Causality analysis of military expenditure, economic growth, and exchange rate in Indonesia 2000 – 2023

Shaghi Ratu Sa'bani*, Sri Iswati, Muliahadi Tumanggor

Universitas Pertahanan, IPSC Sentul, Sukahati, Citeureup, Bogor, Jawa Barat, 16810, Indonesia,
e-mail: shaghirasbn@gmail.com

ABSTRACT

This study investigates the long-term relationship and causal dynamics among military expenditure, economic growth, and exchange rate in Indonesia over the period 2000-2023 to provide empirical insight into whether defense spending functions as a catalyst for economic growth or merely reflects the country's fiscal capacity. Using annual time-series data from the World Bank's World Development Indicators, the analysis applies the Johansen cointegration and Granger causality tests to assess both equilibrium and directional linkages. Before estimation, all variables are expressed in natural logarithms and subjected to the Augmented Dickey–Fuller test to ensure robustness of the empirical results. The findings confirm one significant cointegration relationship, indicating a stable long-term relationship among the variables. Granger causality results identify a unidirectional causality from economic growth to military expenditure, and from military expenditure to the exchange rate. These findings suggest that Indonesia's defense spending is primarily responsive to fiscal capacity while influencing exchange-rate stability. The study contributes to the defense economic literature by integrating defense spending with economic development strategies through domestic procurement, fiscal efficiency, and the strengthening of strategic industries to maximize multiplier effects on economic growth and maintain macroeconomic stability.

Keywords: military expenditure; economic growth; exchange rate; johansen cointegration; granger causality.

priviet lab.
RESEARCH & PUBLISHING

1. INTRODUCTION

Military expenditure is a strategic instrument in national defense policy to maintain the sovereignty, security, and stability of the country, and as a component of fiscal policy that influences microeconomic stability. In Indonesia, the defense budget allocation has increased significantly from Rp42 trillion in 2010 to Rp135 trillion in 2024 (Aulia Fitri, 2024). The increase in budgetary allocations reflects the government's strategic commitment to strengthening national security and modernizing defense capabilities. This is pursued through the maintenance and repair of existing defense equipment, alongside the reinforcement of defense infrastructure in border regions, remote islands, and strategically significant maritime zones. Despite the increase in military budget allocation, its proportion to the gross domestic product (GDP) remains relatively low at an average of 0.7%, significantly below the 2%-3% of GDP standard recommended by NATO. This persistent gap reflects a structural policy dilemma between modernization ambitions under the Minimum Essential Foces (MEF) framework and the government's limited fiscal capacity.
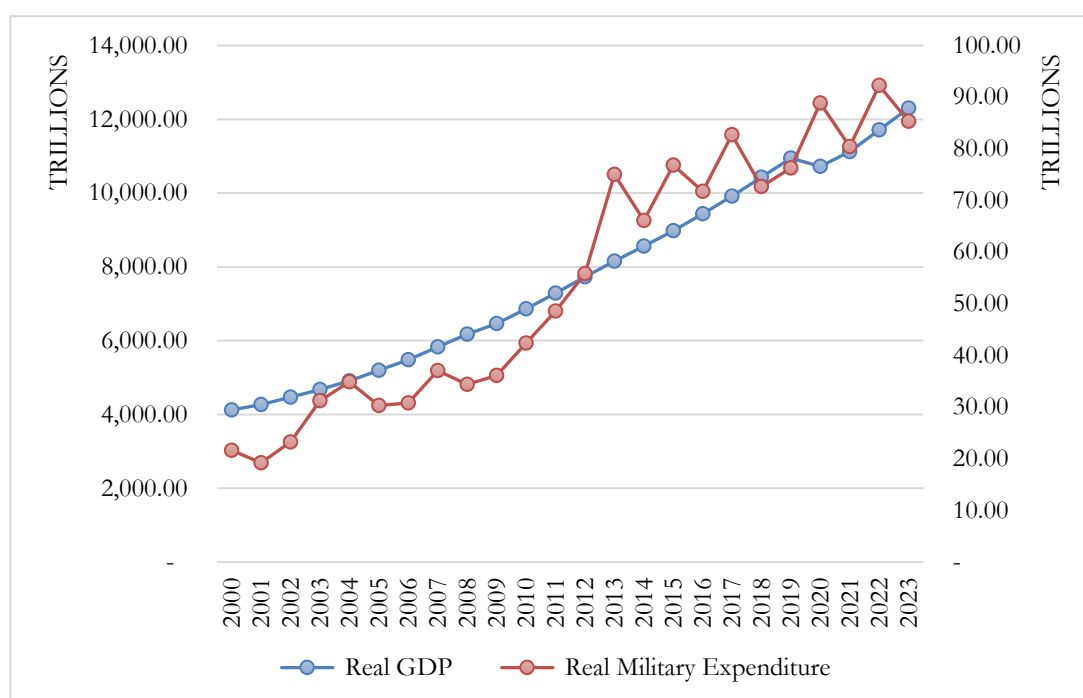

Figure 1. Real GDP and Real Military Expenditure for the period 2000 – 2023 (in Trillion Rupiah)

Source: WDI (2025)

As illustrated in Figure 1, Indonesia's real GDP and real military expenditure exhibit a strong co-directional trend between 2000 and 2023. Specifically, increases in national income are often accompanied by higher military expenditure. During the early reform period (2000-2009), defense spending expanded more slowly than GDP, constrained by post-crisis fiscal consolidation. Acceleration began in 2010 following the Minimum Essential Forces (MEF) launch (2010-2014), which prioritized modernization and reduces reliance on imported arms. However, spending growth stabilized after 2016 and slightly declined during the COVID-19 pandemic, as resources were diverted toward health and social protection. This trajectory indicates a long-term positive association between defense spending and economic growth, consistent with Wagner's Law, yet short-term fluctuations mirror fiscal and geopolitical conditions.

The nexus between military expenditure and economic growth has emerged as a complex and widely debated topic in defense economics, framed primarily by two dominant theoretical perspectives. The Keynesian perspective views military expenditure as a fiscal instrument capable of stimulating aggregate demand, job creation, and technological innovation, and strengthening security and stability,

thereby promoting economic growth (Pandia et al., 2022). In contrast, Wagner's law posits that economic growth drives higher government spending, including defense, as national income and complexity rise (Efthalitsidou et al., 2021). Beside that, in the Mundell-Fleming framework extends this relationship by linking fiscal expansion to exchange-rate dynamics through interest rates and capital flows in open economy. These frameworks imply that the causal direction between military expenditure, economic growth, and exchange rates may very depending on macroeconomic context and fiscal policy structure.

The Indonesia, case offers a compelling context to evaluater whether defense spending serves as an economic stimulus or a fiscal response. This study aims to fill that empirical gap by analyzing the long-term and causal relationships among military expenditure, economic growth, and the exchange rate from 2000-2023. Accordingly, this research seeks to answer three central question: (i) does a long-term equilibrium relationship exist among military expenditure, economic growth, and exchange rate in Indonesia?, (ii) what is the direction of causality among these variables, does growth lead defense spending (Wagnerian hypothesis), or does defense spending stimulate growth (Keynesian hypothesis)?, (iii) how does military expenditure influence exchange-rate dynamics through fiscal or external channels?.

By addressing these questions, the study contributes to the growing literature on defense economics by providing empirical evidence from major Southeast Asian economy, emphasizing how fiscal and external dynamics shape the defense-growth nexus.

2. LITERATUR REVIEW

Numerous previous studies have reported divergent findings regarding the economic effects of military expenditure. Some demonstrate a positive impact of military expenditure on economic growth, particularly within the context of national security and investment climate (Lobont et al., 2019; Selvanathan & Selvanathan, 2014). The government regime factor also influences the effectiveness of military expenditure in promoting growth through defense industry capacity building and aggregate demand (Putra et al., 2019). The study (Susilo et al., 2022) also confirms the positive role of military expenditure on GDP during the pandemic, along with fixed capital formation and labor as the main supporting factors. This indicates the importance of adapting government spending policies in facing crises.

However, several studies argue that military expenditure may hinder economic growth, particularly when it represents unproductive government consumption or is allocated inefficiently (Azam, 2020; Hou & Chen, 2013). Excessive military expenditure may divert resources from productive sectors such as education, health, and infrastructure, thereby weakening long-term growth potential (Desli et al., 2017). Similar findings by (Nugroho & Purwanti, 2021), which analyzed 27 middle-income countries, found that military expenditure does not contribute significantly to GDP and can worsen fiscal pressures. Recent evidence from research by (Ibon & Irfan, 2024) on ASEAN-5 economies further support this view, showing that economic growth significantly drives increases in military expenditure rather than the reverse. These findings indicate that military expenditure in developing economies tents to be more reactive to fiscal capacity than a catalyst for growth. The inconsistency of the previous study suggests that the growth effects of military expenditure are context-dependent, shaped by institutional quality, budget efficiency, and industrial linkages.

Military expenditure may also influence exchange-rate dynamics through various macroeconomic mechanisms as described in the Mundell-Fleming model. In an open economy, fiscal expansion influences domestic interest rates and capital flows, which in turn affect currency valuation (Mankiw, 2009). In Indonesia, fluctuations in military expenditure have coincided with changes in rupiah stability, indicating possible two-way interactions between fiscal and external sectors. The study of (Soelistyo, 2023) found that increases in military expenditure are correlated with broader macroeconomic stability and contribute to maintaining the value of the rupiah. Similar results are reported by (Miyamoto et al., 2019), who found that public spending affects exchange rates through market expectations about fiscal policy. Conversely, the literature also notes the opposite relationship, where exchange-rate volatility can reduce a country's ability to import defense equipment and force a reallocation of the defense budget (Goodhart & Xenias,

2012). These findings suggest that external conditions and fiscal policy play a crucial role in shaping the link between military expenditure and the exchange rate.

2.1 Hypothesis Development

Research on the defense-growth nexus has largely focused on two-variable models, examining either the direction of causality between defense spending and GDP or the fiscal burden of military expenditure. Few studies have integrated the exchange-rate channel even though it represents an important transmission mechanism between fiscal and external sectors. Addressing this empirical gap, this study simultaneously examines the long-term equilibrium and causal relationships among military expenditure, economic growth, and exchange-rate dynamics over the period 2000-2023 in Indonesia economies. Building upon these theoretical foundations, the development of hypotheses in this study draws on three key frameworks: the Keynesian demand-side perspective, Wagner's Law of fiscal responsiveness, and the Mundell-Fleming model of open-economy interactions. These theories provide complementary insights into whether Indonesia's defense spending functions as a short-term economic stimulus, a long-term fiscal response to income growth, or a policy instrument influencing exchange-rate stability. Based on the theoretical reasoning, the hypotheses are formulated as follows:

H1: There exists a long-term equilibrium relationship among military expenditure, economic growth, and the exchange rate in Indonesia.

H2a: Economic growth Granger-causes military expenditure.

H2b: Military expenditure Granger-causes economic growth.

H3a: Military expenditure Granger-causes the exchange rate.

H3b: The exchange rate Granger-causes military expenditure.

3. METHODOLOGY

This study adopts a quantitative approach to investigate the interrelationships among military expenditure, economic growth, and the exchange rate in Indonesia. The analysis draws on annual time-series data for the period 2000-2023, sourced from the World Bank's World Development Indicators. The variables include real Gross Domestic Product (GDP) as a proxy economic growth, real military expenditure (in nominal values deflated by the Consumer Price Index), and the real IDR/USD exchange rate.

The choice of variables is grounded in three theoretical perspectives such as Keynesian, Wagnerian, and Mundell-Fleming, which collectively explain how defense spending interacts with macroeconomic performance and external stability. All variables are transformed into natural logarithmic form (ln) to stabilize variance and meet the assumptions of normality and linearity in time-series estimation.

The study employs the Johansen cointegration and Granger causality framework to capture both long-term equilibrium and short-term dynamic relationships. This approach is particularly appropriate when the variables are non-stationary in levels but stationary at their first differences [I(1)], allowing the identification of stable cointegrating vectors among them.

The empirical procedure begins with testing the stationarity of each series using the Augmented Dickey Fuller (ADF) test to confirm that all variables are integrated of order one [I(1)] (Gujarati, 2010). After establishing the order of integration, the optimal lag length is selected based on standard information criteria such as AIC, SC, and HQ. Long-term relationships among the variables are then assessed using the Johansen cointegration technique, using both the trace statistic and maximum eigenvalue statistic to determine the number of significant cointegrating vectors (Baltagi, 2021).

Finally, the Granger causality test is conducted within a vector error-correction framework to identify the direction of causality between variables (Engle & Granger, 1987). The following equation represents the general form of the model:

$$LnY_t = \alpha_o + \alpha_1 LnME_t + \alpha_2 LnER_t + \varepsilon_t$$

Where Yt = real GDP in rupiah currency units, MEt = military expenditure, ERt = IDR/USD exchange rate, ε_t is the stochastic error term. The estimations were conducted using EViews 10 software, complemented by diagnostic tests for serial correlation, heteroskedasticity, and model stability to ensure robustness and validity of the findings. The analysis is limited to annual aggregate data and does not distinguish between capital and recurrent components of defense spending due to data contraints. See Table 1

Table 1. Description of Variables

Variable	Definition	Measurement	Source
Economic Growth (Y)	Economic growth is measured as real GDP at constant prices. It reflects the value of all final goods and services produced in a country.	Rupiah	WDI
Military Exoenditure (ME)	Total military expenditure. Nominal value is deflated using the Consumer Price Index (CPI) to reflect real value.	Real Rp (constant prices based on CPI, 2015=100)	WDI
Exchange Rate (ER)	Official exchange rate between the rupiah and the US dollar, using the annual average.	Rp/US$	WDI

4. RESULT AND DISCUSSION

4.1 Results

Table 2 reports descriptive statistics for all observed variables. Notably, military expenditure displays the largest dispersion, with a standard deviation of 0.50, whereas the exchange-rate variable exhibits the smallest variation, at 0.22. This pattern suggests that, relative to the other indicators, the exchange rate remained comparatively stable over the sample period. The skewness results for the three variables are close to zero, indicating that the data distribution tends to be symmetrical, with the military expenditure variable slightly skewed to the left and the exchange rate variable slightly skewed to the right. The Jarque-Bera statistics and probability values (>0.05) indicate that all three variables conform to a normal distribution.

Table 2. Descriptive Statistics

	LNY	LNME	LNER
Mean	36.52719	31.52276	9.308859
Median	36.55423	31.58371	9.242342
Maximum	37.04850	32.15556	9.631474
Minimum	35.95505	30.58668	9.038576
Std. Dev.	0.352763	0.500218	0.210624
Skewness	-0.146557	-0.326995	0.286557
Kurtosis	1.675452	1.734876	1.414565
Jarque-Bera	1.840343	2.028241	2.842064
Probability	0.398451	0.362721	0.241465
Sum	876.6526	756.5463	223.4126
Sum Sq. Dev.	2.862161	5.755012	1.020332
Observations	24	24	24

Source: Processed data (2025).

After describing the basic characteristics of the three variables through descriptive statistical analysis, the next step is to ensure the nature of data integration. A stationarity test is conducted to avoid spurious regression and ensure that all variables meet the prerequisites for cointegration analysis. The Augmented Dickey-Fuller (ADF) unit root test results reported in Table 3 reveal that all variables are non-stationary at the levels but become stationary after first differencing, indicating integration of order one I(1). Thus, the three variables meet the prerequisites for the Johansen cointegration test.

Table 3. Stationary Test Result

Variable	Unit Root Test					
	Level		1st Difference		2nd Difference	
	ADF	Prob	ADF	Prob	ADF	Prob
LnY	-1.229668	0.6433	-3.619563	**0.0139**	-3.683995	0.0136
LnME	-1.254697	0.6322	-5.989691	**0.0001**	-6.149597	0.0001
LnER	-0.669938	0.8354	-4.878850	**0.0008**	-6.234173	0.0000

Source: Processed data (2025)

Based on the results in Table 4, all lag selection criteria consistently recommend lag 1 as the most optimal. Therefore, the cointegration analysis and causality test in this study use lag length 1 as the basis for model estimation.

Table 4. Lag-length criteria results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	34.19268	NA	1.03e-05	-2.970732	-2.821514	-2.938348
1	114.0157	129.2372*	1.23e-08*	-9.715778*	-9.118908*	-9.586242*
2	118.8260	6.413723	1.95e-08	-9.316758	-8.272235	-9.090070
3	125.7337	7.236669	2.83e-08	-9.117494	-7.625319	-8.793654

Source: Processed data (2025)

The Johansen cointegration results reported in Table 5 indicate the presence of a single statistically significant cointegration equation at the 5% level. This is known from the trace statistic value (35.73) and max-eigen statistic (24.92), which exceed the critical value of 5%. This finding indicates a stable long-term relationship among the variables included in the research model.

Table 5. Johansen cointegration test results

Hypothesized No. of CE(s)	Eigenvalue	Trace		Max-Eigen	
		Statistic	Critical Value	Statistic	Critical Value
None*	0.677816	**35.73023**	**29.79707**	**24.91791**	**21.13162**
At most 1	0.326475	10.81232	15.49471	8.695065	14.26460
At most 2	0.091753	0.091753	2.117253	2.117253	3.841466

Source: Processed data (2025)

After proving that there is one significant cointegration equation, the analysis continues with the Granger causality test to identify the direction of the causal relationship among the variables. This stage is important to reveal the short-term dynamics and direction of influence underlying the structural relationship found in the cointegration stage. The results in Table 6 confirm unidirectional relationship from economic growth to military expenditure (p = 0.0213), thereby rejecting the null hypothesis. This means that economic growth drives an increase in defense spending and consistent with Wagner's Law, not the other way around. No feedback effect from military expenditure to economic growth was found, indicating that indonesia's defense budget remains largely fiscally responsive, not a primary engine of growth. Furthermore, Granger causality was found from military expenditure to the exchange rate (p = 0.0094), thus rejecting the null hypothesis. This reflects that the dynamics of military expenditure can affect the movement of the rupiah exchange rate and supporting the Mundell-Fleming mechanism. Meanwhile, no significant causal relationship was found between economic growth and the exchange rate.

Table 6. Granger causality test results

Null Hypothesis:	Obs	F-Statistic	Prob.
LNME does not Granger-cause LNY	23	0.99597	0.3302
LNY does not Granger-cause LNME		6.24274	**0.0213**
LNER does not Granger-cause LNY	23	2.14538	0.1585
LNY does not Granger-cause LNER		4.26026	0.0522
LNER does not Granger-cause LNME	23	0.05972	0.8094
LNME does not Granger-cause LNER		8.24220	**0.0094**

Source: Processed data (2025)

Table 7 presents the results of the diagnostic tests conducted to assess the overall adequacy and reliability of the estimated model. The Breusch-Godfrey LM test for serial correlation shows a probability value of 0.7790, indicating that the residuals are free from autocorrelation. The White's test for heteroscedasticity yields a p-value of 0.6739, confirming that the residuals are homoscedastic and the variance of the error term is constant across observations. These findings suggest that the model meets the basic assumptions of the classical linear regression framework. The stability of the estimated model was further verified using the Inverse Roots of the AR Characteristic Polynomial. The results show that all characteristic roots lie within the unit circle (modulus < 1), confirming that the model is dynamically stable and suitable for long-term analysis. See Also Figure 2.

Table 7. Diagnostic test results

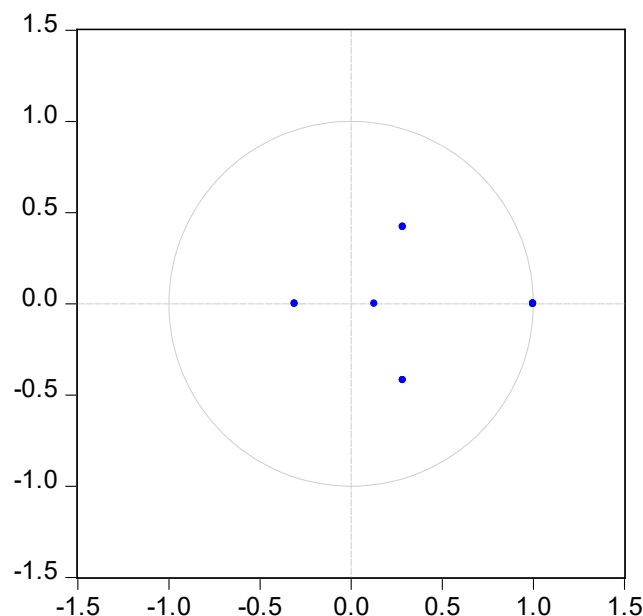| Diagnostic test	Method	p-value	Decision
Serial Correlation	Breusch-Godfrey LM	0.7790	No autocorrelation
Heteroscedasticity	White's Test	0.6739	Homoskedastic
Stability	Inverse Roots AR	-	Stable (roots < 1)

Source: Processed data (2025)

Figure 2. Inverse Roots of AR Characteristic Polynomial

4.2 Discussion

The findings of this study substantiate the presence of a stable long-term relationship among military expenditure, economic growth, and the exchange rate in Indonesia during the period 2000–2023.

Granger causality tests indicate a unidirectional causal flow from economic growth to military expenditure and from military expenditure to the exchange rate. These results indicate that defense spending in Indonesia is largely responsive to fiscal capacity and can influence the dynamics of the rupiah exchange rate, but it has not yet functioned as a driver of economic growth. This pattern is consistent with evidence from middle-income countries showing that the expansion of military expenditure is determined more by national fiscal capacity than by growth-stimulating objectives (Ali, 2021; Ibon & Irfan, 2024; Nugroho & Purwanti, 2021). Moreover, military budget allocations can reduce fiscal space for productive sectors such as education and health (Azam, 2020; Hou & Chen, 2013; Saba & Ngepah, 2019). The case of India illustrates the absence of direct causality between military expenditure and economic growth. Moreover, the Indian government has strategically channeled defense expenditure to strengthen domestic industry through Foreign Direct Investment (FDI) policies combined with state-controlled marketing initiatives (Abdel-Khalek et al., 2020). This shows that military expenditure can be a catalyst for growth if it is strategically directed to support defense industry independence and national innovation.

By contrast, our findings diverge from those of (Fazal Rehman, 2020; Lobont et al., 2019; Selvanathan & Selvanathan, 2014) who found a positive linkage between military expenditure and economic growth, in line with the Keynesian framework that views government spending as an instrument to drive aggregate demand and economic stabilization. In Indonesia, a unidirectional relationship from military expenditure to economic growth was also observed during the New Order and early reform periods (Putra et al., 2019) One factor supporting this finding is the implementation of countertrade in defense equipment procurement, whereby export commodities such as crude palm oil and rubber were used as barter instruments (Maharani & Matthews, 2023). This practice not only facilitated strategic acquisitions but also had direct implications for the trade balance.

The divergent results of this study indicate that the impact of military expenditure on economic growth is strongly contingent upon the prevailing policy context and macroeconomic conditions. Indonesia's relatively small share of defense budget averaged only 0.7% of GDP compared to the ideal standard of 2–3% of GDP. Expenditure orientation that is still dominated by routine expenditure and imports of defense equipment, and the relatively stable domestic security situation has resulted in a weaker fiscal multiplier effect. Unlike the contexts of Sri Lanka, Romania, and Pakistan, which have either experienced conflict or pursued a strong emphasis on domestic procurement, military expenditure can play a more stimulative role. Thus, Indonesia was in a stable condition during the 2000–2023 period, with limited domestic defense industry integration making military expenditure more of a reactive response to fiscal capacity than as a catalyst for growth.

Furthermore, the identification of a unidirectional relationship from military expenditure to the exchange rate suggests that fluctuations in the rupiah during the observation period were influenced by dynamics in defense spending. This finding is consistent with (Miyamoto et al., 2019) which states that military expenditure can trigger real exchange rate appreciation in developing countries through changes in market expectations regarding the government's fiscal position. Similar to (Soelistyo, 2023) the effect of military expenditure on the exchange rate in Indonesia tends to be moderate but remains significant in maintaining currency stability. These results support the Mundell–Fleming framework, whereby fiscal expansion affects interest rates and capital flows, which in turn influence the exchange rate (Mankiw, 2009). Nevertheless, this influence is likely to interact with external factors such as global commodity prices and monetary policy, and therefore should be interpreted with caution.

The results of this study expand the literature by confirming that military expenditure in Indonesia is influenced by national fiscal capacity and has implications for exchange rate stability. These findings highlight the importance of integrating defense policy with broader economic development strategies, optimizing domestic procurement, and strengthening national strategic industries to reduce pressure on the exchange rate. The practical implication is that defense spending should be directed toward maximizing economic multiplier effects through domestic sourcing and industrial innovation, thereby ensuring a more sustainable impact on both economic growth and macroeconomic stability.

5. CONCLUSION

This research investigates the causal relationship between economic growth, military expenditure, and exchange rates in Indonesia from 2000 to 2023. The results of the stationarity test indicate that all variables are non-stationary in their level form, and become stationary after first differencing I(1), thus meeting the requirements for the cointegration test. The results confirm the presence of a cointegration equation that shows a structural relationship between variables in the long term, indicating that there is a long-term relationship among the variables, with a unidirectional causal flow from economic growth to military expenditure and from military expenditure to the exchange rate. These findings suggest that defense spending in Indonesia is primarily driven by fiscal capacity and exerts an influence on exchange-rate dynamics, but has not yet functioned as a catalyst for economic growth. Moreover, the identified causal linkage between military expenditure and the exchange rate indicates that fluctuations in defense spending can affect exchange-rate stability, particularly through arms imports.

Policy recommendations that can be proposed based on empirical findings include establishing defense budget management standards that are oriented towards fiscal efficiency and economic productivity in order to ensure that military expenditure makes a real contribution to national development. This strategy needs to be supported by the integration of the defense budget into economic development plans through technology transfer, strengthening the domestic defense industry, and developing human resources. In addition, close coordination between the Ministry of Finance and the Ministry of Defense in formulating medium- and long-term military expenditure is crucial to anticipate fiscal impacts and maintain macroeconomic stability, particularly in relation to potential pressure on exchange rates and foreign exchange reserves due to external financing. Future research may extend this framework by incorporating additional macroeconomic variables such as inflation, public debt, or external shocks, as well as by employing panel data across countries to provide comparative insights into how different policy contexts shape the relationship between military expenditure, economic growth, and exchange-rate stability.

Ethical Approval
Not Applicable

Informed Consent Statement
Not Applicable

Authors' Contributions
SRS contributed to formulating the research problem, constructing the theoretical framework, collecting the relevant data, and conducting the statistical analyses using the Johansen cointegration and Granger causality approaches. She also prepared the initial manuscript draft and ensured the coherence of the methodological and analytical sections. SI contributed to refining the research design, validating the econometric procedures, and reviewing the robustness of the unit-root and cointegration tests. She ensured the accuracy of data interpretation and provided critical revisions to strengthen the discussion and policy implications. MT contributed to supervising the overall research process, evaluating the structure and academic rigor of the manuscript, and providing substantial feedback on the theoretical integration of defense economics and macroeconomic frameworks. He also assisted in final proofreading and ensured the manuscript met the journal's scholarly standards.

Disclosure statement
The Authors declare that they have no conflict of interest

Data Availability Statement
The data presented in this study are available on request from the corresponding author due to privacy reasons.

Notes on Contributors

Shaghi Ratu Sa'bani
Shaghi Ratu Sa'bani is affiliated with Universitas Pertahanan

Sri Iswati
Sri Iswati is affiliated with Universitas Pertahanan

Muliahadi Tumanggor
Muliahadi Tumanggor is affiliated with Universitas Pertahanan

REFERENCES

Abdel-Khalek, G., Mazloum, M. G., & El Zeiny, M. R. M. (2020). Military expenditure and economic growth: the case of India. *Review of Economics and Political Science*, *5*(2), 116–135. https://doi.org/10.1108/REPS-03-2019-0025

Ali, A. A. (2021). The Causal Relationship between Military Expenditure and Economic Growth in Egypt during the period from 1980 to 2019. *Scientific Journal for Economic& Commerce*, *51*(3), 701–734. https://doi.org/10.21608/jsec.2021.165846

Aulia Fitri. (2024). The Urgency of Increasing the Defense Budget for 2024. *Jurnal Info DPR RI*, *XV*(24), 1–5.

Azam, M. (2020). Does military spending stifle economic growth? The empirical evidence from non-OECD countries. *Heliyon*, *6*(12). https://doi.org/10.1016/j.heliyon.2020.e05853

Desli, E., Gkoulgkoutsika, A., & Katrakilidis, C. (2017). Investigating the Dynamic Interaction between Military Spending and Economic Growth. *Review of Development Economics*, *21*(3), 511–526. https://doi.org/10.1111/rode.12268

Efthalitsidou, K., Zafeiriou, E., Spinthiropoulos, K., Betsas, I., & Sariannidis, N. (2021). GDP and public expenditure in education, health, and defense. Empirical research for Greece. *Mathematics*, *9*(18), 1–17. https://doi.org/10.3390/math9182319

Fazal Rehman, S. (2020). Exploring the Long Run Effects and Relationship of Military Expenditures and Economic Growth in the Scenario of Pakistan. *Bulletin of Business and Economics*, *9*(3), 106–112. https://bbejournal.com/BBE/article/view/120

Goodhart, L. M., & Xenias, A. (2012). Guns and Money in the Open Economy: The Exchange Rate and the Demand for Arms Imports. *International Studies Quarterly*, *56*(4), 786–792. https://doi.org/10.1111/j.1468-2478.2012.00752.x

Hou, N., & Chen, B. (2013). Military expenditure and economic growth in developing countries: Evidence from system gmm estimates. *Defence and Peace Economics*, *24*(3), 183–193. https://doi.org/10.1080/10242694.2012.710813

Ibon, N. D., & Irfan, M. (2024). Causality Analysis of Military Expenditure and Economic Growth in ASEAN-5 Countries. *Media Riset Ekonomi Pembangunan (MedREP)*, *1*(4), 705–713. https://medrep.ppj.unp.ac.id/index.php/MedREP/login

Lobont, O. R., Glont, O. R., Badea, L., & Vatavu, S. (2019). Correlation of military expenditures and economic growth: lessons for Romania. *Quality and Quantity*, *53*(6), 2957–2968. https://doi.org/10.1007/s11135-019-00910-9

Maharani, C., & Matthews, R. (2023). The Role of Offset in the Enduring Gestation of Indonesia's Strategic Industries. *Defence and Peace Economics*, *34*(7), 981–1002. https://doi.org/10.1080/10242694.2022.2065423

Mankiw, G. N. (2009). Macroeconomics. In D. Kasowitz (Ed.), *Worth Publishers* (7th ed.). Worth Publisher.

Miyamoto, W., Nguyen, T. L., & Sheremirov, V. (2019). The effects of government spending on real exchange rates: Evidence from military spending panel data. *Journal of International Economics*, *116*, 144–157. https://doi.org/10.1016/j.jinteco.2018.11.009

Nugroho, D. A., & Purwanti, E. Y. (2021). Impact of Military Expenditure on Economic Growth Encouraging or Constraining? *Jejak*, *14*(1), 9–20. https://doi.org/10.15294/jejak.v14i1.26062

Pandia, K. V., Sutrasna, Y., & Navalino, D. A. (2022). THE EFFECT OF THE STATE BUDGET, GROSS DOMESTIC PRODUCT, AND ECONOMIC GROWTH ON THE DEFENSE BUDGET FOR THE 2010-2020 FISCAL YEAR. *Jurnal Inovasi Penelitian*, *2*(8), 2769–2782.

Putra, B. R., Yeniwati, & Adry, R. M. (2019). Causality Analysis of Defense Spending and Economic Growth in Indonesia. *Jurnal Ecosains, 8*(2), 177–184. http://digilib.unila.ac.id/4949/15/BAB II.pdf

Saba, C. S., & Ngepah, N. (2019). A cross-regional analysis of military expenditure, state fragility and economic growth in Africa. In *Quality and Quantity* (Vol. 53, Issue 6, pp. 2885–2915). https://doi.org/10.1007/s11135-019-00905-6

Selvanathan, S., & Selvanathan, E. A. (2014). Defence expenditure and economic growth: a case study of sri lanka using causality analysis. *International Journal of Development and Conflict*, *4*, 69–76.

Soelistyo, A. (2023). How Strongly Does Military Expenditure Impact Economic Growth and the Exchange Rate? *Jurnal Ilmiah Bisnis Dan Ekonomi Asia*, *17*(3), 266–278. https://doi.org/10.32815/jibeka.v17i3.1177

Susilo, A. K., Sari, D. W., Putra, I. N., & Pratiwi, N. A. (2022). Economic Growth and Military Expenditure in Developing Countries During Covid-19 Pandemic. *Applied Econometrics and International Development*, *22*(1), 19–38.