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REINVESTIGATING THE IMPACT OF GROSS DOMESTIC SAVINGS, EXCHANGE RATES, AND NATIONAL DEBT ON MILITARY EXPENDITURE IN MALAYSIA

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ABSTRACT

This study uses the ARDL method to explore how national debt relates to military expenditure, considering both short and long timeframes. In the short term, the research finds that changes in national debt don't strongly impact military expenditure right away. Interestingly, a stronger national currency is associated with lower short-term military expenditure. Additionally, higher domestic savings positively affect military expenditure in the short term, highlighting the role of local resources. In the long term, the study shows that all considered factors such as national debt, exchange rates, and domestic savings are positively contributed to military expenditure. This suggests that over time, increases in these factors are linked to higher military expenditure. Overall, the study highlights the complex connections between national debt, economic factors, and military expenditure, offering insights into both immediate and long-term influences on defense budget choices.

Keywords: Military expenditure, national debt, gross domestic savings, exchange rate

1.0 INTRODUCTION

According to the Ministry of Defense's report (2020) presented through the "Kertas Putih Pertahanan" or Defense White Paper (DWP), the dynamics between major global powers have grown increasingly uncertain. Despite ongoing diplomatic dialogues and collaborations between the United States and China, their interactions have shifted towards heightened rivalry rather than mutual cooperation. The National Security Strategy and National Defense Strategy documents released by the United States in December 2017 and January 2018 respectively categorize China as a "strategic competitor" and a "revisionist power." These two nations are entangled in an escalating trade dispute, followed by the separation of technology networks, maritime tensions, and other strategic reconfigurations.

The South China Sea tensions have further escalated due to the presence of naval vessels from non-regional states (Storey, 2020). The intrusion of foreign government vessels beyond the shores of Sabah and Sarawak starkly contradicts the sovereign rights of nations within the Exclusive Economic Zone (EEZ), as stipulated by international law. The competitive dynamics and retaliatory measures between major powers have heightened the risk of regional polarization. The security of Malaysia is closely tied to the stability of the Southeast Asian region. While the Association of Southeast Asian Nations (ASEAN) has effectively managed various regional conflicts as a collective community, the reality is that relationships among member states exhibit a more intricate and evolving nature. Malaysia holds a unique position as the sole country in the region sharing land and maritime borders with a majority of Southeast Asian nations. This position, alongside the historical colonial legacy in the region, has led to unresolved land and maritime boundary issues with neighboring countries. Therefore, the necessity for substantial investments in military resources for Malaysia's prosperity becomes evident. However, the challenge lies in the context of the country's significant debt burden, posing constraints on government spending. Hence, a critical examination of the link between national debt and military expenditure in Malaysia is of paramount importance. Due to the potential of national debt to distort the objectives of economic transformation as well defense requirements. In the context of Malaysia, the Strait of Malacca holds immense global importance as a key international maritime route, playing a pivotal role in East-West maritime transportation. Malaysia considers any encroachment in this region a direct challenge to its sovereignty,

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national interests, and defense. Beyond its local impact, control of the Strait by external powers could detrimentally affect global economic prosperity, potentially leading to disputes that transform it into a conflict-prone area, impacting Malaysia's security. Malaysia's stance is that the Strait of Malacca should remain free from external involvement and that littoral States hold the responsibility of safeguarding its sovereignty. Similarly, the Strait of Singapore, crucial for both international and internal trade, holds strategic importance for Malaysia's maritime defense and communications. Malaysia must bolster its defense capabilities to ensure protection of its vital areas in line with national interests, safeguarding sovereignty across terrestrial, maritime, and airspace domains, including the Exclusive Economic Zone (EEZ) and strategic sea lines.

2.0 LITERATURE REVIEW

Several past research endeavors have concentrated on the significance of a nation giving priority to its military expenditures. Such as Bardakas et al.(2022), Odehnal et al. (2020) and Awaworyi and Yew (2014). Through these investigations, a variety of distinct results have been put forward.
Odehnal et al.(2020) employed the ARDL model to meticulously investigate the determinants driving military expenditures within the Baltic States. Their comprehensive analysis encompassed vital variables such as GDP per Capita, Government Deficit/Surplus, General Government Gross Debt, Inflation, and security indicators. The research yielded a significant insight, illuminating the complex interplay between government debt and military expenditure. Notably, a compelling observation highlighted the substantial influence of fluctuations in the state budget deficit on military spending trends in Estonia and Lithuania. As budget deficits expanded throughout the assessment period, there was a discernible decline in military expenditures. Furthermore, the study underscored a direct and meaningful correlation between economic performance, particularly pronounced in Estonia, and an increase in military expenditure. These findings underscore the intricate nexus of relationships encompassing government debt, economic well-being, and the strategic considerations steering decisions regarding military resource allocation within the Baltic region.

In an inquiry conducted by Khan et al.(2021), the focal point of examination rested on the sway exerted by national debt upon military expenditure, culminating in the revelation of a significant interlinkage between these two variables. The research endeavored to underscore that as the quantum of national debt escalates, it invariably ushers in a corresponding uptick in military expenditure. This alignment elucidates that a substantial proportion of the accumulated debt finds its direction towards the financing of military endeavors. This discernment resonates in harmony with the conclusions drawn by Badarkas et al.(2022), who concentrated their inquiry on the nexus between national debt and military outlay, with a particular focus on the Greek milieu. Their study similarly unearthed a positive correlation, bolstering the premise that an augmenting national debt is intertwined with amplified military expenditure.

Furthermore, the findings of Azam and Feng (2017) stand as another testament to this phenomenon. Through their exploration centered on the Asian context, they illuminated a parallel constructive relationship between national debt and military expenditure. This convergence of results across disparate contexts underpins the robustness of the identified correlation. Esener and Ipek (2015), in a distinct angle of investigation honing in on developing countries, provided additional support to this trajectory. Their study in 2015 underscored a positive nexus between debt and military expenditure, further bolstering the notion that these two facets are intimately entwined. In a seminal antecedent investigation conducted by Dunne et al. (2003), a significant facet of inquiry revolved around the intricate interrelationship prevailing between national debt and military expenditure, specifically within the context of small industrialized nations. This antecedent study serves as a foundational precursor to the present research, as it sought to unravel the extent of influence and interplay that existed between these two critical variables. Upon a rigorous examination of empirical evidence and thorough statistical analysis, the findings unearthed a particularly intriguing revelation. The relationship that materialized between national debt and military expenditure within this select group of small, industrialized countries emerged as notably adverse. To put it succinctly, the research demonstrated a discernible and negative correlation between the levels of national debt incurred by these nations and the concomitant amounts they directed toward military expenditures.

Gavilanes (2020) conducted a comprehensive research endeavor, focusing on the intriguing interplay between savings and military expenditure in the South American region. The meticulous analysis resulted in the confirmation of a noteworthy negative association between these two pivotal economic factors. This

discovery sheds important light on the intricate dynamics of resource allocation in the context of military spending in South America. The negative relationship identified by Gavilanes (2020) holds significant implications for regional policymakers and international observers alike. It suggests that in South America, where various nations grapple with unique geopolitical and socio-economic challenges, there is a consistent pattern of prioritizing savings over military expenditure. This prioritization underscores the broader economic and developmental goals of these countries, reflecting a conscious decision to allocate resources away from defense in favor of other pressing needs.

Ridzuan et al. (2020) conducted a comprehensive analysis aimed at elucidating the multifaceted factors influencing military expenditure in Malaysia over a substantial period spanning from 1970 to 2016. Their findings shed important light on the intricate relationship between exchange rates and military expenditure, revealing a significant and noteworthy negative correlation between the two variables. The study's identification of this negative correlation holds significant implications for Malaysia's defense spending dynamics. Notably, the authors highlighted the reliance on imported military equipment as a pivotal factor in understanding this relationship. This reliance underscores the extent to which the fluctuations in the nation's currency, the Malaysian Ringgit, can exert a tangible and adverse influence on the country's military expenditure.

Based on the previous study, majority of the researchers are overlooked the function of national on military expenditure. Hence, it is crucial to explore the impact of national debt on military expenditure as it is important for policy making and planning.

3.0 METHODOLOGY

This study employs a quantitative research approach to investigate the relationship between national debt (ND), exchange rate (ER), gross domestic saving (GDS), and military expenditure (ME) in Malaysia. The research focuses on the past decade, analyzing how changes in these variables influence military spending. National debt is measured as a percentage of GDP, exchange rate reflects currency value, and gross domestic saving is a percentage of GDP. The dependent variable, military expenditure, encompasses defense budget, procurement, and related costs. The study aims to understand how these factors interact using data from the World Bank. Therefore, the following model specification is created:

$$\ln ME_t = \alpha + \beta 1 \ln GDS_t + \beta 2 \ln ER_t + \beta 3 \ln ND_t + \varepsilon_t \quad (1)$$

The natural logarithm of military expenditure (lnME) is the dependent variable. The equation includes explanatory variables: the natural logarithm of gross domestic savings (lnGDS), the exchange rate (lnER), and the natural logarithm of national debt (lnND). The equation's components are as follows: α represents the intercept, β1, β2, and β3 are coefficients indicating the impact of lnGDS, ER, and lnND, respectively, on lnME. The model accounts for unobserved influences through the error term εt. This approach allows for a comprehensive analysis of how changes in gross domestic savings, exchange rates, and national debt relate to variations in military expenditure, while considering potential nonlinearities and interactions among the variables. The complete information of each variable is shown in Table 1:

Table 1: Summary of data and proxy

Variable Name	Proxy	Symbol	Unit of measurement
Military Expenditure	Total yearly expenditure	ME	Ringgit
Gross Domestic Savings	GDP less final consumption expenditure (total consumption)	GDS	% to GDP
Exchange Rate	exchange rate determined by national authorities	ER	Official exchange rate (LCU per US$, period average)
National Debt	Central government debt	ND	% to GDP

Confirming the stationarity status of all variables in equation (1) as either at the first difference (I(1)) or at the original level (I(0)), excluding second-order stationarity (I(2)), is essential. This assessment is achieved using the Augmented Dickey-Fuller (ADF) unit root test, originally developed by Dickey and Fuller. The procedure for conducting the ADF test is expressed as follows:

$$\Delta y_t = \beta 1 + \beta 2_t + \delta y_{t-1} + \alpha i \, \Sigma \Delta y_{t-1} + \varepsilon_t \quad (2)$$

Where Δy_t stands for the initial difference of the variable y_t, β1 represents the constant term within the regression equation, β2 signifies the coefficient denoting the impact of time (t) on the change in Δy_t, δ serves as the parameter symbolizing the coefficient associated with the lagged dependent variable y_{t-1}, α_i refers to parameters that indicate the coefficients corresponding to the preceding differences of y_t (summarized as $\Sigma \Delta y_{t-1}$), $\Sigma \Delta y_{t-1}$ represents the summation of the earlier differences of y_t, and ε_t is the error term responsible for encapsulating the unaccounted variability in Δy_t that isn't explained by the independent variables.
The hypothesis for the unit root test can be stated as follows:

Null Hypothesis (H0): $\delta = 0$ (3)
Alternative Hypothesis (H1): $\delta \neq 0$ (4)

The null hypothesis suggests that the data has a unit root and is non-stationary, while the alternative hypothesis proposes that there's no unit root and the data is stationary. If the test shows the null hypothesis is true (H0 accepted or δ insignificant), it means the data has a unit root and isn't stationary. Conversely, if the results support the alternative hypothesis (H1) and show significance ($\delta \neq 0$), it indicates stationary data without a unit root. Afterward, a bound test is used to check if the variables are co-integrated. If the F-statistic is higher than a certain value, it means the variables have a significant co-integration relationship. This leads to rejecting the null hypothesis and enables us to estimate a long-term relationship between the variables. The long-term ARDL estimation for this study is presented as follows:

$$\Delta \ln ME_t = \beta 0 + \beta 1 \ln ME_{t-1} + \beta 2 \ln GDS_{t-1} + \beta 3 \ln ER_{t-1} + \beta 4 \ln ND_{t-1} + \beta 5,i \sum_{i=1}^{q1} ME + \beta 6,i \sum_{i=1}^{q2} \Delta lnGDS_{t-1} + \beta 7,i \sum_{i=1}^{q3} \Delta lnER_{t-1} + \beta 8,i \sum_{i=1}^{q4} \Delta lnND_{t-1} + \mu t \quad (5)$$

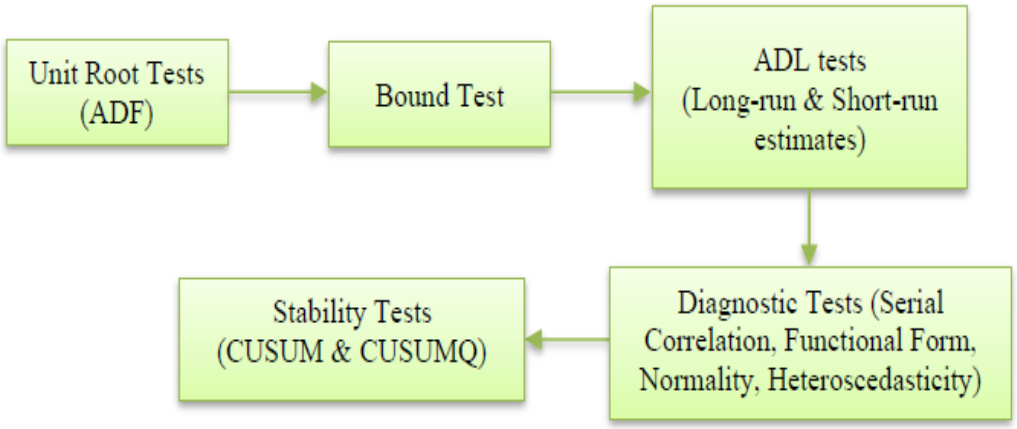
The Δ symbol signifies the first difference operation, while t-1 denotes the first lag. The term Σ(i=1) represents the summation of past lagged values of $\ln ME_t$. The parameters q1 to q3 indicate the optimal lags. The μt symbolizes the error term, encompassing the unaccounted variability in the dependent variable (ΔlnMEt) not explained by the independent variables. Furthermore, grasping the short-term association between the independent variables and child abuse is vital. To evaluate the immediate effects of these factors on child abuse, we will utilize an error correction model (ECM) test. The subsequent equation delineates the ECM model:

$$\Delta \ln ME_t = \mu + \sum_{i=1}^{p} \delta_1 \Delta ln ME_{t-i} + \sum_{i=1}^{q1} \delta_2 \Delta ln GDS_{t-1} + \sum_{i=1}^{q2} \delta_3 \, \Delta ln ER_{t-i} + \sum_{i=1}^{q3} \delta_4 \Delta ln ND_{t-i} + \theta 1 ECT_{t-i} + \varepsilon t \quad (6)$$

The equation includes δ1 to δ4 as coefficients accounting for short-term dynamics, and θ1 as the parameter denoting the rate at which adjustments occur towards the long-term equilibrium. ECTt−i represents the error correction term lagged by i periods.

To ensure the accuracy and suitability of the Equation 1 model, multiple diagnostic tests are conducted. These tests comprise the Normality Test, Breusch-Godfrey Serial Correlation LM Test, Breusch-Pagan-Godfrey Heteroskedasticity Test, and Ramsey RESET Test. In the final stage, these tests are employed to validate the model against necessary criteria.

Moreover, the stability of the model is evaluated using the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of the square of recursive residuals (CUSUMSQ). By analyzing these plots, it is determined whether they fall within the 5% significance boundary. If the plots consistently stay within this range, the model's stability is affirmed.



4.0 FINDINGS

Table 2 indicated a good overview of different aspects of the variables lnME, lnGDS, lnER, and lnPD. There are 31 observations for each variable. For lnME (natural logarithm of military expenditure), the average is about 23.01, and the middle value is around 23.21. LnME goes from roughly 22.19 to 23.60. lnGDS (natural logarithm of gross domestic savings) has an average of about 3.64, and the middle value is around 3.67. It varies by about 0.16 on average. LnER (natural logarithm of exchange rate) has an average of about 1.23, and it varies by about 0.17. For lnPD (natural logarithm of national debt), the average is around 25.08, and it varies by about 0.77. The way the data is shaped is reasonably normal, shown by the Jarque-Bera test probabilities mostly being higher than 0.05.

Table 2: Descriptive statistic results

	lnME	lnGDS	lnER	lnND
Mean	23.01406	3.642413	1.229244	25.0827
Median	23.20659	3.671282	1.299695	24.9373
Maximum	23.59683	3.885067	1.458718	26.2741
Minimum	22.18722	3.260745	0.918051	23.99852
Std. Dev.	0.471008	0.159464	0.173479	0.766254
Skewness	-0.49703	-0.60329	-0.56004	0.120864
Kurtosis	1.665589	2.51927	1.982251	1.38619
Jarque-Bera	3.576361	2.178949	2.958448	3.439469
Probability	0.167264	0.336393	0.227814	0.179114
Sum	713.4359	112.9148	38.10655	777.5636
Sum Sq. Dev.	6.655442	0.762861	0.902845	17.61433
Observations	31	31	31	31

The outcomes of the unit root tests, as displayed in Table 3, delve into the stationarity characteristics of the variables by employing models with solely intercepts and those incorporating trends. The results indicate that when examined at their original levels, none of the variables exhibit stationarity. However, when the first difference is taken, the variables demonstrate signs of stationarity, regardless of whether an intercept-only or intercepts-with-trends model is used. Specifically, for all variables—lnME (natural logarithm of military expenditure), lnGDS (natural logarithm of gross domestic savings), and lnER (natural logarithm of exchange rate)—the introduction of the first difference, in either model, leads to statistically significant

results, suggesting that these variables become stationary after differencing. However, the situation is slightly nuanced for lnND (natural logarithm of national debt). While the first difference makes lnND stationary in the intercept-only model, the results are not as consistent when trends are added. In this case, lnND appears to achieve stationarity in the intercept model, but the evidence for stationarity weakens when trends are taken into account. The findings provide evidence for the presence of a combination of integrated orders I(0) and I(1), confirming the appropriateness of employing the ARDL approach for the analytical framework.

In essence, the results of the bound test in table 3 is consistently show that the calculated F-statistic is significantly higher than the critical values across various significance levels. This indicates strong evidence in favor of a long-term relationship (co-integration) among the variables, validating the use of the ARDL approach and suggesting that the variables have a stable equilibrium relationship over time.

Table 3: Bound test results

F-Bound test		Null Hypothesis: No levels relationship		
Test statistic	Value	Signif.	I(0)	I(1)
F-statistic	8.484235**	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.50%	3.15	4.08
		1%	3.65	4.66

Note: ** indicates the 1% significance level.

The results from the long-run ARDL model in Table 4 reveal important relationships between the variables. When considering no trend and a restricted constant, for lnGDS (natural logarithm of gross domestic savings), a 1 per cent increase leads to about a 2.07 per cent increase in the dependent variable. Similarly, for lnER (natural logarithm of exchange rate), 1 per cent rise corresponds to around a 0.92 per cent increase in the dependent variable. Also, for lnND (natural logarithm of national debt), a 1 per cent increase connects to about a 0.80 per cent increase in the dependent variable. These relationships are solidly backed by their respective t-statistics and p-values, showing strong statistical significance. To sum up, these findings suggest that changes in gross domestic savings, exchange rate, and national debt are closely connected to changes in the dependent variable.

Table 4: Long-run ARDL model estimation

Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnGDS	2.068415**	0.306645**	6.745302**	0.0000
lnER	0.919301**	0.168013**	5.471625**	0.0001
lnND	0.795222**	0.053756**	14.79317**	0.0000

Note: ** and * indicate the 1% and 10% significance levels, respectively.

Table 5 displays the outcomes of estimating the short-run ARDL model. The meaningful and negative coefficient (-0.958903) of the Error Correction Term (ECT) confirms long-term relationships among Gross Domestic Savings (GDS), exchange rate (ER), and National Debt (ND). Additionally, the results suggest that GDS and ER have immediate effects on military expenditure (ME).

Table 5: Short-run ARDL model estimation

Variable	Coefficient	Std.Error	t-Statistic	Prob.
ECT	-0.958903**	0.178147**	-5.382652**	0.0002
lnGDS	0.732917*	0.337578*	2.171106*	0.0507
lnER	-1.520479*	0.443333*	-3.429651*	0.005
lnND	-1.078048	0.550769	-1.957353	0.074
C	-5.202805	2.648776	-1.96423	0.0731

Note: ** and * indicate the 1% and 5% significance levels, respectively.

To make sure the model used in this study is accurate and dependable, various tests were performed to check its stability and diagnose potential issues. These tests include examining whether errors are correlated, if the way variables are related is correct, if errors follow a normal pattern, and if there's a consistent pattern in error variability. The results of these tests, shown in Table 6, confirm the model's strength and reliability. The absence of problems like correlated errors, abnormal patterns, or missed specified relationships suggests that the model accurately represents the variable connections. This enhances our trust in the results. By ensuring there are no statistical concerns, we can be more confident in the estimated relationships and their significance levels. The tests confirm that the model is suitable for studying the variables and bolsters the credibility of the findings. Overall, these stability and diagnostic tests enhance the research's rigor and trustworthiness, making the results more valid and robust.

Table 6: Diagnostic test results

Diagnostic test	F-statistic	Prob.
Normality test	0.5009	0.7785
Breusch-Godfrey Serial Correlation LM Test	1.388943	0.308
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.510379	0.8906
Ramsey RESET Test	0.015524	0.9031

The model's stability is assessed using the CUSUM test. By comparing the CUSUM graph and CUSUM square in Figure 2 and 3 to critical boundaries, we determine stability. If the graph goes beyond these boundaries, it suggests instability at a 5% significance level. Conversely, if it remains within the boundaries, it indicates stability in both long-run and short-run estimations. Based on the CUSUM graph within the critical boundaries, it can be concluded that the model is stable. This implies that the relationships between the variables stay consistent and reliable throughout the analyzed period.

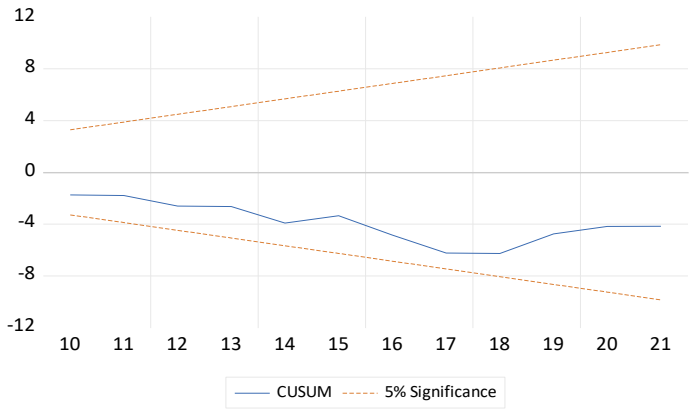


Figure 2: CUSUM

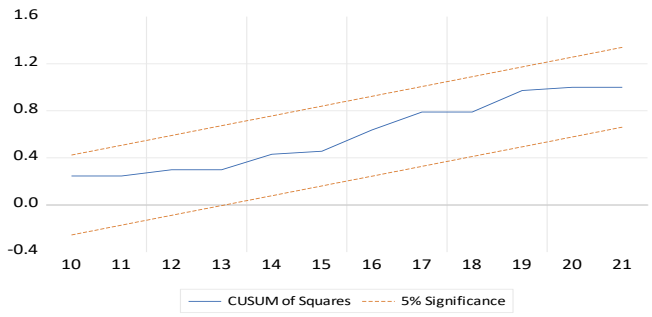


Figure 3: CUSUM square

5.0 CONCLUSION

In conclusion, this study utilized the ARDL methodology to explore the connection between national debt and military expenditure, analyzing both short-term and long-term perspectives. The short-term investigation unveiled that national debt lacks a significant impact on military spending, indicating that swift changes in debt levels don't immediately influence defense outlays. Conversely, the study illuminated a notable adverse effect of exchange rates (ER) on military expenditure, suggesting that a stronger national currency corresponds to decreased short-term defense expenses. This fact is aligned to Ologbenla (2020) and Ridzuan et al. (2020). Furthermore, the favorable influence of gross domestic saving (GDS) on military spending highlights the role of domestic resources in supporting defense endeavors. This findings is consistent to F.Kohler (1988). Shifting to the long term, the ARDL outcomes illustrate that all variables considered are positively contribute to military expenditure. The finding is parallel to Odehnal et al. (2020), Bardakas et al. (2022) and Azam and Feng (2017). This implies that, over an extended period, increases in these factors align with higher defense spending. In its entirety, this study underscores the intricate interplay between national debt, economic indicators, and military expenditure, providing insights into immediate and prolonged factors that mold defense budget choices.

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