The Causality Relationships Between the Kingdom of Saudi Arabia's (KSA) Military Expenditure and Economic Growth in the Period From 1987 to 2019

Mohamed Noureldin Sayed[1]

[1] Applied Studies and Community Services College, Imam Abdulrahman Bin Faisal University, Saudi Arabia

Correspondence: Mohamed Noureldin Sayed, Assistant Professor of Economics, Applied Studies and Community Services College, Imam Abdulrahman Bin Faisal University, Saudi Arabia.

Received: October 30, 2020 Accepted: December 23, 2020 Online Published: March 3, 2021

doi:10.5430/rwe.v12n2p289 URL: https://doi.org/10.5430/rwe.v12n2p289

Abstract

This study aims to test the causality relationships between the Kingdom of Saudi Arabia's (KSA) military expenditure and economic growth in KSA, by using time-series data in respect of the period from 1987 to 2019. This study applies the Granger causality approach and uses the ARDL bound test approach to test the long-term relationships between the variables. By applying the Granger causality approach, this study's findings show that the rate of growth rate in KSA's military expenditure does not result in a similar rate of growth in the country's Gross Domestic Product (GDP). However, by applying the Granger causality approach, there is a bidirectional causality relationship between the KSA's military expenditure and the fixed rate of the country's capital growth.

Keywords: Gross Domestic Product (GDP), military expenditure, economic growth, fixed capital, granger causality approach

1. Introduction

1.1 Background of the Study

The Kingdom of Saudi Arabia (KSA) is a major economy in the Middle East and worldwide. Therefore, KSA yields tremendous power when it comes to decision making in its sphere of influence. One way of inserting influence is through the use of a country's military hence, KSA has spent heavily on the various branches of its military. Besides, increased terrorism activities from local and foreign jihads such as Yemen as well as the threat posed by Iran, the KSA has been forced to improve its military to enhance its readiness and capability to thwart the threats (Cordesman, 2015). The pressure on KSA to keep tabs on threats to its national interests has led to massive military expenditure in recent years. For years now, KSA has been one of the highest spenders on military globally (Roser & Nagdy, 2013).

The connection between a country's economic growth and military spending is one of the most debatable issues worldwide. There have been many research studies that have investigated the effect of military expenditure on a country's economic progress and, the relationships between these two aspects. There have been wide-ranging studies about the nature of these expenditures and, more specifically, the channel of financing and the impact of military expenditure on a country's economic growth. The increase in military expenditure as a percentage of the country's budget has reinforced the argument on the effect of increasing military expenditure on a country's ability to flourish economically and to provide welfare services to its citizens.

Many studies have scrutinized the short-term and long-term impacts of military expenditure on a country's economy (Lee, 2016). A country's military expenditure has a more significant effect beyond the amount of consumed income since such expenditure can either facilitate or result in conflict. Consequently, military expenditure spending may have either positive or negative effects on the country's economy. While, during the Second World War, military expenditure was a worldwide problem, at its conclusion, many developing countries had opportunities to reduce their military expenditure (al-Rasheed, 2016).

Military expenditure has increased as a political response to domestic insecurity arising from the international arms race. D'Agostino, et al.'s (2018) research findings indicate that military expenditure worsens a country's payment deficits; retards economic growth; and, consequently, affects social and financial costs. In KSA, bearing in mind that

the country plays a significant role in ensuring security in the Middle East region, the military plays a vital role in preserving that political command. In 2017, the country was ranked third worldwide in terms of military expenditure. In the same year, KSA spent more than 10% of its GDP on military operations (Lee, 2016). Therefore, KSA's annual military expenditure has a significant impact on the country's economic productivity country. Against this background, by using time-series data in respect of the period from 1987 to 2019, this research paper analyzes the connection between KSA's military expenditure and economic productivity and, more specifically, how military expenditure either enhances or hinders economic growth.

1.2 Purpose of the Study

The purpose of this study is to examine the causal relationship, if any, between military expenditure and economic growth of KSA. This relationship is to be established through the following specific objectives:

To establish how the rate of military growth affect the rate of growth of GDP and vice-versa.

To establish how military expenditure affects the rate of growth of fixed capital and vice-versa.

To establish how the rate of growth of fixed capital affect the rate of growth of GDP and vice-versa.

1.3 Significance of the Study

The study will enhance better understanding of the dynamics of military spending and its effect on the economy of KSA. Importantly, the findings of this study may be used by policy makers in KSA to inform their future decisions on military expenditure. Besides, the study purposes to reconcile the various diverging scholarly views on the causal relationship between the various variables of the study. In a nutshell, the study forms a foundation for future studies.

1.4 Research Questions

Q_{01}: How does the rate of growth of military expenditure affect the growth of GDP and vice-versa in KSA?

Q_{02}: How does the rate of growth of military expenditure affect the growth of fixed capital and vice-versa in KSA?

Q_{03}: How does the rate of growth of fixed capital affect growth of GDP and vice-versa in KSA?

2. Literature Review

Military expenditure is a widely researched topic whose definition is still a matter of debate. Various definitions have been put forward by international organizations, governments and scholars. NATO, IMF and UN have put forward standard definitions of military expenditure but they don't agree all items of the expenditure. Though the difference is small, it leads to different military spending data as each country is free to have their own definition. According to Stockholm International Peace Research Institute (SIPRI), military expenditure is the capital outlays on armed forces, spending on paramilitary forces, expense of defence ministries as well as the cost of running defence related government agencies and cost of space activities (Sandler & George, 2016). On other hand, Kumar (2017) defines military expenditure simply as the resources that a nation allocates to its military. The study therefore embraces SIPRI definition since it is more comprehensive and allow for international comparison. The common measures of military spending are the defence budget in dollars, percentage of government outlays, growth rate and percentage of GDP taken up among others (Thompson, 2013).

Military expenditure is linked mainly to war. In times of peace, most countries spend less than 5% of their GDP on military expenditure (Smith, 2016). However, during times of unrest, it is expected that they will spend more on the military. KSA's military expenditure has always been high due to increasing numbers of terrorist groups and terrorist activities among its neighbours. Despite using most of its GDP on military expenditure, such increases are linked sometimes with economic development. Economic development or growth is defined as the increment in the manufacture of goods and services over particular period of time (Amadeo, 2018). Economic growth is a dynamic concept measured using a country's real Gross Domestic Product (GDP) obtained after removing after removing the effects of inflation from the economy.

Many studies on the relationship between military spending and economic growth have been undertaken with different results (Tekeoglu, 2008). A certain group of scholars support the neo-classical approach that argue that military spending deter development. Another group of scholars are Keynesian theorists who believe that defence expenditure spur growth and yet another class of theorists believe that there is no correlation between military spending and economic growth whatsoever. World Bank data for the period from 1988 to 2012 indicate that nations, which spent most of their GDP on military expenditure, achieved the highest levels of economic development. More specifically, during this period, oil-producing countries such as KSA achieved the greatest economic development (Coutts, Daoud, Fakih, Marrouch & Reinsberg, 2019). These countries realized a 2.57% increase in their rates of economic growth

(Coutts et al. 2019). However, the findings of many studies, which investigated the impact of military expenditure on economic development, failed to demonstrate a clear relationship between military expenditure and economic growth.

In 2019, The Stockholm International Peace Research Institute (SIPRI) data indicated that KSA was third after the United States of America (USA) and China in terms of its investment in military expenditure (Zhao et al., 2019). In 2018, these three countries contributed 60% of worldwide military expenditure (Zhao et al. 2019). However, in the last year, the USA's and China's military expenditure increased by 4.6% and 5% respectively, while that of KSA decreased by 3.1% (Zhao et al., 2019). Irrespective of these countries' changing trends in military expenditure, such spending has a serious impact on each country's economy.

According to Aghion et al. (2018), military expenditure is one arena that lacks a private solution to settling public losses. Worldwide, there is no single organization or people who are adequately motivated to risk their finances for military activities. Adam Smith, who is regarded as the precursor of the industrial revolution, postulates that it is the government's role to defend the nation and that such military expenditure should be justified through taxation (Brady, 2018). In this case, the government should act on behalf of the public in ensuring that the military is financed and equipped sufficiently to defend the country's citizens.

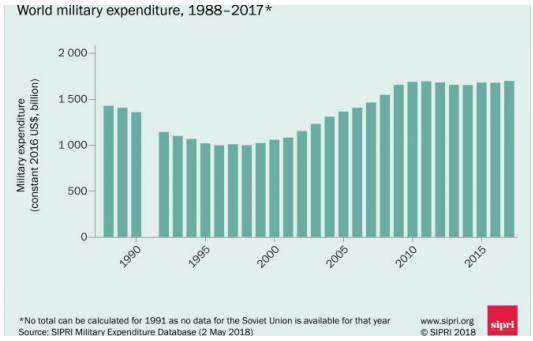


Figure 1. World military expenditure

Source:
https://www.sipri.org/sites/default/files/styles/node/public/2018-05/fs_1805_figure_1_3_0.jpg?itok=8KJUHLsR

Military expenditure has a significant impact on a country's economic growth. For example, as mentioned above, KSA has the third-highest military expenditure worldwide and such expenditure has a significant impact on the country's economy. On one hand, some positive impacts of such expenditure are the improvement of infrastructure, new technologies and the creation of job opportunities. On the other hand, the negative impacts of such expenditure are increased debt, taxation, and less economic growth.

The relationship between the economic progression and the military expenditure is undetermined in terms of either the economic impact of military spending or in terms of the nature of such expenditure and the ways used to finance it. Most previous studies, which have explored the relationship between the two factors, to be specific, military consumption and financial movement, have ignored the centrality of the interrelationships between the military and civilian segments (Manamperi, 2016). The findings of previous investigations have shown that it is difficult to determine a causality relationship between economic expansion and military expenditure. These studies used different quantitative methods and methodologies. The findings of various studies, relating to different countries, show, in some cases, a bidirectional causality between financial progression and military expenditure. In contrast, the findings of studies of other countries show no causality between military expenditure and economic progression.

Having sampled numerous countries, several of the previous studies used cross-sectional analysis. This assumes that, regardless of the variations between these countries in terms of their structures of military expenditure and economic attributes, the outcomes can be generalized to all countries. Furthermore, some researchers have ignored the stationarity test for the variables and disregarded the probability of a long-term relationship. Consequently, this can lead to spurious regression (Manamperi, 2016).

In accepting the fact that KSA has an enormous economy in terms of the Middle East and Sub-Saharan Africa, its economy relies heavily on the petroleum industry. This is demonstrated by 90% of government expenditure being generated from oil revenues (al-Rasheed, 2016). Oil accounts for 88% of KSA's total exports and 35% of its GDP.

Military spending remains the highest for the last five decades in Saudi Arabia (Ping, 2017). Over the last five decades, military expenditure has remained KSA's highest item of military expenditure. This has increased steadily since the 1970s and reached its peak in 2018 when military expenditure accounted for 56 billion dollars of the country's income.

KSA is the richest Middle Eastern country and is one of the world's the G20 countries. As a member of the G20, KSA participates in G20 summits concerning major worldwide and Middle Eastern security decisions. Accordingly, KSA invests more on defence and, in turn, this affects its economy. Typically, investments in non-productive activities have inconsequential impacts on the country's economic growth (Smith, 2016). Furthermore, as shown above, military expenditure accounts for an enormous percentage of the country's resources. More particularly, military expenditure may compromise other geopolitical deliberation. For instance, having invested more of its resources in military expenditure, KSA has fewer resources for economic development. In 2007, worldwide expenditure on defence was $1339 billion; this represented 2.5% of the world's GDP (Al-Hamdi & Alawin, 2016). Between 1998 and 2007, defence expenses increased by 45% due to increased attacks in the Middle East and in other parts of the world (Khalid et al., 2020).

In terms of its Human Development Index (HDI), the UNDP ranks KSA 20th out of 187 countries. Despite having the largest Middle Eastern economy, KSA still has a multidimensional poverty index that indicates many deprivations in health, education and living standards (Manamperi, 2016).

When dealing with KSA as part of a group of Middle Eastern countries, the findings of various studies have indicated that there is a positive relationship between military use and improved economic productivity (Ping, 2017). In the Middle East, the increase in military expenditure is almost attributed wholly to KSA because it spends more than any other country in the region on military expenditure.

In 2020, KSA allocated 18% of its revenue to military expenditure. In 2020, the amount allocated to the military was approximately $48.5 billion; this is 5% less than the amount that was spent in 2019 (Coutts et al., 2019). This allocation means that, after education with 19% of its revenue, KSA spends more on the military than it does on health which accounts for 16% of its revenue.

Theoretically, military expenditure can either promote economic development or hinder economic growth. Military expenditure can promote economic development in various ways such as:

Enhancing the development of new technologies; improving the country's social-economic structure; Promoting infrastructure; Creating a peaceful business environment; Intensifying increasing demand; and Minimizing threats in conducting business (Smith, 2016).

Nevertheless, due to its demands for opportunity costs, military expenditure is detrimental to economic growth. Through weapons trade-off, military expenditure sacrifices income that can be used for other productive activities. In this case, increased military expenditure often increases the tax burden and increases government debt. Together, these usually inhibit economic growth (Smith, 2016). In general, the net impact of military expenditure relies on the benefits exceeding the opportunity costs. Although many previous studies have investigated the effect of military expenditure on economic development, there remains a lack of satisfactory available evidence.

Table 1. KSA- Evolution of debt, country economy

Saudi Arabia: Evolution of debt			
Date	Debt	Debt (%GDP)	Debt Per Capita
2018	149,217	18.98%	4,428$
2017	118,202	17.16%	3,624$
2016	84,462	13.09%	2,657$
2015	37,942	5.80%	1,222$
2014	11,810	1.56%	389$

Source:
https://countryeconomy.com/national-debt/saudi-arabia#:~:text=The%20national%20debt%20increased%20in,it%20was%2017.16%25%20of%20GDP.

When taxation is unable to raise the money required to finance the military expenditure, the government has to borrow money and incur debt. This is especially so in times of political unrest. Brady (2019) states that the capital is finite when government's spending is greater than the country's revenue. In this case, the national debt settles the deficit. The national debt has an impact on the country's economic wealth and the military expenditure is one of the major contributors. KSA's debts have increased in the last few decades and, according to Zhao et al. (2019), the country's national debt totalled 149, 217 million dollars in 2018; this represented an increase of 31,015 million dollars from 2017. Figure 3 below shows KSA's military expenditure as a % of GDP. 5. In 2018, this represented 18.98% of the country's GDP and was an increase of 1.82% from 2017. In 2018, KSA's per capita debt was 4, 428 dollars per citizen as compared to 2431 dollars in 2008 were 2,431 dollars. When compared to the rest of the world, KSA's position in terms of debt worsened in 2018. In terms of the highest debt in relation to GDP, KSA was ranked 11th and, in terms of debt per capita, 115th out of 187 countries.

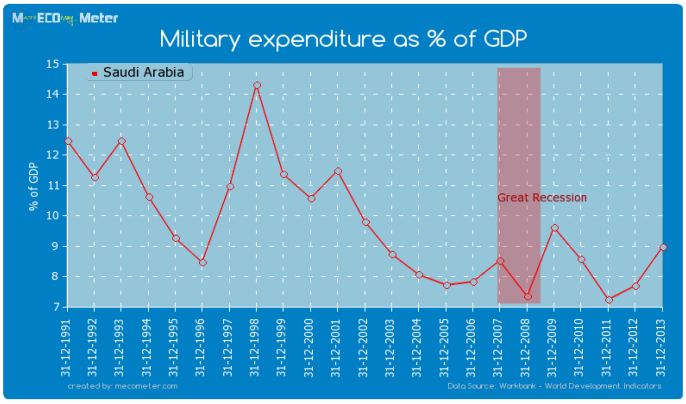


Figure 2. KSA- military expenditure as % of GDP

Source:
http://mecometer.com/image/linechart-country-historic/saudi-arabia/military-expenditure-percentage-of-gdp.png

According to Zhao et al. (2019), during the same period, Saudi Arabia used almost 56 billion dollars or 18% of its revenue to finance military expenditure was. In this regard, if the country's military expenditure was managed over the last decade, KSA's debt could have been stabilized and been minimal or. Zeitun (2014) states that, when the country's liability increases, there is an increase in the interest rate and the cost of borrowing rises in response to the increased risk to the investment. Due to the unfavourable economic environment, an increase in interest hinders local investors from investing in a country. Eventually, this reduces the rate of economic growth and facilitates higher taxation.

However, despite an increase in KSA's national debt, the country offers both domestic and international borrowers generous debt terms to (Warlenius, 2016). For the last decade, the country has maintained an interest rate of 2% to its lenders. Taking into consideration the data for 2018, when the debt was worse, the interest rate increased from 2% in 2017 to 3% in 2018(Erdoğanet al., 2020). In 2020, the interest rate reduced to 1%. Therefore, while military expenditure has increased KSA's national debt, it has had an insignificant impact on KSA's debt interest rate (Erdoğan et al., 2020). Although KSA does not levy income tax on its individual citizens, the 20% rate of income tax on other parties is relatively high when compared to the average global rate of taxation. The level of taxation can be reduced if KSA manages its debt through reduced military expenditure. When there is a high rate of tax, this inhibits investors from investing in certain ventures. For instance, with KSA's rate of taxation in the petroleum industry being as high as 50%, this inhibits the country's Small and Medium sized Enterprises (SMEs) (Erdoğan et al. 2020).

The creation of employment opportunities is one of the positive impacts that military expenditure has on a nation. According to Asongu et al. (2020), military expenditure has a positive effect through increasing the number of troops in the military. Moreover, the necessity of infrastructure, which stems from increased military expenditure, has provided experts with job opportunities. Such experts may include contractors, consultants, and traders. Private Corporations, which stem from increased military expenditure, include weapons manufacturers, sellers of weapons and restaurants. For many years, KSA has been a significant purchaser of weapons manufactured in the USA. Since

2017, KSA has planned to source more than 50% of its defence equipment from the local industries (Efficiency and Productivity Analysis of the Saudi Manufacturing Industries, 2019). In 2017, under the Public Investment Fund (PIF) initiative, the Saudi Arabian Military Industry was established to manufacture military equipment. The company together with others such as Thales, General Dynamics, BAE Systems, EADS, Saic, and Northrop Grumman, which are suppliers of military equipment to the government, have created many job vacancies (Almiman, 2019).

Ping (2017) in a study established an analysis in which he concluded that increased military spending led to higher rates of economic progression in KSA. He presumed that developing countries reduced the growth of their expenditure for military programs and that the reduction of military consumption did not lead to an increment in economic development.

Ortiz, Alvarro and Salinas (2019) in a study on the effect of military spending on output established that military spending and real output have both long term and short term equilibrium relationships depending on a country's income level. They concluded that for high income countries, there exists a unidirectional causal relationship from real output to military spending and vice-versa for upper middle and lower middle economies. On the other hand, they established no causal relationship in either direction in low income countries.

Alptekin and Levine (2012) also undertook a study in which they established a non-linear relationship between military spending and economic growth. Therefore, they concurred with the study by Ortiz et. al (2019) that there exists a positive relationship between military spending and economic growth in developed nations.

However, Pan, Chang and Wolde-Rufael (2015) in a study on the causal relationship between military spending and economic growth in 10 Middle East countries concluded that there is no causal relationship in either direction for KSA, Oman and Jordan. Besides, Chen, Lee and Chiu (2014) established no causality in upper middle income, Sub-Saharan, European and Central Asian countries. In Asia, North Africa, Latin and Caribbean and the Middle East, they established a short-term bidirectional causality between defence spending and economic growth.

Another study by Ageli and Zaidan (2013) on the effects of defence expenditure on economic growth of KSA confirmed that there exists a bidirectional causality that runs from non-oil GDP of KSA to defence spending. On the other hand, Al-Jarrah (2005) in a study the relationship between the variables established that defence spending negates economic development.

Additionally, Hatemi, Chang, Chen, Lin and Gupta (2018) undertook a study on the world's top six military spenders which are the U.S., China, KSA, France, Japan and Russia. They established a military expenditure led hypothesis for China and Japan while growth led hypothesis hold for the remaining four. Moreover, the study concluded that of the six nations, strong economic growth led to automatic expansion in their military spending only in KSA.

The findings of another study, which investigated the relationship between economic development and military expenditure (Manamperi, 2016) show that there was no evidence of a causality link between KSA's military expenditure and economic development. In fact, more generally, the study findings show that military expenditure neither hinders nor enhances a country's economic growth. This is borne out by the findings of Abdel-Khalek's (2019) Indian study which show that there is no causal relationship between military expenditure and economic growth and it is the link between the civil and military sectors that has led to the country's increased economic growth arising from indirect benefits such as increased foreign direct investment.

It is due to the different results by scholars who have undertaken studies on the causal relationship between defence spending and economic growth that the current purposes to investigate with finality how defence spending and economic growth influence each other.

3. Variables of the Model

The quantitative measures are based on the following variables: Gross Rate of Fixed Capital (GRFC), Gross Rate of GDP (GRGDP), and Ratio of Military Expenditure to GDP (MEGDP). GRFC's significance is the net investment that results in the change of fixed assets and capital formation in a country such that it is regarded as a prospective element of military expenditure and economic development. The increase in the country's GRFC may intensify government disbursement and, therefore, expand military outlays (d'Agostino, 2017). The changes in the GDP variable reflect the economic slowdown in growth and the GDP data is articulated as actual esteems to prevent price variations. The military expenditure variable is articulated as the proportion of military spending to GDP.

The author has analysed all the data, encompassed in the model, by exploiting unprocessed data of the yearly time series and using the three variables from 1987 to 2019. This time is adequate to establish the relationship between KSA's economic growth and military spending through using a time series analysis strategy. The author acquired the

GRFC and the GDP yearly data from World Bank Development Indicators. He procured from USA Arms Control and Disarmament Agency (ACDA) and the Stockholm International Peace Research Institute (SIPRI) annual raw data of military expenditure.

3.1 Econometrics Analysis

The author applied Granger's test to test the direction of causation between military expenditure and economic growth using time-series data in KSA for the period 1987-2019, we apply. Granger's causality test is a statistical tool used to test hypothesis to determine whether one time series forecasts another. The test was coined in 1969 by Clive Granger who argued that causality can be tested for by examining the ability to forecast future values based on prior values of a different time series (Akinboade & Braimoh, 2010; Wang, 2016). The direction of causality can be established between two variables, Y and X, as follows:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots + \alpha_i Y_{t-i} + \gamma_1 X_{t-1} + \gamma_2 X_{t-2} + \ldots + \gamma_i X_{t-i} + U_t \quad (1)$$

$$X_t = \lambda_0 + \lambda_1 X_{t-1} + \lambda_2 X_{t-2} + \ldots + \lambda_i X_{t-i} + \delta_1 Y_{t-1} + \delta_2 Y_{t-2} + \cdots + \delta_i Y_{t-i} + V_t \quad (2)$$

Where: U_t and V_t are the serially uncorrelated white-noise series, and the causality runs from X to Y if Y can be predicted by using past values of X than by past values of Y alone. This makes the coefficients of the lagged X variable statistically significant. Also, the causality runs from Y to X if X can be predicted better by using past values of Y than by past values of X alone. This makes the coefficients of the lagged Y variable statistically significant (NUSHIWAT, 2008).

Consequently, the causality test between the two variables X and Y in equations (1) and (2) are as follows:

1. If γ_i (for i=1,2,…,n), the coefficients of the lagged X variable in equation (1), are statistically significant collectively, the causality runs from X to Y.

2. If δ_i (for i=1,2,…,n), the coefficients of the lagged Y variable in equation (2), are statistically significant collectively, the causality runs from Y to X.

3. If γ_i and δ_i (for i=1,2,…,n), in equations (1) and (2) respectively, are statistically significant collectively, bi-directional causality is concluded.

4. If γ_i and δ_i (for i=1,2,…,n), in equations (1) and (2) respectively, are statistically insignificant collectively, the test is inconclusive.

The author applied this test of the direction of causality, between military spending and economic growth. In doing so, the output variable is the annual growth rate of GDP (GRGDP); and annual growth rate of military expenditure (GRME), and the two equations used in the estimates are as follows:

$$GRGDP_t = \alpha_0 + \alpha_1 GRGDP_{t-1} + \alpha_2 GRGDP_{t-2} + \alpha_3 GRME_{t-1} + \alpha_4 GRME_{t-2} + u_t \quad (3)$$

$$GRME_t = \beta_0 + \beta_1 GRME_{t-1} + \beta_2 GRME_{t-2} + \beta_3 GRGDP_{t-1} + \beta_4 GRGDP_{t-2} + v_t \quad (4)$$

Where:

α_0 and β_0 are the constant terms.

α_1 to α_4 and β_1 to β_4 are the coefficients of the explanatory variables.

3.2 Consequently, the Econometrics Model Is as Follows

$$GRGDP_t = \alpha_0 + GRME_t + GRFC_t + \varepsilon_t \quad (5)$$

Where: GRGDP: Gross rate of GDP.,*GR*ME: Ratio of military expenditure to GDP. GRFC: Gross rate of fixed capital. The annual data of GRGDP, GRME, and GRFC, were taken from World Bank Open Data. Table 2 below shows the descriptive statistics of the variables.

Table 2. The descriptive statistics of the variables

	GRGDP	GRME	GRFC
Mean	3.497064	10.48985	21.13458
Median	2.743828	10.06205	20.37199
Maximum	15.19343	16.89641	29.85240
Minimum	-6.632496	7.230053	17.30892

Std. Dev.	5.228223	2.468241	3.053852
Skewness	0.596019	0.757386	0.863476
Kurtosis	3.049626	2.852709	3.241177
Jarque-Bera	1.897893	3.088305	4.054037
Probability	0.387149	0.213493	0.131728
Sum	111.9061	335.6751	676.3066
Sum Sq. Dev.	847.3638	188.8586	289.1064
Observations	32	32	32

The author used the following hypotheses in this study:

As shown below, the null hypothesis H_0 is Military Expenditure does not cause economic growth.

$$GRGDP_t = \alpha_0 + \sum_{i=1}^{n1} \alpha_{1i} GRGDP_{t-i} + \sum_{i=1}^{n2} \alpha_{2i} GRME_{t-i} + \sum_{i=1}^{n3} \alpha_{3i} GRFC_{t-i} + \lambda EC_{t-1} + e_t \quad (6)$$

Where: H_0: $\alpha_{2i} = 0, \lambda = 0,$ for $i = 1, \ldots, n.$ & H_1: $\alpha_{2i} \neq 0, \lambda \neq 0,$ for at least one i. EC: Error correction, e: Is the error term, t: Time, n :the lag periods, α_{2i}: The Granger casualty in the short run, and λ: The Granger casualty in the long run.

The null hypothesis H_0 is rejected if the coefficients of military expenditure α_{2i} are statistically significant, i.e. error correction (EC) coefficient (λ) is significant. Whereas EC coefficient (λ) indicates a causal relationship in the long run.

The alternative hypotheses H_1 is that the economic growth does not cause military expenditure (as shown in Equation 6 above).

$$GRME_t = \beta_0 + \sum_{i=1}^{m1} \beta_{1i} GRME_{t-1} + \sum_{i=1}^{m2} \beta_{2i} GRGDP_{t-i} + \sum_{i=1}^{m3} \beta_{3i} GRFC_{t-i} + \varphi EC_{t-1} + u_t \quad (7)$$

Where:

$$H_0 = \beta_{2i} = 0, \lambda = 0, \text{for } i = 1, \ldots \ldots, m \ \& \ H_1: \beta_{2i} \neq 0, \lambda \neq 0, \text{for at least one}$$

φ: The Granger casualty in the long run, and β_{2i}: The Granger casualty in the short run. H_1 is rejected if GRGDP coefficients (β_{2i}) is statistically significant. Also, the coefficient of GRGDP (β_{2i}) indicates the causality in the short run, and the EC coefficient (φ) refers to causal relationship in the long run. The causality relationship between KSA's military expenditure and economic growth in KSA is as follows:

In analyzing if the study variables have unit roots, the author used the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests. Table 3 below shows the results of the unit root tests of the model variables.

Table 3. The results of the unit root tests

	ADF			**Phillips-Perron**		
	intercept	**trend & intercept**	**None**	**intercept**	trend & intercept	none
GRGDP	**Level**					
	intercept	trend & intercept	None	intercept	trend & intercept	none
	-5.807089	-5.861172	-3.9429	-5.778417	-5.823518	-4.248446
	0.0000	0.0002	0.0003	0.0000	0.0002	0.0001
GRME	**Level**					
	-3.049546	-3.067386	-1.498189	-3.060852	-3.023202	-1.726976
	0.0413	0.1315	0.1233	0.0403	0.1423	0.0796

	1st difference					
	-5.844072	-5.830224	-5.840388	-6.479485	-8.485731	-6.186006
	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000
GRFC	**Level**					
	-1.941442	-2.995153	-0.381568	-2.041901	-2.946321	-0.353993
	0.3099	0.1495	0.5385	0.2684	0.1628	0.5491
	1st difference					
	-5.775536	-5.586845	-5.870037	-6.124634	-5.84518	-6.189325
	0.0000	0.0004	0.0000	0.0000	0.0002	0.0000

As shown in Table 3, the results of the ADF & PP tests () indicate that GRGDP series is stationary at the level value I(0), However, the other two variables, namely GRME and GRFC, are not stationary at the level value but they became stationary at the first difference I(1).

Then, the author needed to determine the appropriate lag structure, the optimal lag length according to: Akaike (1974), Schwarz (1978), HQ (Hannan & Quinn (1979), or Quinn (1980), All tests suggested that 1 lag is the optimum lag-length.

Next, the author examined the co-integration among the variables since Table 3's results showed that the model variables were mixed of order of integration I(0) & I(1). Therefore, the author applied the ARDL co-integration approach to test the long-run relationships. Also, he formulated the ARDL model as shown in following Equation.

$$\Delta GRGDP_t = \alpha_0 + \sum_{k=1}^{p} \alpha_{1k}\, \Delta GRGDP_{t-k} + \sum_{k=0}^{q1} \alpha_{2k}\, \Delta GRME_{t-k} + \sum_{k=0}^{q2} \alpha_{3k}\, \Delta GRFC_{t-k} + \alpha_4 GRGDP_{t-1} + \alpha_5 GRME_{t-1} + \alpha_6 GRFC_{t-1} + u_t \quad (8)$$

Where $\alpha_4 \sim \alpha_6$ are the long- term coefficients? Also, the author used the bounds test, in the ARDL approach to test the long-run relationship. In addition, he used the F-statistic of the lagged terms (as shown Equation (7)) to test the long-term equilibriutm relationship and whether or not there was a cointegration among the variables.

Table 4 below shows the result of the Bounds Test for ARDL and cointegration. Where the upper bound assumes that all the regressors are I(1), and the lower bound assumes that the regressors are I(0). While the null hypothesis of F-Bounds test is that there is no cointegration among variables. Therefore, if the calculated F-statistic (or t-statistic) is below the lower bound, the null hypothesis is accepted. If the F-statistic (or t-statistic) is higher than the upper bound, the null hypothesis is rejected and the cointegration among variables is verified. Table 4 shows the result of the bound test for.

Table 4. Results of the bounds tests

Dependent variable	Function		F-Statistics
GRGDP	F(GRME, GRFC)		11.03676
Asymptotic Critical values			
1%		5%	
I(0)	I(1)	I(0)	I(1)
5.15	6.36	3.79	4.85

Since the calculated value of the F-statistic is 11.03676 which are above the upper bound 4.85 at the 5% significance level, the author rejected the null hypothesis that no cointegration existed between the series. Therefore, these results confirm the existence of long-run equilibrium relationships between the variables used in this study.

The existence of a long-run relationship between the variables suggests that the existence of Granger-causality. However, the direction of this causality can be determined only by the F- statistic and error correction term.

Table 5. Granger causality/block exogeneity wald tests results

Null hypothesis	Chi-sq	D.F	Prpb.	Causality
GRME does not Granger cause GRGDP	2.344896	2	0.3096	No causality
GRGDP does not Granger cause GRME	4.208137	2	0.1220	
GRME does not Granger cause GRFC	6.770845	2	0.0339	Bidirectional causality : GRFC Granger cause GRME, and GRME Granger cause GRFC
GRGFC does not Granger cause GRME	8.544653	2	0.0139	
GRFC does not Granger cause GRGDP	2.255431	2	0.3238	No causality
GRGDP does not Granger cause GRFC	4.218124	2	0.1214	

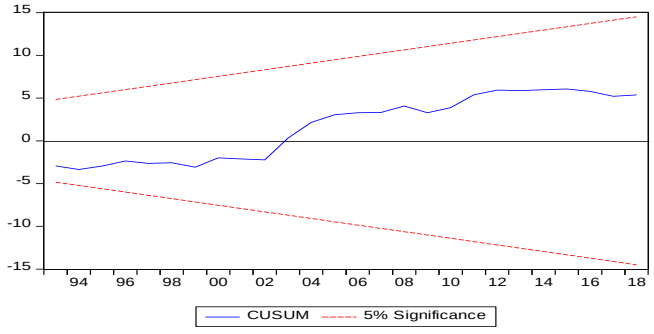
The results of Granger Causality indicate that:

- The rate of growth in military expenditure does not affect the rate of growth of GDP and, vice-versa.
- The rate of growth of Military Expenditure affects the rate of growth of fixed capital and vice-versa. Consequently, there is bidirectional causality.
- The rate of growth of fixed capital does not affect the rate of growth of GDP and vice-versa growth.

From the analysed data, after careful examination and analysis, the study establishes that there is a bidirectional causal relationship between defence spending and the economic growth of the KSA. That is, military spending causes growth in fixed capital and vice-versa. Therefore, defence spending does affect the rate of growth of KSA.

3.3 The Stability of the Model

The author selected ARDL to test the stability of the model so as to avoid misspecification of the functional form; this is due to the volatility of the time variables. Usually, the Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ) tests are used to ensure the stability of the ARDL-ECM model, (Pesaran). The statistics of the CUSUM and CUSUMSQ tests are calculated as the cumulative sum or cumulative sum of the squares of the regression residuals, respectively.



3.4 The Diagnostic Tests

These models pass the entire diagnostic tests such as normality of the residues, heteroscedasticity and the serial correlation.

4. Conclusion

KSA plays a significant role in ensuring security in the Middle East region. In this regard, it is important to investigate the causality relationship between KSA's military use and economic progress in the period from 1987 to 2019. This study aimed to determine the impact that the country's military expenditure had on the rate of the country's economic growth AND, more particular to identify the factors that underpinned this causal relationship.

Accordingly, for the purpose of this study, the author used an econometric model which had as its variables the gross rate of growth of KSA's GDP and the gross rate of growth of the country's fixed capital. This study's findings show in the period from 1987 to 2019 the existence of unidirectional causality between KSA's military expenditure and economic growth. The findings demonstrate, also, that, during this period, the amount of military expenditure did not impact on the rate of growth of the country's GDP and vice-versa. The findings show too that rate of growth of KSA's fixed capital had an impact on the amount of military expenditure and that increases in military expenditure led to corresponding increases in the rates of growth of the country's fixed capital. In addition, the increases in the rates of growth of fixed capital did not impact on the rate of growth of the country's GDP and vice-versa.

5. Limitations of the Study

The analysis makes assumptions about the connection between KSA's economic growth and military use and takes accounts of the numerous difficulties associated with pooled data. Notwithstanding, the results still demonstrate that, even when different measures of the military burden are used, higher military expenditure has impacted negatively on KSA's economic progress. Existing empirical studies and economic theories do not state unambiguously whether higher military expenditures promote or hinder economic development. There have been systematic efforts to distinguish the sources of military expenditure in order to establish realistically by how much that spending can be reduced. This study focuses only on data between 1987 to 2019 and therefore, this limited period reduces the amount of data that can be used for comparative purposes. According to the literature review, military expenditure increases most significantly during times of war, i.e. amongst other things, the costs of training and purchasing weapons expenditures. During times of peace, countries worldwide spend approximately 5% of their total GDP on the military. Accordingly, it is difficult to compare KSA's military expenditure and its rates of economic growth with those countries that are not engaged in war related activities because such countries low military expenditures mean that their rates of economic growth are not impacted in the same way as in KSA.

6. Policy Recommendations

The study supports the KSA efforts to defend its interests with the best military hardware possible knowing that for every penny spent on its defence, there is a positive ripple effect on its economy. However, KSA should ensure that it lives within its means by not depending too much on debts to finance its defence spending.

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