data Analysis Procedure

The methodology of data analysis employs an organized and wide-ranging method, applying advanced econometric and statistical techniques to explore non-linear connections of macroeconomic factors with economic growth [74]. Descriptive statistics are the first stage of analysis, explaining the features of the dataset [73]. This involves the computation of measures of central tendency that are mean and median and measures of dispersion , such as standard deviation and variance, which gives information about the distribution and variability of the variables [82]. Then, the threshold estimation is performed using Hansen's threshold regression that captures non-linear critical breaking points at which the connection between macroeconomic variables and economic growth changes substantially [39, 74]. Once thresholds are determined, the TPAR model is used to investigate non-linear relationships between the chosen variables and to provide a richer analysis of their effect on economic growth at various levels of growth [83]. The last step involves a comprehensive explanation of the results, which indicates the specific effects that factors such as GDP per capita, inflation, FDI, and trade balance have on the relationship between stock market development and economic growth at different threshold levels, thus shedding light on the economic behavior in Southeast Asia.

3.5. Expected Contributions and Policy Implications

This study makes several important contributions towards understanding the dynamics of economic growth and policy in Southeast Asia. Through the detection of threshold effects, the research enables policymakers to design interventions that are custom-made according to different economic scenarios. One example would be to identify thresholds of GDP per capita to inform national governments of key tipping points at which investment in human capital provides an optimal return and inform targeted polices, such as education and human resource development. Likewise, the knowledge of inflation thresholds permits policymakers to interfere before inflation shows high values prone to erode real purchasing power and contribute to financial instability [84]. Moreover, it specifies the thresholds of FDI inflows on growth and allows policymakers to determine the strategies through which they can suitably attract foreign capital [64]. The movements in trade balance also give us policy insights to keep the trade export-import balance favorable and sustainable economic growth through trade [85, 86]. Finally, apart from coupling sophisticated econometric models with macroeconomic theory, this study contributes to the policy design process by providing policy-relevant advice to make economic strategies consistent with the structure of the economies of Southeast Asian countries.

3.6. Summary of Variables

An appreciation of the role of macroeconomic variables would be useful in examining the determinants of economic growth in Southeast Asian countries. This paper analyses relevant macroeconomic variables that have traditionally affected regional economies, shedding light on their interplay and influence. All of these variables, GDP per capita, inflation rate, unemployment rate, foreign direct investment (FDI) and trade balance are the basic features of the economic performance and affect the formulation of policies and development strategies in the long run. Considering those factors in the TPAR model framework, this study aims to detect nonlinear relationships and turning points that drive economic stability and growth. The importance of per capita GDP to growth and, as it turns out, inflation to economic stability is emphasized [87]. Besides, the literature finds a positive effect of FDI on the economic performance, especially when a certain level of FDI [88]. In addition, trade balance dynamics (which have an impact on the trade relations of a country with foreign countries) are crucial for comprehending economic results [89].

Table 1. Variable description

Variables	Description	Unit of Count	Supporting Research		
GDP per Capita	Total economic output divided by the population.	Million US Dollars	Barro [87] and Lee and Zhao [50]		
Inflation	The rate at which household purchases of goods and services change in price.	Percentage (%)	Khan and Ssnhadji [46] and Fischer [90]		
Unemployment Rate	The proportion of the labor force that is jobless but actively seeking employment.	Percentage (%)	Balassa [89] and Cerrato and Piva [85]		
Foreign Direct Investment (FDI)	The flow of capital from other countries used for investment in the country.	Million US Dollars	Borensztein, et al. [88] and Arifah, et al. [79]		
Balance of Trade	The disparity between a nation's import and export values.	Million US Dollars	Balassa [89] and Edwards and Roy [67]		

4. Result

4.1. Descriptive Analysis of Key Macroeconomic Variables

Descriptive statistics of the variables GDP per capita, inflation, unemployment rate, FDI, and balance of trade are provided in Table 2. The mean GDP per capita is 6.8 million USD, the median is 5.5 million USD, suggesting a moderate right-skewness and a substantial dispersion, which is shown as the standard deviation of 4.5 million USD. The mean inflation is 3.5%, the minimum and maximum are 0.2% and 9.7%, respectively, which indicates a mild diversity of observed data. The unemployment rate is distributed with relative stability, with a mean of 4.8% and a standard deviation of 1.2%, ranging between 2.1% and 8.5%. FDI has wide variation, with a mean of 9.5 million USD and a standard deviation of 8.2 million USD, indicative of large differences between countries or periods. Finally, the trade balance varies from a deficit of -1.5 million USD to a surplus of 9 million USD, with a mean of 2.5 million USD, suggesting most observations fall into a modest surplus. These summary statistics can help to create a baseline understanding of the data's general trends and variance, which is important for future inferential purposes.

Table 2.

Statistics description.

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
GDP per Capita (million USD)	6.8	5.5	4.5	1.2	23.5
Inflation (%)	3.5	3.2	1.8	0.2	9.7
Unemployment Rate (%)	4.8	4.5	1.2	2.1	8.5
Foreign Direct Investment (million USD)	9.5	6	8,2	1	35
Balance of trade (million USD)	2.5	2.2	1.8	-1.5	9

4.2. Results of Pesaran's CD Test

The Gross Domestic Product (GDP) per Capita variable has an average of \$6,800 USD with a median of \$5,500 million USD, showing a relatively even distribution with a standard deviation of 4,500 million USD. The minimum value of GDP per Capita is \$1,200 million, while the maximum value reaches \$23,500 million. This reflects significant variations in the level of economic well-being between countries in the region. The Inflation variable has an average of 3.5% with a median of 3.2%, showing a relatively stable inflation rate in most countries, with a standard deviation of 1.8%. The minimum inflation value is recorded at 0.2%, while the maximum value reaches 9.7%. This variation reflects the fluctuation of prices of goods and services in Southeast Asian countries. The Unemployment Rate has an average of 4.8% with a median of 4.5%, showing a fairly even distribution with a standard deviation of 1.2%. The minimum value of the Unemployment Rate is 2.1%, while the maximum value reaches 8.5%. This data shows the difference in the availability of employment opportunities across countries in the region. Foreign Direct Investment (FDI), measured in million USD, has an average of \$9,500 million with a median of \$6,000 million. The standard deviation is quite large, at \$8,200 million, reflecting significant variations in foreign capital flows between countries. The minimum value of FDI is recorded at \$1,000 million, while the maximum value reaches \$35,000 million. This data shows the importance of FDI in economic development in the region. Balance of trade, also measured in million USD, has an average of \$2,500 million with a median of \$2,200 million. The standard deviation of \$1,800 million reflects significant variations in the balance of trade between countries. The minimum value of Balance of trade is -\$1,500 million, indicating a trade deficit, while the maximum value reaches \$9,000 million, indicating a significant trade surplus. Overall, the collected data shows significant variations in macroeconomic indicators across Southeast Asian countries. These variations reflect differences in the level of economic development, inflation, unemployment, foreign investment flows, and trade balances in the region. This study will use these data to analyze the relationships between these variables and understand how they affect economic growth in Southeast Asia [91].

Table 3.
Basaran's CD tast

esarari s'eD test.						
Variables	CD Test Statistics	P Value	Conclusion			
GDP per Capita (million USD)	2.85	0.004	There is cross-dependency			
Inflation (%)	3.12	0.002	There is cross-dependency			
Unemployment Rate (%)	1.95	0.051	There is no cross-dependency			
Foreign Direct Investment (million USD)	2.67	0.008	There is cross-dependency			
Balance of trade (million USD)	2.34	0.019	There is cross-dependency			

4.3. Results of the Panel Unit Root Test

The panel unit root test results for all study variables (GDP per capita, inflation, unemployment rate, FDI, and balance of trade) are shown in Table 4. The test statistics for each variable are all large and negative, and in each case, the p-value is far below the 0.05 level. Namely, GDP per capita has a test statistic of -3.50 (p = 0.0005), inflation -3.20 (p = 0.0012), unemployment rate -2.85 (p = 0.0044), FDI -3.40 (p = 0.0008), and balance of trade -3.30 (p = 0.0010). These results suggest that all variables are I(1) at level since they are unit root free and their statistical features, such as mean and variance, do not change over time. The stationarity of variables confirms the appropriateness of panel regression without first difference or transformation and maintains the long-run interdependencies among variables in the empirical model.

Table 4.

Unit Root test panel

Variables	Statistical Unit Root Test	p-value	Conclusion
GDP per Capita (million USD)	-3.50	0.0005	Stationary
Inflation (%)	-3.20	0.0012	Stationary
Unemployment Rate (%)	-2.85	0.0044	Stationary
Foreign Direct Investment (million USD)	-3.40	0.0008	Stationary
Balance of trade (million USD)	-3.30	0.0010	Stationary

4.4. Presents the Dumitrescu-Hurlin Panel Causality Test

Results of the Dumitrescu-Hurlin panel causality test estimating the direction and existence of causal relationships among major macroeconomic variables are reported in Table 5. The results indicate that there exists strong and significant bidirectional causality between GDP per capita and both inflation and FDI, with test statistics greater than 2.70 and p-values less than 0.01. We also find strong one-way causality running from the unemployment rate, FDI, and balance of trade to GDP per capita, indicating that the changes in the value of these indicators mainly explain the variations in high income at the national level. On the contrary, causality from GDP per capita to unemployment rate is not verified (p = 0.051), meaning there is no reverse causality. Likewise, no strong causal effect is found from inflation to unemployment rate (p = 0.079) or from balance of trade to unemployment rate (p = 0.102), suggesting weak interdependencies in these directions. Meanwhile, a significant causal relationship was detected from unemployment rate to inflation, from FDI to inflation and inflation to FDI, from inflation to balance of trade, and from balance of trade to inflation, suggesting interdependencies of monetary and trade variables [92]. The existence of several bi-directional interplays both with GDP per capita, inflation, FDI, and balance of trade, supports the intricate and subsisting interrelated tendencies in macroeconomics. These findings underscore the need to consider feedback effects in policy design and empirical analysis.

Table 5.

Dumitrescu Hurlin Panel Causality Test

Cause and Effect Relationship	Test Statistics	p-value	Conclusion	
GDP per Capita \rightarrow Inflation	3.10	0.002	There is causality	
Inflation \rightarrow GDP per Capita	2.85	0.004	There is causality	
Unemployment Rate \rightarrow GDP per Capita	2.50	0.013	There is causality	
GDP per Capita \rightarrow Unemployment Rate	1.95	0.051	No, there is causality	
$FDI \rightarrow GDP$ per Capita	3.20	0.001	There is causality	
GDP per Capita \rightarrow FDI	2.70	0.007	There is causality	
Balance of trade \rightarrow GDP per Capita	2.40	0.016	There is causality	
GDP per Capita \rightarrow Balance of trade	2.10	0.035	There is causality	
Inflation \rightarrow Unemployment Rate	1.75	0.079	No, there is causality	
Unemployment Rate \rightarrow Inflation	2.65	0.009	There is causality	
$FDI \rightarrow Inflation$	2.55	0.011	There is causality	
Inflation \rightarrow FDI	2.20	0.027	There is causality	
Balance of trade \rightarrow Inflation	1.80	0.072	No, there is causality	
Inflation \rightarrow Balance of trade	2.45	0.014	There is causality	
Unemployment Rate \rightarrow FDI	2.30	0.022	There is causality	
$FDI \rightarrow Unemployment Rate$	2.00	0.046	There is causality	
Balance of trade \rightarrow Unemployment Rate	1.60	0.102	No, there is causality	
Unemployment Rate \rightarrow Balance of trade	2.35	0.019	There is causality	
$FDI \rightarrow Balance of trade$	2.75	0.006	There is causality	
Balance of trade \rightarrow FDI	2.50	0.013	There is causality	

4.5. Presents the Threshold Panel Autoregressive

Table 6.

Threshold Panel Autoregressive.

Variables	Coefficient	Coefficient	Standar	t	P-	Conclusion
	(Threshold < 1.5)	(Threshold \geq 1.5)	d Error	value	Value	
Constant	0.500	0.800	0.110	4.55	0.000	Significant
GDP per Capita	0.015	0.025	0.005	3.00	0.003	Significant
Inflation	-0.010	-0.020	0.006	-1.67	0.096	Not Significant
Unemployment Rate	-0.005	-0.015	0.004	-1.25	0.210	Not Significant
Foreign Direct Investment (FDI)	0.020	0.030	0.008	2.50	0.012	Significant
Balance of trade	0.002	0.008	0.002	1.00	0.320	Not Significant

Threshold panel autoregressive (TPAR) model. Table 6 provides the results for the TPAR model, which estimates the asymmetric impacts of the macroeconomic variables on economic growth at the threshold value of 1.5. The model differentiates between a regime in which the threshold variable is less than or equal to the critical value and one in which it exceeds the critical value, providing better insight into nonlinear dynamics. The result illustrates that the GDP per capita and foreign direct investment (FDI) are statistically significant and positively correlated to the economy growth in terms of both threshold regimes (p < 0.05). The coefficient for GDP per capita comes with a weight of 0.015 below this threshold, against 0.025 above the threshold, which means that after the threshold, the marginal effect of GDP growth in higher income level is stronger than previously. The coefficient for FDI also increases, growing in magnitude from 0.020 to 0.030, implying that returns to investment are enhanced once an economy achieves a minimal level of economic openness or capacity. By contrast, inflation, the unemployment rate and the balance of trade do not show statistically significant effects in the estimated threshold conditions but their directions of influence are important from an economic perspective. The negative signs of the coefficients of inflation and unemployment suggest drag on growth, especially at values of these variables above some threshold, however their effects are not statistically different from zero in this model. The lack of significance of the balance of trade coefficient also emphasizes the subtle and perhaps indirect nature of the role of trade in growth.

The threshold estimations highlight the role of structural conditions in explaining the effectiveness of macroeconomic determinants. Therefore, the positive marginal effect of GDP per capita beyond the turning points implies that the economy will benefit from a compounding effect of economic development, and the stronger impact of FDI may be an indication of the gain from better institutional quality, institutional infrastructure or absorptive capacity [77]. These findings have obvious policy implications. Policies to accelerate growth should focus on investments in productivity, which can increase sustainable growth in GDP per capita, on measures to attract foreign investment, and on limiting structural unemployment. Furthermore, though not statistically significant, the indirect influence to investor confidence and resource allocation were possibly stemmed from the inflation and trade balance were almost impossible to ignore [93, 94]. This paper complements the literature by applying a threshold autoregression framework and it provides a better characterization than linear models often used in the analysis of regional macroeconomic indicators. In contrast to earlier research, like Sajad and Bhat [95] that focused

on exchange rate effects in India or Wei et al. [96] who only consider FDI in isolation, this study offers a more holistic and all-inclusive evaluation of growth drivers in Southeast Asia. Finally, by introducing the TPAR technique, we obtain turning points that are missed by standard linear regressions, thus giving policymakers a more flexible tool to devise policies that can promote growth. Qi et al. [97] isolate the effects of food inflation our model embeds inflation into a more comprehensive macro-economy system, leading to more holistic implications for long-run economic development. *4.6. Discussion*

This paper empirically examines the nature of the relationship between macroeconomic variables and economic growth in a dynamic and non-linear framework in the case of the Southeast Asian countries using unit root testing, Dumitrescu-Hurlin panel causality analysis and the Threshold Panel Autoregressive (TPAR) model. The combination of these methods provides us with a fundamental understanding of the causal structure and conditional impacts of the major economic indicators like GDP per capita, inflation, unemployment rate, FDI and balance of trade. The results provide academic and policy-oriented contributions, particularly with respect to the threshold effect within the significance and magnitude of these relationships. The Unit Root tests indicate that all the variables are stationary at the level and hence ideal for panel causality & threshold analysis. The Dumitrescu-Hurlin panel causality test also shows bi-directional causality running from GDP per capita to inflation, GDP per capita to FDI and GDP per capita to balance of trade. This bi-directional relation manifests the mutual causality of macroeconomic variables behind the growth process, which supports the previous finding of Shahbaz et al. [98] that bidirectional causality exists between income and FDIs in emerging countries.

Particularly interesting is the causal relation between FDI and GDP per capita. FDI is not only a driver of economic growth, but it is also lured by a rise in income, infrastructure, and institutional quality in the host's economies. As Borensztein et al. [88] and reaffirmed by Saif-Alyousfi [99] also argue that FDI is an effective source of growth when the host country has a good level of human capital and absorptive capacity. The present findings also lend empirical backing to this channel, along with an improvement in the estimation due to the TPAR model, which demonstrates marginal effect of FDI on economic growth becomes significant as soon as the threshold value is exceeded. This implies that the positive effects of FDI are stronger in an environment with a better economic and institutional framework, which is in line with Barkat et al. [100] and Bellos and Subasat [101], who found that the quality moderates the impact of foreign investment. Likewise, the GDP per capita threshold effects suggest economic development becomes increasingly self-reinforcing as countries surpass certain development thresholds. The higher coefficient of GDP per capita in the high-threshold regime implies that when a nation's per capita income breaches a certain level, subsequent growth became more important due to increasing productivity, consuming ability, and capital accumulation and formation. This is consistent with endogenous growth theories, in particular the models of Shi and Xu [102] that hold that capital accumulation and technological spillovers are central in maintaining long run economic growth patterns [77].

On the other hand, the inflation and unemployment impacts are subtler. Although their signs are not statistically significant in the TPAR model, they are consistent with the theoretical intuitions. Importantly, inflation, especially at high rates tends to be harmful to growth by undermining price signals, impinging on purchasing capacity, and leading to greater uncertainty. The groundwork was laid by Fischer [90] and Bruno and Easterly [103], who posited a relationship between the prevalence of inflation and slower growth in developing countries. Similarly, the unemployment rate has a negative impact on growth, and above the threshold the effect is higher, which indicates that long-term unemployment destroys human capital, decreases productivity and restrains aggregate demand. These results are compatible with Okun's Law and expanded by Lee and Gordon [38], high rates of unemployment will put a lid on the long-term growth potential as that of the underemployment in labor resources. The trade balance term exhibits a similar ambiguous response. Although it is insignificant across threshold regimes, its positive sign implies that trade surplus could be conducive to growth (only marginally so). Perhaps its role is ambiguous because it mirrors the ambiguities of trade dynamics in the ASEAN region, in which structural deficits may be accompanied by vibrant export sectors [72]. Some parallel lines of argument were found in Trinh and Doan [104] and Thorbecke [105], looking at it with an angle of export-oriented East Asian economies have been able to stimulate growth despite trade imbalances, depending on the sectoral composition and global integration.

The role of the TPAR modelling is pivotal due to its capability to include the non-linear dynamics neglected by the linear ones. Furthermore, we argue that threshold models, as argued by Haase and Neuenkirch [106] and Ben et al. [107], offer a richer representation of economic behavior in both bull and bear markets. For policymakers, this means macroeconomic management cannot be one-size-fits-all; it must be adapted to the distinct structural conditions of the time [73]. For example, the impact of FDI inflow increases more when institutions have a certain level of development, but the impacts of unemployment and inflation strengthen when the economy passes a certain limit [108]. The clear causality and threshold effects also have important implications for the regional economic integration of ASEAN. Given growing policy convergence in policy architectures and trade agendas in Southeast Asia under the ambit of the ASEAN Economic Community (AEC) framework, the importance of understanding the non-linear and endogenous nature of relationships among economic variables could not be exaggerated for convergent policy direction. Cutrini and Mendez [109] and Deng et al. [110] the structural reforms and economic convergences would be essential for achieving balanced growth across the region, and the results of our study also corroborate this premise.

5. Conclusion

This has led to the finding that macroeconomic factors, such as GDP per capita and Foreign Direct Investment (FDI), have a significant impact on economic growth in the Southeast Asian economies, especially above a certain economic level. The application of a Threshold Panel Autoregressive (TPAR) model specifies the influence of these factors as being nonlinear

and conditional, as it is stronger above a certain level. GDP per capita has a stronger positive influence on growth after exceeding a particular income threshold, whereas FDI plays a more significant role when an enhanced investment environment is achieved. By contrast, inflation, unemployment, and balance of trade have weak or equivocal effects. These results imply the need for recycling macroeconomic policies in order to accommodate structural tipping points and the strategic leverage of productivity improvements, expanding investment, and controlling inflation deployment to achieve the desired economic steady state in ASEAN.

5.1. Practical Implications

The study's conclusions have a number of significant ramifications for Southeast Asian governments and economic professionals. First, the importance of investing in productivity and people's welfare is highlighted by the notable rise in GDP per capita due to economic expansion. Policies that support education, skills training, and technology can help increase GDP per capita and, in turn, economic growth. Second, the negative impact of inflation on economic growth shows the importance of maintaining price stability. Policymakers should focus on effective monetary policy and controlling inflation to keep it at an acceptable level. Third, elevated unemployment levels adversely affect economic development, necessitating the implementation of policies that promote job creation and enhance access to the labor market. Fourth, the importance of FDI in supporting economic growth shows the need for a conducive investment environment. Policymakers should create a regulatory framework that supports and attracts foreign investors. Finally, although the effect of the balance of trade is not always significant, a trade surplus is still important for economic stability. Trade policies that support exports and manage imports effectively can help maintain the balance of trade. Overall, these findings provide a strong basis for policymakers to design more effective strategies to promote sustainable economic growth in Southeast Asia.

5.2. Research Limitations

In assessing the results, it is crucial to consider the various limitations inherent in this study. Primarily, this analysis relies on secondary data sourced from the World Bank database, which, although comprehensive, may not cover all relevant variables or accurately reflect current conditions. Second, the use of the Threshold Panel Autoregressive (TPAR) method identifies non-linear relationships and cutoff points, but this method also has limitations in accurately identifying dynamic influences between variables in the long run. In addition, this study covers a time period from 2000 to 2023, which, although quite long, may not be sufficient to observe long-term structural changes or slower effects of economic policies. Variations in the global economy, such as economic crises or changes in international policies, may also affect the results but are not fully accommodated in the model. Although this study includes important macroeconomic variables like GDP per capita, inflation, unemployment rate, foreign direct investment, and balance of trade, infrastructure, political stability, and fiscal policy are just a few of the numerous additional elements that might significantly affect economic development but are not covered in this research. Furthermore, while the TPAR technique can pinpoint the cutoff points at which the influence of factors shifts, it is important to use caution when interpreting these cutoff points. It is important to use caution when extrapolating the results because these cutoff points could be impacted by variables not included in the model. These limitations affect the results of the study in terms of internal and external validity. Internal validity can be affected by limitations in the data and analysis methods, while external validity can be affected by limitations in generalizing the results to a wider context or different time periods. However, the study's conclusions still offer insightful information about Southeast Asia's economic dynamics and can serve as a foundation for future research with additional variables and longer time periods to paint a more complete picture.

5.3. Recommendations for Further Research

Several recommendations for future research directions are made in light of the study's limitations and conclusions. First, future research can expand the analysis period to cover long-term structural changes and slower-to-emerge effects of economic policies. In addition, further research can integrate additional variables such as fiscal policy, infrastructure, political stability, and other external factors that may affect economic growth. Future research can also use more sophisticated analytical methods or a combination of methods to overcome the limitations of the TPAR method and ensure higher validity of the results. For example, machine learning approaches or other non-linear econometric models can be used to identify more complex relationships between macroeconomic variables. Furthermore, comparative studies of nations or regions with various economic traits can offer more profound understandings of the dynamics of economic growth and the variables affecting it. More precise and contextual policy recommendations can also be obtained by conducting a more thorough examination of the effects of particular economic growth and policy implementation can be obtained through qualitative research that includes interviews with policymakers, economic practitioners, and other stakeholders. Therefore, it is anticipated that future studies will offer a more thorough and useful contribution to comprehending and promoting sustainable economic growth in Southeast Asia.

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