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The Nexus Between GDP and Military Expenditure in Indonesia: Evidence From Time Series Analysis

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Abstract

As one of the key players in the region, Indonesia remains unable to fulfill its full potential in the defense sector. Indonesia's consistently low military expenditure has impeded the country's modernization program intended to be achieved in 2024 and might hinder in achieving the ideal defense posture in 2045. Therefore, analyzing the determinants of military spending and their effect to understand its potential in the face of such a problem is crucial. This study investigates the long-run multiplier (LRM) of a key determinant of military expenditure, namely Gross Domestic Product (GDP), in a dynamic time series model using the Generalized Error Correction Model from 1974 to 2016. Additionally, a novel LRM-bounds testing approach is employed to assess the long-run relationship. The findings reveal that a 1% increase in GDP leads to approximately 0.3% on average increase immediately and a cumulative increase of 0.4% over the next six years. From this result, Indonesia should strive for consistent and strong economic growth. This is because a large increase in GDP has a multiplier effect that will be beneficial for Indonesia's military spending. Therefore, even if defense spending as a share of GDP remains minimal, the problem can be minimized by strong GDP growth. While strong GDP growth might have a beneficial impact on military spending, this article also emphasizes the importance of effectively utilizing defense expenditure by strategically allocating more resources toward arms acquisition, research, and the development of the defense industry. Finally, since social processes rarely rest, policymakers should also consider temporal dynamics when dealing with GDP and military expenditure.

INTRODUCTION

Military spending is the research interest of many political scientists, international relations scholars, and security experts. An increase in military expenditure is often associated with a growing ability of the state military to procure weapons and a higher quality of military personnel. The availability of well-equipped and trained armed forces is essential in the anarchic international system, where no states can trust each other (Waltz, 1979). However, a large military expenditure often comes at the expense of civilian goods. Known as the guns and butter model, states face the dilemma of the trade-off between security and the welfare of the people.

In the case of Indonesia, the archipelago has constantly underperformed in terms of military spending. From the minister of defense to analysts, they lament the consistently low Indonesian military expenditure over the last 10 years which has remained below 1% of the Gross Domestic Product (GDP) (Firmansyah, 2023). The relatively low military spending compared to the potential of Indonesia has hindered the Minimum Essential Forces (MEF) Program. The Chief of Staff of the Indonesian Navy, Muhammad Ali, has attributed the failure to achieve the target of completing the MEF in 2024 to the combination of low military expenditure and the limitations of the indigenous defense industry (Rizkia, 2023). With the limitation Indonesia faces regarding its defense posture, it becomes important to examine the determinant of defense spending and its cumulative effect.

This article empirically explores one of the determinants of Indonesia's military expenditure, GDP. In defense economics, one of the most agreeable determinants of military spending among scholars is GDP. This is attested by numerous defense economics literature where many studies have found that GDP positively affects military expenditure (Conrad, 2023; George, Hou, & Sandler, 2019; Kumar, 2017; Wang, 2013). Therefore, examining the effect of GDP on military expenditure is important for Indonesia to be able to strengthen its defense.

This study is valuable on two fronts. First, it offers a new methodological approach to examining the relationship between GDP and military expenditure in Indonesia. This study used the Generalized Error Correction Model (GECM) re-introduced by De Boef & Keele (2008) and the bounds approach developed by Webb, Linn, & Lebo (2019) to determine the Long Run Relationship (LRR) among variables of interest. Previous studies involving military expenditure relied on the traditional time series methods such as the static Ordinary Least Square (OLS) (Pandia, Sutrasna, & Navalino, 2022; Saputro, Mahroza, & Tarigan, 2020; Susdarwono & Sani, 2023), and Vector Autoregressive (Soelistyo, 2023), while several others assessed the relationship with multiple countries using Time-Series Cross-Section (TSCS) (Afriadi, 2020; Rahawarin, Ahmad, & Octavian, 2019). This methodological innovation in studying Indonesia's defense spending is valuable as it allows analysts to make accurate inferences without needing to determine whether the time series contains a unit root or not. Thus, this approach provides a more robust and reliable insight into the relationship between GDP and military expenditure.

Second, this study enriches the literature on Indonesian defense economics by focusing on one of the most interesting features of the time series regression. An interesting feature of time series regression is the ability to determine the Short Run Relationship (SRR), LRR, and the Long Run Multiplier (LRM) of the variable in interest (Keele, Linn, & Webb, 2016). Unlike previous studies that utilize static time series OLS models (Pandia, Sutrasna, & Navalino, 2022; Saputro, Mahroza, & Tarigan, 2020; Susdarwono & Sani, 2023), that overlook the dynamics among variables, and treat autocorrelation as a nuisance rather than as unspecified dynamics (Ahmad, & Octavian,

2019), this study follows the guidance of De Boef & Keele (2008) and Linn & Webb (2020) to start from the plausible general model. Thus, this ability to model temporal dynamics is crucial in understanding the effect of Indonesia's GDP on military spending across time.

As stated by De Boef & Keele (2008), understanding the LRM is valuable in optimizing policymakers' decision-making process. Consequently, considering Indonesia's objective of attaining sufficient defense capabilities, it is crucial to investigate the LRM of GDP on military expenditure and its implications for Indonesia. The first part will analyze the statistical relationship between GDP and military expenditure. In the next part, it will then discuss the implications of the effect of GDP on military spending in Indonesia. Therefore, this examination holds significance as GDP serves as a fundamental determinant in realizing Indonesia's goal.

METHODS

Econometric Model

This study uses a quantitative method with time series data using the GECM popularized by De Boef & Keele (2008) to model the relationship between GDP and military expenditure across time. Unlike TSCS regression which is popular in political science and international relations, time series regression allows for a more in-depth analysis of country-specific data as it focuses on a single unit. Therefore time series regression is more appropriate to model the relationship between GDP and military spending in Indonesia alone. As this study used GECM, an example of the bivariate equation can be written as follows:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \beta_0 \Delta x_t + \beta_1 x_{t-1} + \eta_t \quad (1)$$

Where Δy_t is the first difference of the dependent variable, α_0 is a constant, α_1 is the coefficient from the error correction, β_0 is the SRR, $\beta_1$is the LRR, and η_t follows a white noise process. We can estimate the total effect of x toward y known as the LRM coefficient by calculating $\frac{\beta_1}{-\alpha_1}$. The bivariate GECM can be extended to include multiple independent variables and the functional form can be written as follows:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{j=1}^{k} (\beta_{0j} \Delta x_{j,t} + \beta_{1j} x_{j,t-1}) + \epsilon_t \quad (2)$$

In most social science research, using equation 2 is usually more desirable than equation 1, since in the social world, a phenomenon is often a combination of numerous factors. Therefore, the inclusion of multiple weakly exogenous variables is more appropriate and reduces the risk of omitted variables bias. Before estimating GECM and testing for the validity of LRR among variables, finding the univariate properties of a series is crucial. For example, a simplified expression of a single series can be written as:

$$y_t = D_t + \rho y_{t-1} + \mu_t \quad (3)$$

Equation 3 tells us the univariate properties of y_t, where D_t captures the deterministic component of the time series, and μ_t is a white noise process. When $\rho = 1$, the time series is non-stationary and integrated at order I(1). Without accounting for the univariate properties of time series, the analyst is at risk of making a spurious result (Box-Steffensmeier, Freeman, Hitt, & Pevehouse, 2014). Enns, Kelly, Masaki, & Wohlfarth,

(2016) and Grant & Lebo, (2016) show that to make correct inferences using GECM, one must have a balance equation. In other words, if the dependent variable is I(0), then the right-hand side (RHS) also must be I(0). The same can be said for the I(1) dependent variable.

To determine the univariate properties of a series, analysts often relied on stationary tests. However, as shown by Webb, Linn, & Lebo (2019) these tests often have weak statistical power to detect a unit root. Keele et al., (2016) used Monte Carlo simulations to show that the statistical power of these tests to detect a unit root is poor even when T=250. This is alarming considering most data in political science and international relations are very short and sometimes below T=50. To overcome this problem, Webb, Linn, & Lebo (2019) developed a bounds approach based on Pesaran, Shin, & Smith (2001) by using the LRM to test for LRR without knowing the univariate properties of the series. If the test statistic is higher than the upper bound, the analyst can reject the null hypothesis of no LRR. However, if the test statistic falls below the lower bound, the analyst cannot reject the null hypothesis of no LRR, or if it is located between the bounds, and cannot determine conditional equilibrium or cointegration among variables (Webb, Linn, & Lebo, 2020).

Using this LRM-bounds approach gives us two main advantages. On one hand, it allows the analyst to establish LRR even when the univariate properties of the series are uncertain. This is especially crucial with short series we often find in political science and international relations. On the other hand, unlike the Engle & Granger (1987) two-step method and Pesaran, Shin, & Smith, (2001) bounds test, it's easier to distinguish which variables are cointegrating with the dependent variable. As Kraft, Key, & Lebo (2022) noted, analysts often mistakenly assume that all variables are cointegrating with the dependent variables when the cointegration test shows significant results. Instead, a significant result only indicated that at least one variable is cointegrating with the dependent variable. Therefore the LRM-bounds approach developed by Webb et al. (2019) which identifies what variables are cointegrated or in conditional equilibrium with the dependent variable is valuable to help avoid incorrect inferences.

While the bound approach proposed by Webb, Linn, & Lebo (2019) can be used without knowing the univariate properties of the series. Keele, Linn, & Webb (2016) and Philips (2022) advise that pretesting is still essential to at least increase our confidence if a series has a unit root or not. To account for the weak statistical power of the unit root test, this study utilizes four different types of test, the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Dickey-Fuller Generalized Least Square (DF-GLS), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) to determine the univariate properties of the variables.

Data

Before doing statistical analysis, this study needs two key data. First is the dependent variable, military expenditure was obtained from the Stockholm International Peace Research Institute (SIPRI). The data is measured in a constant 2021 US dollars and available for Indonesia from 1974 to 2022. Second, is the GDP as the main independent variable of interest. For GDP, the data is obtained from the World Bank and available from 1967 to 2022. To normalize the data, this study takes the natural logarithm of both the dependent and independent variables. Using natural logarithm transformation for both dependent and independent variables also made the coefficient easier to interpret as a percentage change.

This study includes three control variables to avoid incorrect inferences regarding the two main variables of interest. The first control variable is democracy. Studies have found that democracies allocated considerably less to the military compared to non-democracies (Conrad, 2023; George et al., 2019; Hauenstein, Smith, & Souva, 2021; Wang, 2013). The logic is that democratic government survival is less likely determined by the military. In addition, the political checks and balances deny disproportionate national income to the defense sector. Nevertheless, measuring democracy remains difficult since it's a contested concept. To overcome the problem, this study used the electoral, liberal, deliberative, participatory, and egalitarian democracy indicators by the Varieties of Democracy (V-DEM) dataset to measure the concept (Coppedge et al., 2023). Using these five types of democracy indicators also serves as a sensitivity analysis to check the robustness of the result.

The second control variable is domestic unrest. Even though there is a more outward-looking vision compared to the new order era, Indonesia's military remains focused on internal threats (Haripin, Priamarizki, & Marzuki, 2021; Haripin, 2020). Based on that, an increase in domestic unrest will likely increase military spending. The data was obtained from the Major Episode of Political Violence (MEPV) dataset by Marshall (2019). Unlike most other datasets that treated domestic unrest as a dummy variable, the MEPV offers an aggregate measure of societal unrest that ranges from 0 to 10, where higher values imply a higher level of civil and ethnic violence and war. The last control variable is the number of military personnel. Kumar (2017) argues that military personnel is one of the determinants of military expenditure. Therefore, an increase in military personnel will likely increase military spending. For the data of military personnel, this study utilizes the Correlate of War Project National Material Capabilities (NMC) v6.0 dataset (Singer, Bremer, & Stuckey, 1972; Singer, 1988). Data on military personnel was available until 2016. This study refrains from adding more variables to the RHS of the equation to avoid overfitting the model (Keele, Linn, & Webb, 2016). Due to the limitation of the data, this study only examines the relationship between GDP and military expenditure from 1974 to 2016.

The overall model of this research can be written as follows:

$$\Delta ME_t = \alpha_0 + \alpha_1 ME_{t-1} + \beta_{0(GDP)}\Delta GDP_t + \beta_{1(GDP)}GDP_{t-1} + \delta_{0(DEM)}\Delta D_t + \delta_{1(DEM)}D_{t-1} + \delta_{0(DM)}\Delta Z_t + \delta_{1(DM)}Z_{t-1} + \epsilon_t \quad (4)$$

Where military expenditure is the dependent variable, GDP is the independent variable of interest, and D is a vector consisting of different types of democracy including electoral democracy (ED), liberal democracy (LD), deliberative democracy (DD), participatory democracy (PD), and egalitarian democracy (EgD), while Z is a vector consisting of the domestic unrest and military personnel and ϵ_t is a well-behaved residual.

RESULT AND DISCUSSION

Result

The first step before estimating GECM is to test the univariate property of a time series that will be used in this study. These data include military expenditure from SIPRI, GDP from the World Bank, five types of democracy from V-DEM, domestic unrest from MEPV, and the size of military personnel from NMC. To find out the univariate property of these variables, this study utilizes four different types of unit root and stationary tests

to cross-validate the result. Except for the KPSS test, the alternative hypothesis of the other three tests indicates data is stationary.

Table 1. Stationary Tests

	ADF	PP	DF-GLS	KPSS
ME	-2.075	-2.102	-2.188	1.573***
ΔME	-4.490***	-5.767***	-4.002***	0.902
GDP	-2.317	-2.360	-2.271	2.056***
ΔGDP	-4.760***	- 6.181***	-4.793***	0.067
ED	-0.027	-0.615	-0.983	1.811***
ΔED	-3.890***	-3.558**	-3.897***	0.154
LD	-0,114	-0.685	-0.799	1.819***
ΔLD	-3.828***	-4.202***	-3.969***	0.132
DD	-0.200	-0.694	-1.046	1.810***
ΔDD	-3.949***	-3.524**	-4.027***	0.149
PD	-0.123	-0.467	-0.662	1.846***
ΔPD	-3.243***	-4.042***	-3.273***	0.169
EgD	-0.082	-0.711	-0.887	1.829***
ΔEgD	-3.866***	-3.881***	-3.987***	0.134
DU	-4.217***	-3.061	-2.612	1.479***
ΔDU	-3.974**	-4.249***	-4.111***	0.218
MP	1.419	0.143	0.080	1.424***
ΔMP	-4.364***	-6.772***	-3.901***	0.238

Note: One lag is included for all tests. Δ is the first difference of the variable. The ADF, PP, DF-GLS, and KPSS results represent test statistics for stationary tests. *p<0.1; **p<0.05; ***p<0.01.

From the result presented in Table 1, most of the variables show that they are integrated at the order I(1), indicating a different stationary process. Nevertheless, both the Phillips-Perron test for liberal democracy and deliberative democracy fail to reject the null at the 1% level, thus introducing more uncertainty to the model that is intended to be estimated. In addition, the ADF result of the domestic unrest variable rejects the null at level, which is inconsistent with the rest of the unit root and stationary tests. As such, the use of the LRM bounds approach developed by Webb, Linn, & Lebo (2019) is appropriate for this study in the face of uncertainty in the series properties.

Table 2 presents the statistical analysis using GECM between GDP and military expenditure and all the control variables including different types of democracy, domestic unrest, and size of military personnel. As expected, in all five models, GDP is influencing military spending. The β_0 is statistically significant all over five models, indicating that in the short run, GDP consistently has a positive relationship to military expenditure. Aside from the SRR, the LRR shown by the α_1 and β_1 between GDP and military spending is also statistically significant. The error correction rate is indeed between $-1 \leq \alpha_1 \leq 0$. This value is the speed of a return from disequilibrium in the short run to the long-run equilibrium. Therefore there is a potential for a valid LRR as long as the t-value is located at the upper bound. Using the bound approach, the LRM test statistic of GDP in all five models is higher than the upper bound. These results are shown in Table 3 indicating that there is a cointegration between GDP and military expenditure, thus validating the existence of LRR. Considering the statistically significant β_1 also for liberal democracy, deliberative democracy, and egalitarian democracy, this study tests if there is a valid cointegration with military expenditure among these three variables.

Table 2. GECM Results

	Model 1	Model 2	Model 3	Model 4	Model 5
ME_{t-1}	-0.42**	-0.41**	-0.41**	-0.38**	-0.43**
	(0.16)	(0.16)	(0.15)	(0.15)	(0.16)
ΔGDP	0.28***	0.33***	0.27**	0.31***	0.30***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
GDP_{t-1}	0.16**	0.16**	0.16**	0.14*	0.17**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)
ΔED	-1.42***				
	(0.36)				
ED_{t-1}	-0.28				
	(0.15)				
ΔLD		-1.53***			
		(0.38)			
LD_{t-1}		-0.31*			
		(0.18)			
ΔDD			-1.39***		
			(0.34)		
DD_{t-1}			-0.26*		
			(0.14)		
ΔPD				-2.02***	
				(0.43)	
PD_{T-1}				-0.28	
				(0.43)	
ΔEgD					-1.99***
					(0.52)
EgD_{t-1}					-0.44*
					(0.23)
ΔDU	-0.002	-0.002	-0.000	-0.004	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DU_{t-1}	-0.01	-0.01	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
ΔMP	0.003***	0.003***	0.003**	0.004***	0.003**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
MP_{t-1}	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.92	-0.96	-0.96	-0.72	-1.06
	(1.01)	(1.05)	(1.01)	(1.01)	(1.05)
Adj. R^2	0.523	0.519	0.533	0.563	0.515
AIC	-63.933	-63.601	-64.82	-67.653	-63.266
Shapiro-Wilk	0.486	0.342	0.348	0.242	0.32
Breusch-Pagan	0.438	0.431	0.369	0.582	0.471
Breusch-Godfrey	0.521	0.646	0.478	0.53	0.438
RESET	0.153	0.192	0.214	0.115	0.266
Num. obs.	42	42	42	42	42

Note: Standard error in parentheses. *p<0.1; **p<0.05; ***p<0.01. Δ is the first difference of the variable. $t-1$ is the first lag of a variable. Results from the Shapiro-Wilk, Breusch-Pagan, Breusch-Godfrey, and RESET tests represent the *p*-value.

Since this study's main interest is specifically the effect of GDP on military expenditure in Indonesia, this study will first examine the LRM of these two variables. In

the first model, the LRM coefficient is 0.390, indicating that the total effect of an increase of 1% of GDP on military spending is 0.39%. For the second model, a rise of 1% of GDP will positively affect military expenditure by 0.392%. The third model shows that an increase of 1% in GDP will increase military expenditure by 0.4%. In the fourth model, an increase of 1% of GDP will affect military spending by 0.373%. The last model indicated that an increase of 1% of GDP has a positive impact on the dependent variable by 0.4%. Across these five models, if the effect on military spending is rounded up, there is close to a 0.4% average increase as the result of an increase in 1% of GDP.

Table 3. LRM and Bound Test Results

	Model 1	Model 2	Model 3	Model 4	Model 5
GDP	0.390	0.392	0.4	0.373	0.4
Standard error	0.092	0.097	0.095	0.1	0.093
t-value	4.229	4.045	4.237	3.740	4.297
LD		-0.769			
Standard error		0.365			
t-value		-2.105			
DD					
Standard error			-0.637		
t-value			0.294		
			-2.164		
EgD					
Standard error					-1.150
t-value					0.451
					-2.547

Note: LRM standard error*s* were estimated using the delta method. The t-statistics are "Below" if $|t|< 0.88$, “Between” if $0.88 < |t| < 2.70$, and “Beyond” if $|t| > 2.70$.

To better examine the effect across time, this study used stochastic simulations proposed by Jordan & Philips (2019) and Philips (2018) to visualize the overall effect of a change in the GDP on military expenditure. Figure 1 represented 10,000 simulations of a counterfactual 1% increase and decrease of GDP to military spending on model 4. The decision to simulate model 4 is based on the coefficient of determination and the Akaike Information Criterion (AIC) in Table 2. For brevity, the simulations of other models are not presented in this study. As shown in Figure 1a, when the shock appears at T=10, an increase of 1% of GDP will increase the military expenditure by 0.3% immediately. This is approximately the same as the β_0 of model 4 in Table 2. Figure 1(a) also shows that the effect of the GDP is distributed over time before it seems to dissipate at T=16 or six years after a shock happens. Overall there is an increase of less than 0.4% in the long run which is approximately the same as the LRM in Table 3. Figure 1(b) shows the simulations of a 1% decrease in GDP to military spending and has the same interpretation as 1a, except in reverse.

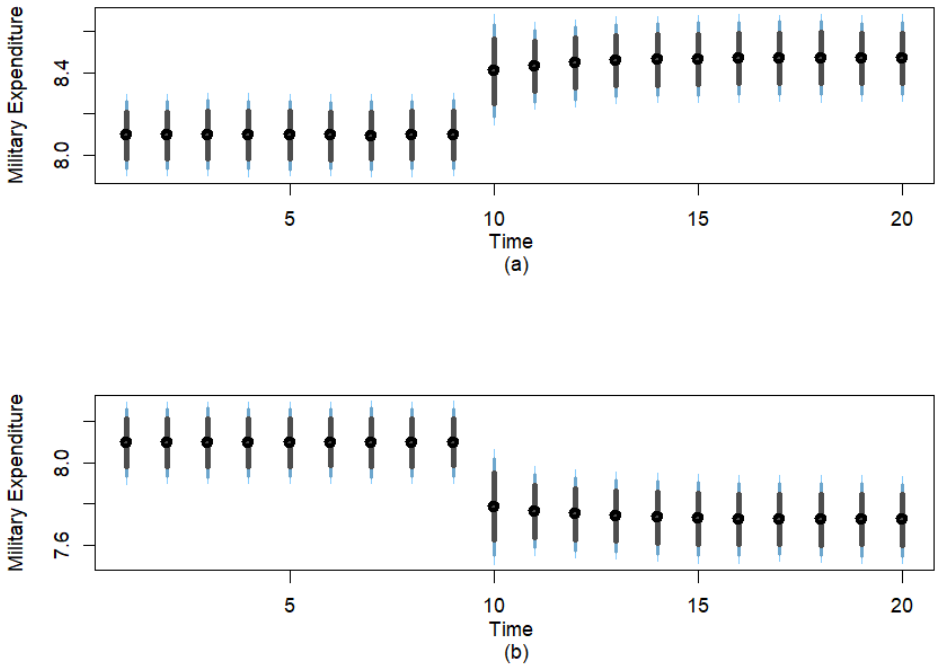

Figure 1. Stochastic Simulations of 1% Increase and Decrease of GDP to Military Expenditure (Simulations by the Author)

According to Noor, Anggitta, & Widjajanto (2021), an ideal defense expenditure for Indonesia until 2045 is in the range of 177 to US$242 billion based on the average exchange rate for 2021. Using extrapolation for forecasting purposes based on the result from the GECM using the available SIPRI data with the assumption that there is a constant 7% increase of GDP each year as the elected President Prabowo envisions. A constant 7% increase in GDP reveals the country's cumulative military spending will be US$266 billion, above the ideal expectation. However, considering 7% might be too optimistic, this study also calculates a constant 5% increase which resulted in US$244 billion.

It must be noted that this extrapolation only considers the effect of GDP on military expenditure holding other variables constant, which might make the result tends to be more optimistic since this study lacks information on how much change the other variables will take. It also didn't consider changes in the exchange rate between Rupiah and US Dollars and inflation. Therefore, this forecasting is only a rough estimate of a more complex real-world process and must be interpreted with caution. Forecasting has also notoriously been criticized due to its unreliable estimation. Despite these limitations, Box-Steffensmeier, Freeman, Hitt, & Pevehouse (2014) argued that forecasting should be utilized more in the social sciences as it can provide rough predictions on the trajectory of a series. Thus, despite their unreliability, this study supports this position.

Aside from this study's main variable of interest, all models show that all of the control variables except domestic unrest are statistically significant in the short run while only three are significant in the long run. First, the number of military personnel has a positive effect in the short run, but not in the long run. An increase of a thousand soldiers will increase military expenditure by 0.3%. This is expected since an increase in personnel means more budget was needed. In addition, all different types of democracy are statistically significant in the short run with negative signs which confirm this study's expectations. However, in the LRR only liberal, deliberative, and egalitarian democracy shows the potential of cointegrating with military expenditure. Sadly, the LRM-bound testing in Table 3 shows inconclusive results, therefore this study cannot determine if

these three types of democracies have LRR with the dependent variables. It must be noted that in exchange for being able to distinguish LRR even when the univariate property is uncertain, the LRM bounds test tends to be very conservative and is more prone to Type II error (Webb, Linn, & Lebo, 2020). Therefore, assuming that democracy didn't have a negative LRR with military expenditure is premature and the best this study can say is lacks evidence for them.

For the diagnostic test, Table 2 presents the normality, heteroscedasticity, autocorrelation, and omitted variable bias test. In all these tests, this study was able to confidently reject the alternative hypotheses, which indicated a well-specified model. The Shapiro-Wilk and the Breusch-Pagan test indicated that the residual is distributed normally and shows homoscedasticity. There is no autocorrelation left in the residual as shown by the Breusch-Godfrey test. Next, the Ramsey RESET test implies that no omitted variable bias may impact the result of this study. This study also includes a stability test using the Cumulative Sum of Recursive Residual (CUSUM). Looking at Figure 2, all five models show that they are stable

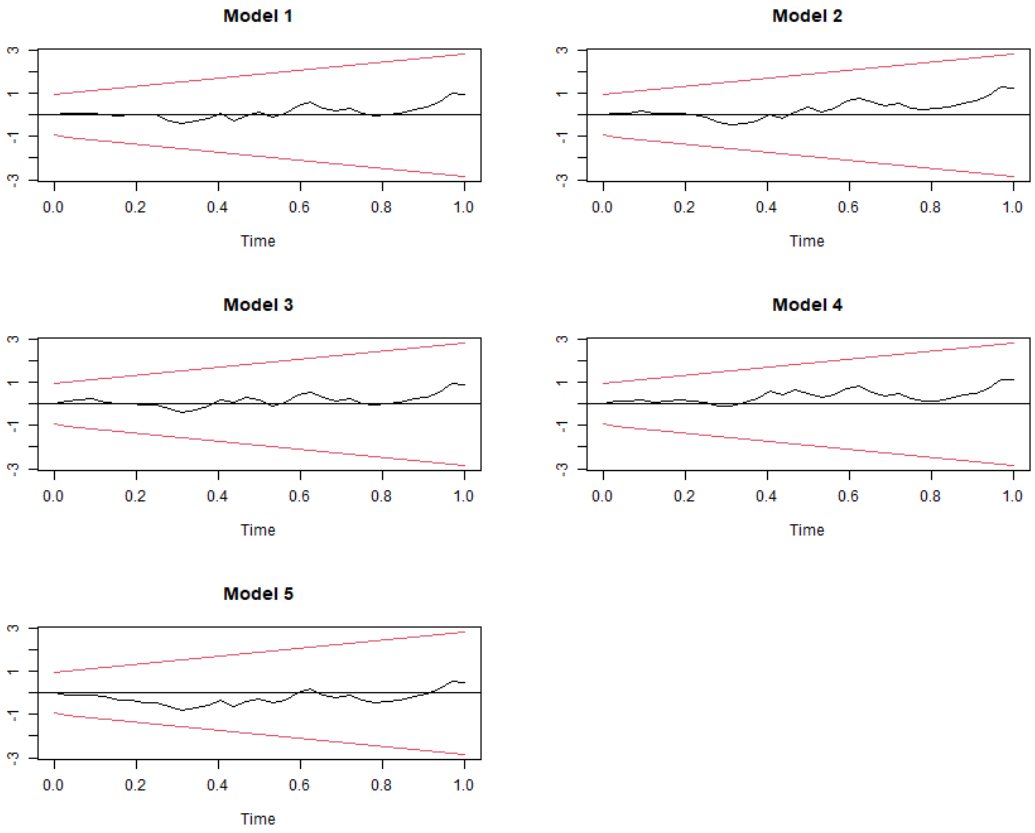

Figure 2. CUSUM Test Plot (Visualized by the Author)

Discussion

This study confirms previous literature that discussed before on the relationship between GDP and military spending. Unlike previous literature, this study focuses on the relationship between these two variables in Indonesia specifically. The evidence from the statistical result pointed out that GDP positively influences military expenditure in Indonesia. This result, therefore has implications for Indonesia in its quest to strengthen its defense capability in the middle of increasing geopolitical competition in the Indo-Pacific.

First, an important confirmation from this study is that GDP will play a significant role in shaping defense expenditure in Indonesia's case. This implies that stronger economic growth allows Indonesia to increase its investment in defense capabilities by allocating more funds to the defense sector. Based on the two extrapolation cases presented earlier, provide support for this argument. Therefore, achieving a 7% economic growth as outlined in Prabowo's plan, while challenging, is considered a very ideal target for Indonesia to pursue to strengthen its defense capabilities.

Second, it is important to exercise caution and acknowledge that an increase in military expenditure does not guarantee an immediate enhancement of Indonesia's defense capabilities. The effectiveness of the use of its military expenditure will be an important aspect of strengthening Indonesia's defense capabilities. According to Gindarsah et al. (2021) half of Indonesia's military expenditure is spent on personnel instead of bolstering its arms acquisition, research, and defense industry. Their research along with Prihandoko et al. (2023) suggests that an increase in allocations in these critical sectors is important to achieve Indonesia's ideal defense posture in 2045. Thus, while this study shows there is a significant and positive correlation between the number of military personnel and military expenditure, policymakers should be cautious that an excessive increase in the size of the armed forces might hinder progress in these sectors.

Third, this study finds that there is a dynamic effect of GDP on military expenditure. As Box-Steffensmeier, Freeman, Hitt, & Pevehouse (2014) noted, many social processes can be better understood in terms of change over time. In addition, understanding this dynamic process and modeling it as such made us able to understand the data-generating process more deeply. This study has shown that some social processes never rest with the result of this study showing that GDP is not only affecting military expenditure immediately but also distributed over time. For this reason, policymakers should consider the temporal dynamics when making decisions regarding defense spending.

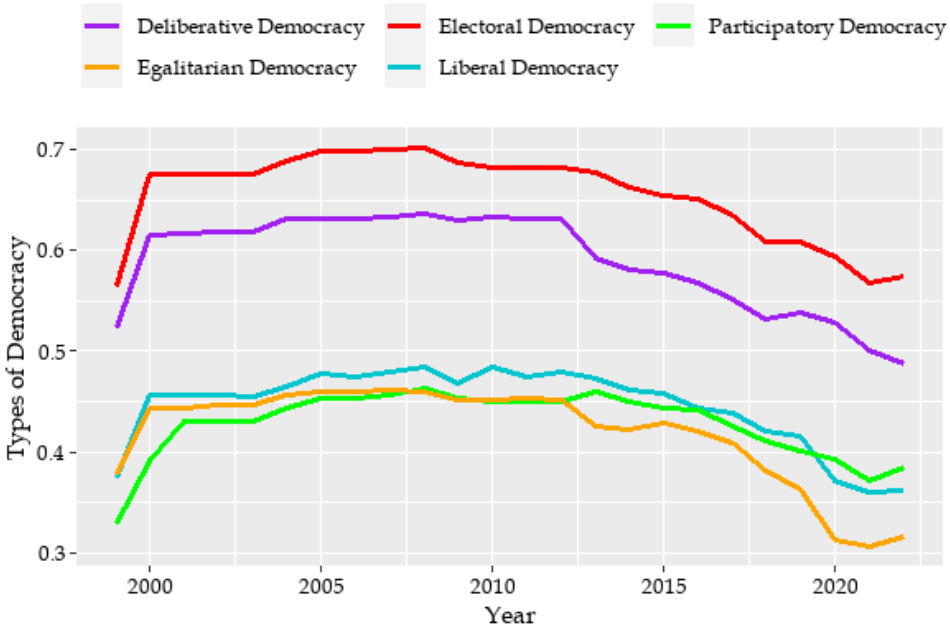

Figure 3. Indonesia's Democracy Index 1999 - 2022, Visualized by the Author from Coppedge et al., (2023).

Lastly, this study's control variables which are the five types of democracies have shown a negative relationship with military expenditure. Examining Figure 3, there are

clear downward trends among these types of democracies in the last ten years. Therefore, Figure 3 confirms Aspinall's (2018) concerns about democratic backsliding in Indonesia. It is expected that this downward trend will likely continue under the next President, Prabowo Subianto. Satrio (2023) argued that Prabowo is a long-term proponent of the idea of returning to the original 1945 constitution by supporting the Fifth Amendment. He then explains that returning to the original 1945 constitution will likely increase the authoritarian tendency of the government and thus reduce Indonesia's democracy index further. As a consequence, it will likely see more democratic regression in Indonesia. Nevertheless, Prabowo himself is a former military member and as a defense minister has shown strong interest in supporting Indonesia's defense modernization. Therefore, with Indonesia's democratic backsliding, an increase in military expenditure may be seen in Indonesia under Prabowo's leadership.

CONCLUSIONS, RECOMMENDATIONS, AND LIMITATIONS

This study offers an empirical examination of the effect of GDP on military expenditure in Indonesia. The findings make several contributions to our understanding of the effect of GDP on military expenditure in Indonesia and their implications for strengthening Indonesia's defense capabilities. First, this study attempts to overcome the difficulty in modeling temporal dynamics by developing an empirical strategy that accounts for this problem. By estimating GECM with the LRM bounds test, it finds that GDP has a positive SRR and LRR. In the short run, an increase of 1% in GDP will increase military spending by approximately 0.3%. In addition, the total effect of a 1% GDP increase on military expenditure is close to 0.4% and distributed over the next six years after the shock happens. These results remain robust even when considering various control variables and different model specifications. By focusing on the temporal dynamics, this study contributes to the existing defense economic literature in Indonesia by increasing our understanding of the effect of GDP on military expenditure over time.

Second, strong economic growth will result in a higher level of military expenditure. Even if the military expenditure as a share of GDP remains under optimal, a strong increase in GDP might at least reduce this problem. Therefore, a large increase in GDP, in this case Prabowo's 7% economic growth plan will help achieve Indonesia's ideal defense posture. In addition, an increase in GDP has a multiplier effect on defense spending that last several years. As a consequence, it will be preferred if Indonesia has consistently strong economic growth.

Third, while a significant GDP increase might lead to an increase in defense expenditure, Indonesia must invest these funds in the right places to maximize their impact. Ideally, Indonesia should increase its defense allocation on research, arms acquisition, and defense industry. Fourth, when dealing with defense spending, policymakers should also account for temporal dynamics instead of only focusing on short-term goals.

Besides our main interest, this research also finds an important finding regarding two of the control variables. Democracy has been found to affect military spending negatively. With the ascension of Prabowo to the presidential seat, Indonesia's democratic regression will likely continue. On the other hand, Prabowo's presidency will likely increase Indonesia's military spending further. The other control variable, the size of the armed forces is positively affecting defense spending. Nevertheless, policymakers must remain cautious as an excessive increase in military personnel might take resources from other crucial sectors.

Lastly, there are several suggestions for further research. From the methodology perspective, there are several other ways to model the relationship between GDP and military expenditure. First, there is a possibility that military expenditure is either positively or negatively affecting economic growth. Further research then can utilize the dynamics system of the equation model to assess this simultaneous effect between military expenditure and GDP. Next, the analyst can allow the ρ in equation 3 to take fractional values. By relaxing this assumption, we can estimate a long memory model. Another way to model this relationship is by incorporating a moving average component into the model by including Autoregressive Moving Average disturbances.

From the other perspective, further research can also test other political science and international relations variables that might affect military expenditure in Indonesia. Since quantitative studies in this field remain rare in Indonesia, research in this direction might be able to increase our understanding of the data-generating process of Indonesian military expenditure.

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