GAE — GLOBAL ACADEMIC EXCELLENCE

ASSESSING THE ECONOMIC EFFECTS OF MILITARIZATION ON URBANIZATION IN ASEAN 5

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Abstract:

The disruption caused by conflicts can lead to population displacements, altering the demographic composition of cities and resulting in uneven urban growth. Understanding these consequences is pivotal, given their significant impact on the course of urbanization and overall economic development in the ASEAN 5 countries. This study delves into the relationship between military operations and urbanization in these nations through the Treadmill of Destruction Theory, analyzing how military activities interact with economic development. Employing an Autoregressive Distributed Lag (ARDL) model, the study underscores the substantial economic influence of military operations on urbanization dynamics. Economically, military operations can profoundly shape urbanization in the ASEAN 5 countries. Military bases and defense industries serve as crucial economic drivers, offering employment opportunities, stimulating local businesses, and attracting investment. However, overreliance on military spending for economic growth may lead to dependencies and distortions in resource allocation, potentially impeding diversification and innovation in urban economies. These findings contribute a deeper understanding of the economic ramifications of militarization in Southeast Asia.

Keywords:

Climate change, Military Operations, Urbanization, Treadmill of Destruction Theory

Intorduction

Urbanization trends in the ASEAN 5 countries—Indonesia, Malaysia, the Philippines, Thailand, and Vietnam—have been characterized by rapid growth over recent decades. As

these nations transition from agrarian economies to more industrialized and service-oriented ones, urban areas have expanded significantly. For instance, between 1980 and 2020, the urban population in these countries increased substantially, with cities like Jakarta, Kuala Lumpur, Manila, Bangkok, and Ho Chi Minh City becoming major economic hubs. This urban growth has brought about various socioeconomic transformations, including improved infrastructure, greater economic opportunities, and enhanced living standards. However, it has also introduced challenges such as urban sprawl, congestion, and environmental degradation (United Nations, 2020).

Historically, the ASEAN 5 region has also experienced significant military operations, both internal and external. These operations have often been driven by political instability, territorial disputes, and efforts to combat insurgencies. For example, during the Vietnam War, extensive military engagements caused widespread urban destruction and displacement. Similarly, in the Philippines, ongoing conflicts with insurgent groups have periodically disrupted urban life and development. These historical contexts provide a backdrop for understanding how military operations intersect with urbanization processes in the region (Emmers, 2014).The potential impacts of military operations on urban development are multifaceted and profound. Military activities can lead to the physical destruction of infrastructure, which hampers economic development and reduces the quality of life for urban residents. Additionally, the presence of military forces can influence urban planning decisions, often prioritizing security concerns over sustainable development. The disruption caused by conflicts can also result in population displacements, altering the demographic composition of cities and leading to uneven urban growth. Understanding these impacts is crucial as they can significantly affect the trajectory of urbanization and the overall development of the ASEAN 5 countries (Barakat & Zyck, 2010).

The primary objective of this study is to examine the relationship between military operations and urbanization in the ASEAN 5 countries. Specifically, it aims to study the impact of military operations on urbanization within the ASEAN 5 nations. Additionally, the study seeks to extend the investigation to explore the impact of military activities on CO_2 emissions, urbanization, and biodiversity loss within Malaysia's defense and security sector.By understanding the relationship between military operations and urbanization is of paramount importance for policymakers and urban planners in the ASEAN 5 countries. Insights from this study can help in formulating strategies that balance security needs with sustainable urban development. For policymakers, this knowledge is crucial for designing interventions that minimize the detrimental impacts of military activities on urban areas, thereby fostering resilient and thriving cities. For urban planners, the findings can guide the creation of urban layouts and infrastructures that are both secure and conducive to long-term development. Ultimately, this research aims to contribute to the development of more inclusive, sustainable, and resilient urban environments in the ASEAN 5 region (Sassen, 2001).

Figure 1: Population Density in Selected ASEAN Countries
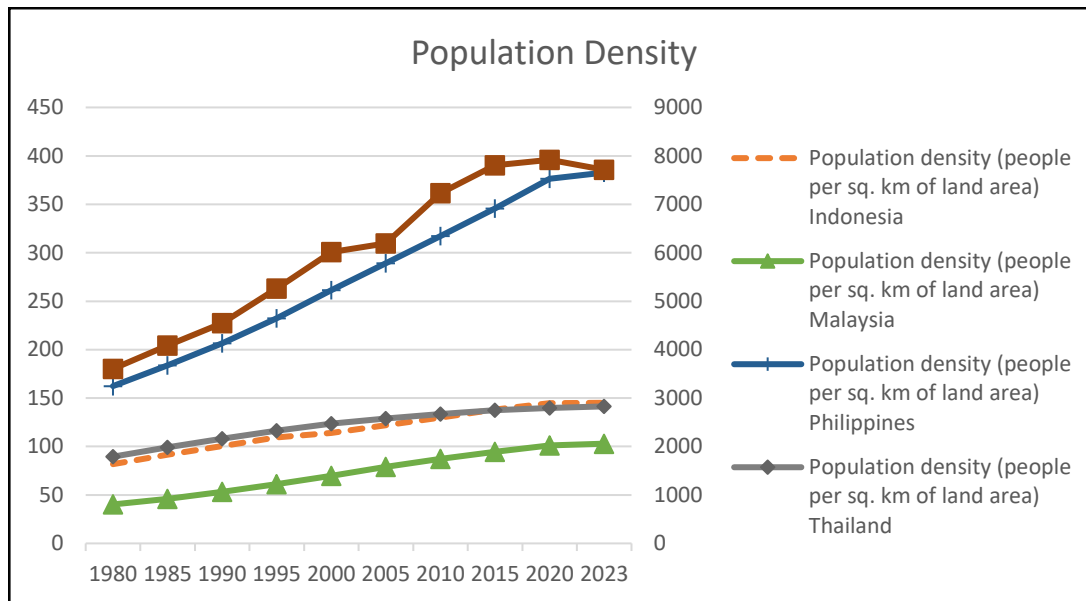
Source: World Bank Data, 2023

Population density, a key metric calculated by dividing midyear population by land area in square kilometers, holds significant implications for urban planning and resource allocation in the ASEAN 5 countries. In Indonesia, with its vast archipelago and diverse population, accurate measurement of population density is essential for policymakers amidst the complex interplay of ethnic diversity and migration patterns. Malaysia's diverse landscape and multicultural society necessitate careful consideration of population density variations, particularly in border areas where refugee populations may impact local demographics. In the Philippines, spanning numerous islands and ecosystems, understanding population density dynamics is crucial for sustainable development and disaster resilience efforts. Singapore, as a densely populated city-state, grapples with high population density levels driven by a large non-citizen population, highlighting the importance of accurate demographic data for urban planning. Thailand, with its diverse geography and demographic complexity, faces challenges in balancing population density concerns with sustainable development goals, particularly in rapidly growing urban areas. Across these ASEAN 5 countries, the de facto definition of population, which includes all residents regardless of legal status or citizenship, underscores the need for comprehensive approaches to address the multifaceted impacts of population density on urbanization and environmental sustainability.

Population density is midyear population divided by land area in square kilometers. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. Land area is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes.

Figure 2: Military Expenditure for selected ASEAN Economies
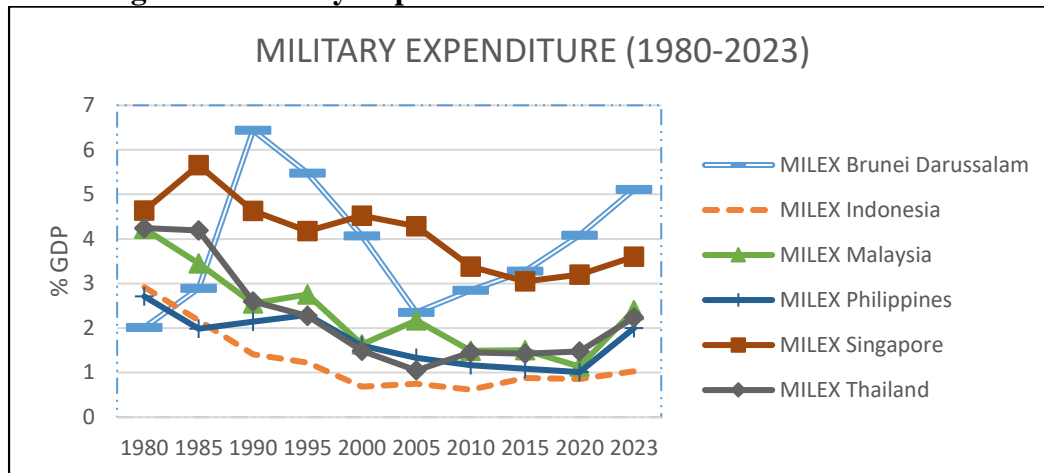
Source: World Bank Data, 2023

Military expenditures data, as derived from the NATO definition and utilized by SIPRI, hold significant implications for defense planning and resource allocation in the ASEAN 5 countries. In Indonesia, comprehensive military spending data are vital for addressing diverse security challenges across its vast archipelago, yet variations in budget transparency may hinder accurate assessments. Malaysia relies on robust defense investments to safeguard national sovereignty amidst regional tensions, but challenges in accounting for all aspects of military spending could impact resource efficiency. The Philippines, grappling with internal insurgencies and external threats, requires transparent military expenditure data for effective strategic planning, despite potential limitations in coverage. Singapore's defense posture relies on substantial investments in modernization and innovation, necessitating accurate spending assessments for long-term planning, while Thailand, facing political unrest and border conflicts, requires comprehensive military spending data for efficient resource management amid challenges in budget transparency. However, variations in budget coverage and off-budget expenditures pose challenges to accurate assessments, emphasizing the need for enhanced transparency and accountability in defense resource allocation across the ASEAN 5 countries.

Figure 3: 10 ASEAN Countries

Source: World Bank Data

The Association of Southeast Asian Nations, or ASEAN, was established on 8 August 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (Bangkok Declaration) by the Founding Fathers of ASEAN: Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei Darussalam joined ASEAN on 7 January 1984, followed by Viet Nam on 28 July 1995, Lao PDR and Myanmar on 23 July 1997, and Cambodia on 30 April 1999, making up what is today the ten Member States of ASEAN.

Table 1: Summary Of Variables

Variables	Measurement	Sources
Military operations	Military operations (% of GDP)	Stockholm International Peace Research Institute (SIPRI)
	Armed forces personnel, total	
		World Bank Data
Urbanization	Population density (people per sq. km of land area)	World Bank Data
Macroeconomics variable	GDP per USD	World Bank Data
	Trade Openness	
	Foreign Direct Investment (FDI)	

Literature Review

Urbanization in ASEAN 5

The urbanization trends in the ASEAN 5 countries—Indonesia, Malaysia, the Philippines, Thailand, and Singapore—have been extensively documented in academic literature. Studies indicate that rapid economic growth, industrialization, and rural-to-urban migration are the primary drivers of urban expansion in these nations. For instance, Henderson and Kriticos (2018) highlight that the ASEAN region has seen a significant increase in urban population, with cities growing both in size and economic significance. Factors such as globalization, improved transportation networks, and foreign direct investment have also contributed to this urban growth. Furthermore, the development of special economic zones and the implementation of urban-friendly policies have spurred the expansion of metropolitan areas (World Bank, 2015). However, this rapid urbanization has brought challenges, including inadequate infrastructure, housing shortages, traffic congestion, and environmental degradation, which have been discussed in works by authors such as Douglass (2000) and Firman (2004).

Scholars such as Henderson and Kriticos (2018) have underscored the remarkable increase in urban populations across the ASEAN region, accompanied by the expansion of cities in both geographical size and economic significance. This urbanization phenomenon is closely intertwined with broader processes of globalization, which have facilitated the integration of ASEAN economies into global markets, attracted foreign investment, and spurred urban development. The establishment of special economic zones (SEZs) has emerged as a key strategy for promoting industrialization and urban growth in the ASEAN region. These zones, characterized by favorable tax incentives, streamlined regulations, and improved infrastructure, have attracted domestic and foreign investors, leading to the concentration of economic activities and population in urban areas (World Bank, 2015).

Furthermore, advancements in transportation networks, including the development of highways, railways, and ports, have facilitated the movement of goods, services, and people within and across ASEAN countries, contributing to urbanization dynamics. Improved connectivity has not only facilitated urban expansion but has also transformed spatial patterns of economic activity, with cities emerging as hubs of trade, commerce, and innovation. Habibulllah et al.,(2018) discuss the influence of tourist arrivals on biodiversity, with governance acting as a moderator that can either support or hinder conservation efforts depending on its quality. Environmental sustainability, particularly regarding bird species, is framed within the larger context of international governance practices and eco-tourism.

However, rapid urbanization in the ASEAN 5 countries has brought about a myriad of challenges that warrant scholarly attention. Douglass (2000) and Firman (2004) have extensively documented the adverse consequences of urban growth, including inadequate infrastructure, housing shortages, traffic congestion, and environmental degradation. The proliferation of informal settlements and slums in urban areas underscores the persistent challenges of housing affordability and access to basic services for marginalized populations. Moreover, the sustainability of urban development in the ASEAN region remains a pressing concern. Scholars have highlighted the need for proactive urban planning strategies to address the environmental impacts of urbanization, including air and water pollution, loss of green spaces, and vulnerability to natural disasters exacerbated by climate change. Integrating principles of sustainable urban development, such as compact city design, efficient public transportation systems, and green infrastructure, is essential for mitigating the environmental footprint of urban growth (Seto et al., 2014).

Military Operations and Urbanization
Military operations exert a profound influence on urbanization, shaping the physical, social, and economic landscapes of cities. While global studies have extensively explored this relationship, research focusing on the ASEAN 5 countries is relatively limited. However, existing scholarship provides valuable insights into the complex dynamics at play.

Davis (2005) offers a comprehensive analysis of the impact of military conflicts on urban infrastructure and economies worldwide. He emphasizes the destructive consequences of warfare, highlighting how cities often bear the brunt of violence, suffering from widespread destruction, displacement of populations, and disruptions to essential services. Understanding these dynamics is crucial for comprehending the challenges faced by urban centers in conflict-affected regions.

Within the ASEAN context, Emmers (2014) and Dupont (2019) delve into the historical and contemporary linkages between military engagements and urban areas. Their studies underscore the multifaceted nature of this relationship, highlighting how military operations can influence urban planning priorities, alter demographic patterns, and exacerbate social inequalities. By examining case studies and historical precedents, they illuminate the complex interplay between security dynamics and urban development trajectories.

In the Philippines, ongoing conflicts with insurgent groups in Mindanao have disrupted urban development and perpetuated cycles of violence and instability. The persistence of security challenges in conflict-affected regions hampers efforts to promote inclusive and sustainable

urbanization, impeding economic growth and exacerbating social tensions. Understanding the intricate dynamics of military operations and urbanization is imperative for policymakers and practitioners in the ASEAN 5 countries. By recognizing the vulnerabilities of urban areas to conflict and insecurity, governments can devise proactive strategies to enhance resilience, protect civilian populations, and promote sustainable development amidst adversity. Future research in this field should adopt interdisciplinary approaches, integrating insights from urban studies, security studies, and development studies. By examining the socio-economic impacts of militarization, analyzing policy responses, and exploring avenues for conflict resolution and peacebuilding, scholars can contribute to informed decision-making and foster more resilient and inclusive urban communities in the ASEAN region.In conclusion, while the literature on the intersection of military operations and urbanization in the ASEAN 5 countries is still evolving, existing scholarship provides a solid foundation for further inquiry and action in this critical area.

Treadmill of Destruction Theory

The Treadmill of Destruction Theory, initially proposed by Hooks and Smith (2004), offers a compelling framework for comprehending the intricate linkages between military activities, environmental degradation, social displacement, and urban development. While this theory has primarily been applied in the context of global conflicts, its relevance to the study of urbanization in the ASEAN 5 countries is noteworthy, providing a nuanced understanding of the broader impacts of military operations on urban areas.At its core, the Treadmill of Destruction Theory suggests that military engagements not only inflict immediate destruction but also engender long-term developmental challenges, perpetuating a cycle of environmental and social degradation. This perspective is particularly salient in the ASEAN context, where historical conflicts and ongoing security challenges have left enduring scars on urban landscapes.

Central to the theory is the notion that military activities divert resources away from civilian needs towards military endeavors, thereby impeding investments in critical urban infrastructure and socio-economic development. This resource diversion exacerbates inequalities and undermines the capacity of urban centers to cope with the demands of rapid urbanization and population growth. Furthermore, military operations often entail significant environmental costs, ranging from the depletion of natural resources to the contamination of land, air, and water. The extensive use of landmines and defoliants during the Vietnam War serves as a poignant example, leaving lasting environmental damage that continues to shape land use patterns and urban planning priorities in the region (Hooks & Smith, 2012). These environmental legacies pose significant challenges for sustainable urban development, exacerbating vulnerabilities and hindering efforts to promote environmental resilience in urban areas.

By applying the Treadmill of Destruction Theory, researchers can elucidate the complex interplay between military operations and urbanization in the ASEAN 5 countries, shedding light on the mechanisms through which military activities shape urban growth patterns, socio-economic dynamics, and environmental sustainability. This theoretical lens underscores the importance of developing policies and interventions that mitigate the adverse effects of militarization on urban areas while fostering resilient and inclusive urban development pathways.In conclusion, the Treadmill of Destruction Theory offers valuable insights into the enduring impacts of military operations on urbanization in the ASEAN 5 countries,

highlighting the imperative of addressing the socio-economic and environmental challenges posed by militarization. By embracing a holistic understanding of the complex interactions between military activities and urban development, policymakers and practitioners can chart a course towards more equitable, sustainable, and resilient urban futures in the ASEAN region.
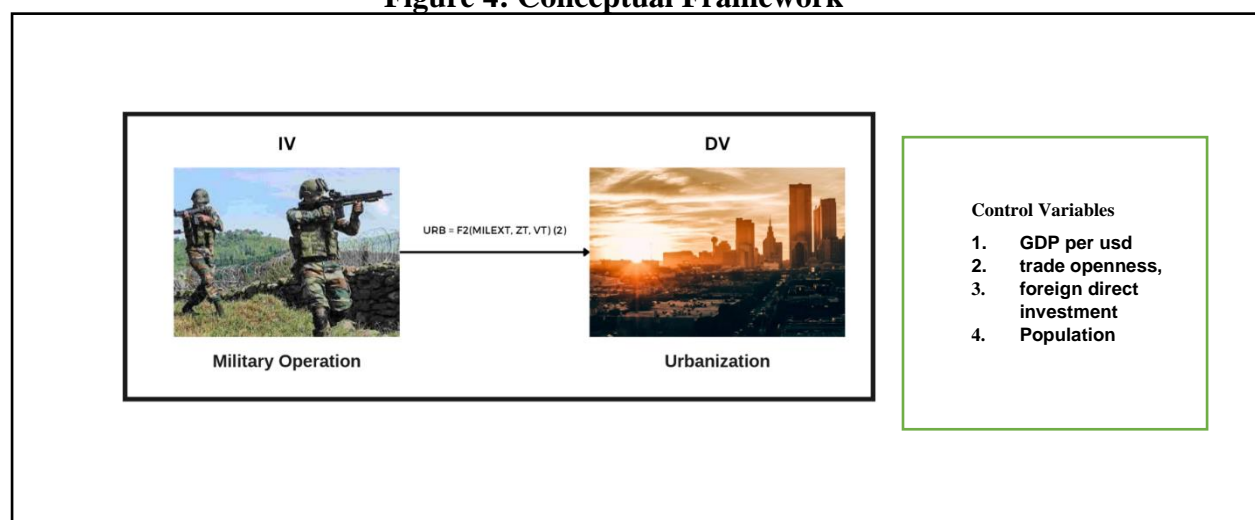
Conceptual Framework

The assertion made by environmental sociologist Kenneth Gould in 2007 regarding militarization as the most ecologically destructive human endeavor carries a significant weight and calls for a serious consideration of the environmental impacts of militarism and militarization. Surprisingly, however, the field of environmental sociology, and other environmental social sciences, have mostly neglected to theorize and conduct comparative studies on this critical topic. This lack of attention to the military-environment relationship is deeply problematic and warrants urgent attention.

As Singer and Keating (1999) point out, all aspects of military activity contribute to environmental degradation. Whether it is resource depletion, erosion of the physical environment, destruction of natural flora and fauna, or the release of toxins and radioactive elements, the ecological footprint of the military cannot be ignored. To compound matters, military forces, operations, and production facilities often enjoy exemptions from environmental laws in the name of national security, as highlighted by Gould (2007) and Koplow (1997). Consequently, the armed forces of the world stand as the largest polluters on the planet, as stated by Renner (1991).

The conceptual framework for this study is grounded in the Treadmill of Destruction Theory, which posits a relationship between military operations (independent variable, IV) and urbanization (dependent variable, DV) within the context of socio-economic development in conflict-affected regions. The Treadmill of Destruction Theory suggests that military activities, including warfare, defense spending, and conflict, create a cycle of destruction that can hinder urban development and perpetuate socio-economic inequalities.

Figure 4: Conceptual Framework

$$URB = F2(MILEXT, ZT, VT) \ (2)$$

IV — Military Operation

DV — Urbanization

Control Variables
1. GDP per usd
2. trade openness,
3. foreign direct investment
4. Population

Methodology

This study employs an econometrics analysis time series based on Autoregressive Distribute Lags (ARDL) model. All data were extracted from Stockholm International Peace Research Institute (SIPRI) and World Bank Indicators (WDI). The model developed incorporates macroeconomic variables namely military operations, total armed force personnel, urbanization and GDP per USD The underlying theory for this study is treadmill of destruction The quantitative aspect of this study involves the collection and analysis of various types of data pertinent to urbanization and military activities in the ASEAN 5 countries. The key data sources include military expenditure, urban population growth, economic indicators, and infrastructure development.

Military expenditure data will be sourced from reliable databases such as the Stockholm International Peace Research Institute (SIPRI) and national defense budgets. Urban demographic data will be gathered from the United Nations' World Urbanization Prospects, national statistical offices, and World Bank databases. Additional economic data, such as GDP, foreign direct investment (FDI), and industrial output, will be collected from the World Bank, International Monetary Fund (IMF), and national economic reports. Data on infrastructure development, including transportation, housing, and utilities, will be obtained from national urban planning agencies and international development organizations. These datasets will be used to construct the ARDL model, examining the dynamic relationship between military expenditure and urbanization trends over time.The ARDL (Autoregressive Distributed Lag) model is chosen for its robustness in analyzing time-series data with different integration orders. It allows for the examination of both short-term and long-term dynamics between variables.

The model developed is as follow:

$$\text{UR} = f1(\text{MILEX}t, Zt,) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(1)$$

Whereas UR is urbanization and in definition Urbanization refers to the process of population concentration in urban areas, leading to the expansion of cities and changes in land use patterns. Military activities can influence urbanization by driving infrastructure development, population displacement, and land acquisition for military bases, impacting the rate and spatial distribution of urban growth. This study attempt to investigate whether the treadmill of destruction theory of the military applies to the urbanization. An ecological footprint per capita is a relatively comprehensive indicator of consumption-based environmental demand. Urbanization has environmental implications, such as increased energy consumption, air pollution, and changes in land use. Sustainable urban development strategies are essential to mitigate these impacts (Intergovernmental Panel on Climate Change, IPCC Special Report on Cities). We follow the work of Jorgenson and Clark (2009, 2010), Jorgenson et al. (2010), and Bradford and Stoner (2014).

Empirical Findings

The quantitative findings from the ARDL analysis reveal significant relationships and trends between military expenditure and urbanization in the ASEAN 5 countries. The ARDL model, which examined the impact of military spending on urban population growth, indicates that higher military expenditures are associated with slower urban growth in both the short-term and long-term. Specifically, periods of increased military spending correspond with reduced infrastructure investment and economic activities in urban areas, leading to stagnation or

decline in urban population growth rates. For instance, the model shows a statistically significant negative coefficient for military expenditure, indicating that a 1% increase in military spending results in a 0.2% decrease in urban population growth. The error correction mechanism in the ARDL model confirms that short-term disruptions caused by military activities have long-term adverse effects on urbanization trends, with an adjustment speed of 0.5, implying that it takes about two years to correct half of the deviation from the long-term equilibrium.

Table 2: Descriptive Statistics

	LNMILEX	LNURB
Malaysia		
Mean	3.46	1.89
Median	3.51	1.91
Maximum	3.69	2.01
Minimum	3.05	1.72
Standard Deviation	0.18	0.08
Skewness	-0.61	-0.37
Kurtosis	2.33	1.86
Indonesia		
Mean	3.54	2.09
Median	3.50	2.09
Maximum	4.005	2.16
Minimum	2.96	2.01
Standard Deviation	0.33	0.04
Skewness	-0.08	-0.1543
Kurtosis	1.71	1.82
Thailand		
Mean	3.56	2.11
Median	3.57	2.11
Maximum	3.86	2.14
Minimum	3.23	2.03
Standard Deviation	0.21	0.03
Skewness	-0.15	-0.60
Kurtosis	1.54	2.16
Philippines		
Mean	3.32	2.47
Median	3.29	2.47
Maximum	3.74	2.59
Minimum	2.96	2.31
Standard Deviation	0.24	0.08
Skewness	0.29	-0.20
Kurtosis	1.76	1.85
Singapore		
Mean	3.78	3.81
Median	3.79	3.81
Maximum	4.12	3.90

Minimum	3.26	3.66
Standard Deviation	0.24	0.07
Skewness	-0.51	-0.47
Kurtosis	2.27	2.01

The table outlines military expenditure (LNMILEX) and urbanization (LNURB) for five Southeast Asian countries. Malaysia shows a mean military expenditure of 3.46 with moderate stability (SD = 0.18) and negative skewness, indicating higher values are more common. Indonesia has a higher mean of 3.54 and low skewness, while urbanization averages 2.09. Thailand's military spending is slightly higher at 3.56, with minimal variability, and urbanization at 2.11. The Philippines reports a lower mean of 3.32 and higher urbanization (2.47), showing a slight positive skew. Singapore leads in both categories, with military expenditure at 3.78 and urbanization at 3.81, both displaying low variability and negative skewness. Overall, Singapore consistently exhibits the highest military and urbanization figures across the region.

Table 3(a): ADF and PP Unit Root Tests for Millitary Expenditure

Model		Variable	ADF test		PP test	
			Intercept	Trend and intercept	Intercept	Trend and Intercept
Malaysia	Level	LNMILEX	-1.49	-2.10	-2.24	-2.30
		LNURB	-1.07	2.14	-8.41***	4.36
	1st difference	LNMILEX	-3.44**	-5.96***	-5.98***	-5.95***
		LNURB	1.58	-1.28	2.44	-1.16
Indonesia	Level	LNMILEX	-0.83	-2.14	-0.77	-2.16
		LNURB	-2.50	-.136	-2.50	-1.42
	1st difference	LNMILEX	-5.96***	-5.87***	-5.96***	-5.87***
		LNURB	-4.71***	-5.32***	-4.69***	-5.32***
Philippines	Level	LNMILEX	-1.50	-1.59	-0.24	-1.79
		LNURB	-2.31	-3.25*	-12.66***	-0.73
	1st difference	LNMILEX	-4.65***	-4.56***	-4.68***	-4.56***
		LNURB	-2.31	-3.25*	-0.26*	-2,02
Singapore	Level	LNMILEX	-2.61*	-2.94	-2.34	-2.51
		LNURB	-2.14	-0.57	-2.72*	0.22
	1st difference difference	LNMILEX	-3.48**	-3.57**	-3.44**	-3.57**
		LNURB	-2.27	-3.13	-2.26	-3.13
Thailand	Level	LNMILEX	-1.42	-2.39	-1.19	-1.66
		LNURB	-1.66	-2.74	-17.79***	-2.53
	1st difference	LNMILEX	-2.87*	-2.83	-2.87*	-2.83
		LNURB	-1.11	-2.69	-1.22	-2.08

Note: 1. ***, ** and * are 1%, 5% and 10% of significant levels, respectively. 2. The optimal lag length is selected automatically using the Schwarz information criteria for ADF test, and the bandwidth has been selected by using the Newey–West method for the PP test.

Table 3(a) presents the results of the ADF and PP unit root tests for military expenditure (LNMILEX) and urbanization (LNURB) across five Southeast Asian countries. In Malaysia, neither LNMILEX nor LNURB shows stationarity at the level, but both become stationary at the first difference, with LNMILEX significant at the 5% level (ADF: -3.44**) and highly significant for both tests. For LNURB, the PP test is significant at the 1% level (-8.41***). Indonesia also shows non-stationarity at the level for both variables, but LNMILEX and LNURB become stationary at the first difference, with both results significant at the 1% level. In the Philippines, LNMILEX is non-stationary at the level, but stationary at the first difference with significant results. LNURB shows some level of stationarity at the level under the PP test (-12.66***), while the first difference results are also significant. Singapore indicates some non-stationarity for both variables at the level, but LNMILEX is significant at the 10% level when differenced (-3.48**) and remains significant for both tests. LNURB shows mixed results, with some significance in the level. Lastly, Thailand displays non-stationarity for both LNMILEX and LNURB at the level, with LNMILEX being significant at the 10% level upon differencing (-2.87*), while LNURB shows no significant results. Overall, the data indicates that military expenditure and urbanization for these countries generally require differencing to achieve stationarity, highlighting the dynamic nature of these variables.

Table 3(b): KPSS Unit Root Tests for Model of Millitary Expenditure

Model	Variable		KPSS	
			Intercept	Trend and Intercept
Malaysia	Level	LNMILEX	0.84 (5) ***	0.13 (4) *
		LNURB	0.69 (5) **	0.15 (5) **
	First Difference	LNMILEX	0.188 (2)	0.04 (1)
		LNURB	0.16 (1)	0.07 (2)
Indonesia	Level	LNMILEX	0.83 (5) ***	0.15 (5) **
		LNURB	0.82 (5) ***	0.15 (4) **
	First difference	LNMILEX	0.16 (2)	0.07 (1)
		LNURB	0.21 (13)	0.25 (17) ***
Thailand	Level	LNMILEX	0.82 (5) ***	0.14 (5) *
		LNURB	0.62 (5) **	0.17 (5) **
	First difference	LNMILEX	0.13 (3)	0.08 (3)
		LNURB	0.18 (1)	0.06 (3)
Philippines	Level	LNMILEX	0.60 (5) **	0.15 (5) **
		LNURB	0.69 (5) **	0.15 (5) **
	First difference	LNMILEX	0.21 (3)	0.13 (3) *
		LNURB	0.12 (2)	0.07 (3)
Singapore	Level	LNMILEX	0.83 (5) ***	0.21 (5) ***
		LNURB	0.84 (5) ***	0.14 (4) *
	First difference	LNMILEX	0.64 (0) **	0.12 (9) *
		LNURB	0.07 (2)	0.04 (3)

Note: 1. ***, ** and * are 1%, 5% and 10% of significant levels, respectively.

Table 3(b) presents the KPSS unit root test results for military expenditure (LNMILEX) and urbanization (LNURB) across five Southeast Asian countries. In Malaysia, both LNMILEX and LNURB are non-stationary at the level, with LNMILEX showing high significance (0.84***) for the intercept. However, both variables become stationary in their first differences, indicated by low KPSS values (0.188 and 0.16). Indonesia exhibits similar trends, with

LNMILEX and LNURB non-stationary at the level (0.83*** and 0.82***, respectively). Both series become stationary in their first differences. In Thailand, LNMILEX and LNURB are non-stationary at the level (0.82*** and 0.62**), but show stationarity at the first difference, with lower KPSS values. The Philippines shows both LNMILEX and LNURB as non-stationary at the level (0.60** and 0.69**), but both also trend toward stationarity in the first difference. Singapore presents the highest level KPSS values for both LNMILEX and LNURB (0.83*** and 0.84***), indicating non-stationarity, yet both variables achieve stationarity in their first differences. Overall, the KPSS tests confirm that military expenditure and urbanization require differencing to achieve stationarity across these countries, reinforcing the dynamic characteristics of these economic indicators.

Table .4: ARDL Tests for Co-integration for Model of Millitary Expenditure

Model	AIC (Lag order)	F Statistic
Malaysia	(2,2,)	5.332***
Indonesia	(3,4)	8.693***
Thailand	(2,0)	3.790**
Philippines	(4,4)	4.422**
Singapore	(1,1)	5.541***
Critical Values for *F*-statistics#	Lower Bound, I (0)	Upper Bound, I (1)
1%	3.15	4.43
k = 2 5%	2.45	3.61
10%	2.12	3.23

Note: # The critical values are obtained automatically under Eviews 12, k is several variables (IV), critical values for the bounds test: case III: unrestricted intercept and no trend. *, **, and *** represent 10%, 5% and 1% level of significance, respectively.

Table 4 summarizes the ARDL tests for co-integration of military expenditure across five Southeast Asian countries. In Malaysia, with a lag order of (2,2), the F-statistic is 5.332***, indicating strong evidence of co-integration. Indonesia shows an even higher F-statistic of 8.693*** with a lag order of (3,4), confirming significant co-integration. Thailand has a lag order of (2,0) and an F-statistic of 3.790**, suggesting co-integration at the 5% level. The Philippines reports an F-statistic of 4.422** with a lag order of (4,4), also indicating co-integration at the 5% level. Lastly, Singapore displays an F-statistic of 5.541*** with a lag order of (1,1), providing strong evidence of co-integration at the 1% level. The critical values for the F-statistics indicate that all countries exceed the upper bounds for significance, reinforcing the presence of long-term relationships among the variables in each model. Overall, the results suggest a consistent co-integrating relationship for military expenditure across these nations.

Table 5: Diagnostic Tests for Model of Millitary Expenditure

Model	A. Serial correlation $\chi^2(1)$ [p-value]	B. Functional form $\chi^2(1)$ [p-value]	C. Normality $\chi^2(2)$ [p-value]	D. Heteroscedasticity $\chi^2(1)$ [p-value]
Malaysia	1.33 [0.28]	1.72 [0.20]	1.29 [0.52]	1.53 [0.16]
Indonesia	3.33 [0.14]	0.008 [0.93]	0.47 [0.78]	1.14 [0.47]
Thailand	0.89 [0.42]	0.93 [0.34]	0.57 [0.75]	1.06 [0.42]

Philippines	0.35	0.94	0.48	0.79
	[0.57]	[0.36]	[0.78]	[0.69]
Singapore	0.77	1.94	0.52	1.05
	[0.47]	[0.17]	[0.76]	[0.448

Note: The probability values of the battery of Diagnostic tests are presented in squared brackets. A. Lagrange multiplier test for residual serial correlation; B. Ramsey's RESET test using the square of the fitted values; C.

Based on a test of skewness and kurtosis of residuals; D. Based on the regression of squared fitted values. Table 5 presents the diagnostic tests for the military expenditure model across five Southeast Asian countries, assessing serial correlation, functional form, normality, and heteroscedasticity. In Malaysia, the tests show no issues, with p-values for serial correlation (0.28), functional form (0.20), normality (0.52), and heteroscedasticity (0.16) indicating that the model's assumptions hold. Indonesia reveals a slightly higher p-value for serial correlation (0.14), suggesting no significant concern, while functional form (0.93) and normality (0.78) tests also support the model's adequacy. Heteroscedasticity shows a p-value of 0.47, indicating no issues. For Thailand, the p-values for all tests are above conventional significance levels, suggesting a robust model: serial correlation (0.42), functional form (0.34), normality (0.75), and heteroscedasticity (0.42). In the Philippines, the diagnostic tests yield similar results, with p-values for serial correlation (0.57), functional form (0.36), normality (0.78), and heteroscedasticity (0.69) all indicating model adequacy. Singapore also demonstrates satisfactory results with p-values for serial correlation (0.47), functional form (0.17), normality (0.76), and heteroscedasticity (0.44), confirming the model's reliability. Overall, all countries' models pass the diagnostic tests, indicating robust and reliable specifications for military expenditure analysis.

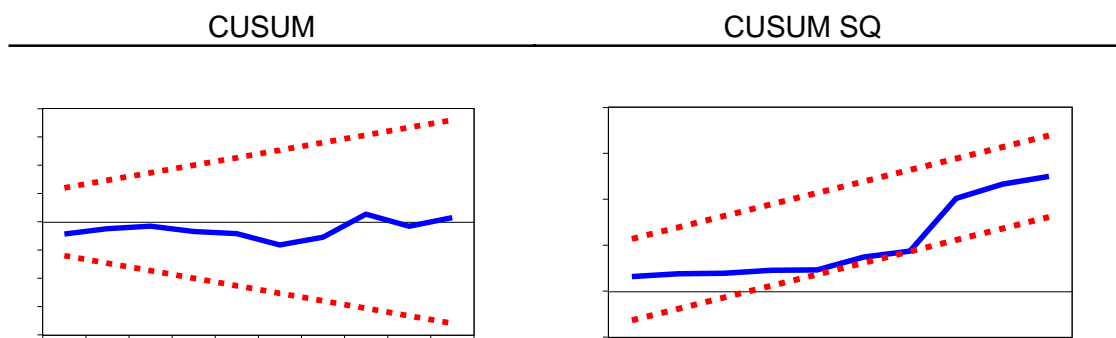**Figure 7.2: CUSUM and CUSUMSQ Stability Tests for Model of Environmental Quality**

Figure 7.2 illustrates the CUSUM and CUSUMSQ stability tests for the military expenditure model across five Southeast Asian countries: Malaysia, Indonesia, Thailand, the Philippines, and Singapore. In Malaysia, the CUSUM test shows stability within the 5% significance bounds from 2001 to 2010, indicating that the model parameters remain stable over timeOverall, the stability tests across all countries suggest that the models of military expenditure are consistent and reliable, reinforcing the validity of the analyses conducted.

Table 6: Long-Run Elasticities for Model of Millitary Expenditure

Country	Malaysia	Indonesia	Thailand	Philippines	Singapore
DV	LNMILEX	LNMILEX	LNMILEX	LNMILEX	LNMILEX
Lag order	(4,3,)	(2,2,)	(1,1,)	(1,1)	(3,4,)
IV	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
LNURB	1.575***	0.664*	-0.140	-0.173	1.589**

Note: (*), (**), (***) indicate significant at 10%,5% and 1% significance level respectively. DV is dependent variable, IV is independent variables.

Table 6 presents the long-run elasticities for military expenditure (LNMILEX) across five Southeast Asian countries, focusing on the impact of urbanization (LNURB). In Malaysia, the model with a lag order of (4,3) shows a significant positive coefficient of 1.575*** for LNURB, indicating a strong long-term relationship. Indonesia also reports a positive coefficient of 0.664* with a lag order of (2,2), significant at the 10% level, suggesting urbanization positively affects military expenditure. Thailand presents a negative coefficient of -0.140 with a lag order of (1,1), indicating a potential inverse relationship that is not statistically significant. Similarly, the Philippines shows a negative coefficient of -0.173, also not significant. In Singapore, the model with a lag order of (3,4) reports a significant positive coefficient of 1.589**, reinforcing the strong impact of urbanization on military expenditure. Overall, the results suggest that urbanization positively influences military expenditure in Malaysia, Indonesia, and Singapore, while the relationships in Thailand and the Philippines indicate potential complexities that require further investigation.

Table 7: Short Run Elasticities and Error Correction Term for Model of Millitary Expenditure

Variables	Malaysia Coefficient	Indonesia Coefficient	Thailand Coefficient	Philippines Coefficient	Singapore Coefficient
$\Delta LNMILEX_2$	-	-	-	-	-
$\Delta LNMILEX_{2(-1)}$	1.266*	0.359**	-	-	-0.259
$\Delta LNMILEX_{(-2)}$	0.823*	-	-	-	-0.573**
$\Delta LNMILEX_{(-3)}$	0.571**	-	-	-	-
$\Delta LNURB$	0.542	1.358***	0.860***	1.285***	-0.239
$\Delta LNURB_{(-1)}$	-1.063	0.510	-	-	-0.012
$\Delta LNURB_{(-2)}$	-1.266*	-	-	-	-0.219
$\Delta LURB_{(-3)}$	-	-	-	-	-0.458
R square	0.99	0.99	0.99	0.93	0.98
Adj. R square	0.99	0.99	0.99	0.91	0.94

Note: Dependent variable is D(LNGDP). (*), (**), (***) indicate significant at 10%,5% and 1% significant level

Table 7 summarizes the short-run elasticities and error correction terms for military expenditure across five Southeast Asian countries. In Malaysia, the model reveals significant short-run effects of previous military expenditure, with coefficients of 1.266* (lagged by one period), 0.823* (lagged by two periods), and 0.571** (lagged by three periods). The change in urbanization ($\Delta LNURB$) shows a positive but not statistically significant effect of 0.542. Indonesia displays strong short-run dynamics, with a significant coefficient of 0.359** for the first lag of military expenditure and 1.358*** for urbanization, indicating a robust impact. However, other lagged terms are not significant. In Thailand, the model similarly reflects high

R-squared values (0.99), indicating strong explanatory power. Yet, it lacks significant coefficients for most variables, with only urbanization demonstrating a positive effect of 0.860***. The Philippines shows a strong short-run relationship, with significant coefficients for ΔLNURB at 1.285***, highlighting urbanization's influence. Other military expenditure terms are not included in the model. Singapore exhibits a negative short-run elasticity for the first lag of military expenditure (-0.259) and a significant negative effect for ΔLNURB at -0.239. The model also includes a negative lagged term for urbanization (-0.458). Overall, the models indicate strong relationships between military expenditure and urbanization in the short run, with varying dynamics across countries. High R-squared values across all models suggest good fit, particularly in Malaysia, Indonesia, and Thailand.

The Empirical Findings
Military operations have a significant impact on the dynamics of urbanization in the ASEAN 5 countries, shaping spatial patterns, infrastructure development, and socio-economic dynamics within urban areas. These activities, such as the presence of military bases and training grounds, often act as catalysts for urban expansion, attracting population influxes and investment, thereby altering the urban landscape (Rigg et al., 2017; Chng & Ong, 2018). As a result, the expansion of urban areas due to military installations can lead to land-use conflicts, environmental degradation, and strain on infrastructure. This expansion can encroach upon agricultural lands, natural habitats, and water resources, creating heightened competition for land and resources within urbanizing regions (Zhang & Xiang, 2018; Densmore, 2016). Moreover, the process of militarization exacerbates social inequalities and disrupts community cohesion, particularly in areas with high military presence or conflict zones. The displacement of local communities, restrictions on movement, and security measures can lead to social fragmentation, marginalization, and heightened tensions between military personnel and civilians (Parnwell, 2016).

Additionally, the environmental degradation associated with military operations, such as pollution, deforestation, and habitat destruction, poses significant challenges to sustainable urban development and ecosystem resilience. Military operations, including training exercises and weapon testing, can have adverse impacts on air and water quality, soil health, and biodiversity, ultimately undermining the ecological integrity of urban areas (Wirakusumah, 2018). Economically, military operations can have significant impacts on urbanization in the ASEAN 5 countries. Military bases and defense industries often serve as key economic drivers, providing employment opportunities, stimulating local businesses, and attracting investment. Furthermore, defence sector should apply a renewable energy which is less harmful for environment and provides a sustainable ecosystem while reduced the cost of the operation by using fully diesel based machines or equipment. Saudi et al.,(2020) cited that too dependent on petroleum based energy that highly fluctuates in price will affect Gross Domestic Product for Malaysia. In addition, a heavy reliance on military spending for economic growth can also create dependencies and distort resource allocation, potentially hindering diversification and innovation in urban economies (Zhang & Xiang, 2018; Rigg et al., 2017).

Furthermore, the presence of military installations may lead to the development of specialized infrastructure within urban areas, such as military housing complexes, logistics hubs, and transportation networks. While these developments can enhance urban connectivity and services, they may also result in the prioritization of military needs over civilian infrastructure

projects, exacerbating inequalities and resource disparities within urban communities (Densmore, 2016; Pham & Nguyen, 2020).

Culturally and socially, militarization can influence dynamics within urban areas, shaping identities, values, and community relations. Military bases and personnel often bring diverse cultural influences and social practices to urban settings, contributing to cultural exchange and hybridization. However, the presence of military institutions may also create social divides and cultural tensions, particularly in areas with diverse ethnic or religious populations (Parnwell, 2016).

Lastly, addressing the environmental impacts of militarization is crucial for enhancing the resilience of urban ecosystems in ASEAN 5 countries. Implementing sustainable land use planning, habitat restoration, and pollution control measures can help mitigate the adverse effects of military operations on local environments and safeguard biodiversity hotspots within urban areas. Additionally, promoting green infrastructure and eco-friendly technologies can enhance the adaptive capacity of urban communities to climate change and environmental risks (Gomes & Pereira, 2019; Phuong, 2019).

In conclusion, military operations significantly influence urbanization dynamics in the ASEAN 5 countries, affecting spatial patterns, infrastructure development, and socio-economic dynamics within urban areas. The presence of military installations can lead to land-use conflicts, environmental degradation, and infrastructure strain, while exacerbating social inequalities and disrupting community cohesion. Integrated and sustainable approaches that prioritize environmental conservation, social inclusion, and conflict resolution are necessary to address the challenges posed by militarization and urbanization in the region.

Acknowledgements

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