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REVISITING THE CAUSAL NEXUS BETWEEN DEFENSE EXPENDITURE AND ECONOMIC GROWTH: TIME SERIES ANALYSIS FOR SAUDI ARABIA

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ABSTRACT

This time series study analyzed the effect of defense expenditure on GDP, oil GDP and non-oil GDP of Saudi Arabia. The defense expenditure is introduced as explanatory variable in production function for said purpose. This study used time series data from 1969 to 2013 and unit root test determined that variables of the study share same integration order. Long run relationship was established among variables through cointegration test. Dynamic ordinary least squares results showed that defense expenditure positively affect GDP and non-oil GDP in the long run while its impact on oil GDP is insignificantly positive. The causality analysis confirmed that defense expenditure has direct and indirect effect on GDP in Saudi Arabia as defense expenditure causes GDP, oil GDP, non-oil GDP, investment, and labor force in the long run. This study concluded that defense expenditure is as one of the factor of the economic growth in Saudi Arabia.

Keywords: GDP, Oil GDP, Non-Oil GDP, Defense expenditure, Time series analysis, Saudi Arabia.

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Contribution/ Originality

This study contributes in the existing literature as it incorporates defense expenditure in the production function along with capital and labor force to determine whether defense expenditure is a long run contributor of economic growth (GDP, oil GDP, non-oil GDP) or not in case of Saudi Arabia.

1. INTRODUCTION

According to endogenous growth models long run growth is determine endogenously as opposed to neoclassical growth models in which long run growth is exogenously determined. The theoretical work of Barro (1991) depends on endogenous growth models and is considered pioneer work regarding the role of government expenditure in long run economic growth. Two prominent views exist in the literature about military expenditure and economic growth. First view is based on Keynesian framework, according to which military expenditure works as a stimulator to increase aggregate demand in the economy (Gold, 1990). Defense expenditure has spills over effect as research and development in defuse sector can increase the development of new technology in the civil sector. Thus, defense expenditure will stimulate economic development through up gradation of technology. Contrariwise, defense expenditure restrain economic process in the economy by crowding out investment and also reducing the availability

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of resources for civilian purpose (Yakovlev, 2007). Besides this some researchers like Adams and Gold (1987) and Barro (1991) extends its role as a spillover effects on human capital. Heo (2010) further emphasized military expenditure role in enhancing investment climate and increase foreign investment in the economy. The second view which is opposing the first view is based on neoclassical model. According to this view military expenditure may crowd-out effect not just on private investment but also on public investment. Thus, military expenditure negatively affects economic growth of the economy (Sandler and Hartley, 1995). The reason is public sector is less concerned with production cost so technical efficiency is absent in public sector.

In the literature it is not decided yet whether military expenditure stimulates economic growth or it is detrimental to economic growth. This relationship differs from country to country and from region to region. The nexus between military expenditure and economic growth depends on many factors prevailing in the region or country, for instance, investment structure, political scenario, geographical location, and culture. Halicioglu (2004); Wijeweera and Webb (2009); Wijewerra and Webb (2011) found the positive effect of military expenditure on economic growth whether Sivard (1977); Atesoglu (2002); Killer *et al*. (2006); Ocal and Brauer (2007); Smith and Tuttle (2008) established the detrimental effect of military expenditure on economic growth.

Heo (1999) carried out study for the South Korean economy to examine the impact of defense expenditure on economic growth. He found that defense expenditure has indirect effect on economic growth through investment and exports, so increase in defense expenditure in South Korea will restrain economic growth.

Al-Jarrah (2005) carried out study to find out causal relationship between economic growth and defense expenditure by employing time series data over period from 1970 to 2003. They found two-way causation between economic growth and defense expenditure in long run however; they concluded that increase in defense expenditure has lowered economic growth in long run in Saudi Arabia.

Wang *et al*. (2012) estimated the economic productivity in OECD countries without/with defense expenditure. Their results indicated that economic productivity with defense expenditure has a higher Malmquist index (MPI). Thus, they concluded that defense expenditure can enhance economic productivity in OECD countries. Shahbaz *et al.* (2013) examined the role of defense expenditure in economic development of the Portuguese economy. They found that cointegration is existed between economic growth, capital, labor and defense expenditure in the long run. They also found that defense expenditure positively contributed to the economic growth in Portugal. Furthermore, they revealed that there exists one-way causation from defense expenditure to economic growth so they concluded that defense expenditure can play a vital role in the economic development of Portuguese economy.

Alshahrani and Alsadiq (2014) investigated the impact of government spending on economic growth in Saudi Arabia. They used aggregate and disaggregate data for government spending. Their result documented the negative effect of defense expenditure on economic growth in long run and they concluded that capital expenditure, private domestic expenditure and health expenditure are the significant contributor of long run economic growth in Saudi Arabia.

This study is an attempt to reinvestigate the causal nexus between defense expenditure and economic growth in case of Saudi Arabia. The earlier two studies in this regard of Al-Jarrah (2005) and Alshahrani and Alsadiq (2014) concluded that defense expenditure is not a long run factor of economic growth in Saudi Arabia. So this study will incorporate defense expenditure in the production function along with capital and labor force to determine whether defense expenditure is a long run contributor of economic growth or not. Furthermore, this study will employ dynamic ordinary least squares to determine long run estimates once it is determined that there exists long run relationship between variables. The other distinct feature of this study is that output is replaced by gross domestic product (GDP), oil GDP, and non-oil GDP in the production function. Besides this, long run and short run causality is assessed by vector error correction model (VECM). The rest of paper is arranged such that next section of the paper explains the theoretical frameworks and empirical models. Data and research methods are discussed in section third of the paper and fourth section represents results interpretation. The last section of the paper concludes the study.

2. THEORETICAL FRAMEWORKS AND EMPIRICAL MODELS

Mainly two prominent models are being applied in the literature to determine the effect of defense expenditure on economic growth. There are studies such as Deger (1986); Rasler and Thompson (1988) and Mintz (1989) who examine effect of defense expenditure on economic growth indirectly through demand-sides models and incorporated other variables of interest, for instance education, health spending and saving, along with defense expenditure. However, on the other side we have studies that incorporated defense expenditure in the production function. Huang and Mintz (1991); Ward and Davis (1992); Ward *et al.* (1995); Shahbaz *et al.* (2013) determined the effect of defense expenditure on economic growth through supply-side by incorporating defense expenditure in production function. This study also following the supply-side models and included defense expenditure in the production function following Mintz and Huang (1991) and Shahbaz *et al.* (2013). So the model will be as given in Eq. 1:

$$GDP = f(CAP, LAB, DEF) \quad (1)$$

Whereas *GDP* indicates gross domestic product, *CAP* represents gross capital formation, *LAB* presents labor force, and *DEF* represents defense expenditure. However, in this study the effect of defense expenditure will be also examined on oil GDP (*OGDP)* and non-oil GDP (*NGDP*). Thus, for oil and non-oil GDP the models will be as presented in Eq. 2 and Eq. 3 respectively.

$$OGDP = f(CAP, LAB, DEF) \quad (2)$$

$$NGDP = f(CAP, LAB, DEF) \quad (3)$$

After taking natural log (*log*) of the Eq. 1, Eq. 2 and Eq. 3 the empirical models of the study can be written as in Eq. 4, Eq. 5 and Eq. 6 respectively.

$$log\, GDP_t = b_{0+} b_1 log\, CAP_t + b_2 log\, LAB_t + b_3 log\, DEF_t + e_t \quad (4)$$

$$log\, OGDP_t = b_{0+} b_1 log\, CAP_t + b_2 log\, LAB_t + b_3 log\, DEF_t + e_t \quad (5)$$

$$log\, NGDP_t = b_{0+} b_1 log\, CAP_t + b_2 log\, LAB_t + b_3 log\, DEF_t + e_t \quad (6)$$

Where t and e presents time period and error term respectively.

3. DATA AND RESEARCH METHODS

Data has gathered from various issues of the "Achievements of the development plans" published by Ministry of economy and planning, Kingdom of Saudi Arabia. Data of all monetary variables are in constant 1999 Saudi Riyal. Gross capital formation and employment is used as a proxy for capital and labor force respectively.

Cointegration test has to be applied once it is determined that order of integration is same of all variables of concern (Johansen, 1988; Johansen and Juselius, 1990). In order to check whether all variables of the study possess same integration level augmented Dickey- Fuller test (Dickey and Fuller, 1979) will be applied. The cointegration test will be determined long run relationship and this test can be expressed in equation form as written in Eq. 7 below:

$$\Delta X_t = \mu + \phi D_t + \Pi X_{t-p} + \Gamma_{p-1} \Delta X_{t-p+1} + \cdots + \Gamma_1 \Delta X_{t-1} + \varepsilon_t, \;\; t = 1, \ldots, T \quad (7)$$

where $\Gamma_i = (\Pi_1 + \cdots + \Pi_i - I), i = 1, \ldots, p-1$, and Γ represents cointegration vector.

This study will employ dynamic ordinary least squares (DOLS) to get long run estimates (Stock and Watson, 1993). The leads and lags of first difference of independent variables remove problems like serial correlation, simultaneity biasedness and small sample biasedness between regressions. The estimation of DOLS is presented in Eq. 8.

$$y_t = \alpha + \beta' x_t + \sum_{j=-k}^{k} \Pi'_j \Delta x_{t-j} + \upsilon_t \quad (8)$$

The lead-lag truncation parameter is presented by k.

When long run relationship is found then VECM model will be used to test the short run and long run causality among variables. The following VECM shown in Eq. 9, Eq. 10, and Eq. 11 has to be employed to determine causality in both short run and long run.

$$\begin{bmatrix}\Delta logGDP_t\\ \Delta logCAP_t\\ \Delta logLAB_t\\ \Delta logDEF_t\end{bmatrix}=\begin{bmatrix}\alpha_1\\ \alpha_2\\ \alpha_3\\ \alpha_4\end{bmatrix}+\begin{bmatrix}b_{11p}\ b_{12p}b_{13p}b_{14p}\\ b_{21p}\ b_{22p}b_{23p}b_{24p}\\ b_{31p}\ b_{32p}b_{33p}b_{34p}\\ b_{41p}\ b_{42p}b_{43p}b_{44p}\end{bmatrix}\times\begin{bmatrix}\Delta logGDP_t\\ \Delta logCAP_t\\ \Delta logLAB_t\\ \Delta logDEF_t\end{bmatrix}+\begin{bmatrix}\gamma_1\\ \gamma_2\\ \gamma_3\\ \gamma_4\end{bmatrix}ECT_{t-1}+\begin{bmatrix}e_{1t}\\ e_{2t}\\ e_{3t}\\ e_{4t}\end{bmatrix} \quad (9)$$

$$\begin{bmatrix}\Delta logOGDP_t\\ \Delta logCAP_t\\ \Delta logLAB_t\\ \Delta logDEF_t\end{bmatrix}=\begin{bmatrix}\alpha_1\\ \alpha_2\\ \alpha_3\\ \alpha_4\end{bmatrix}+\begin{bmatrix}b_{11p}\ b_{12p}b_{13p}b_{14p}\\ b_{21p}\ b_{22p}b_{23p}b_{24p}\\ b_{31p}\ b_{32p}b_{33p}b_{34p}\\ b_{41p}\ b_{42p}b_{43p}b_{44p}\end{bmatrix}\times\begin{bmatrix}\Delta logOGDP_t\\ \Delta logCAP_t\\ \Delta logLAB_t\\ \Delta logDEF_t\end{bmatrix}+\begin{bmatrix}\gamma_1\\ \gamma_2\\ \gamma_3\\ \gamma_4\end{bmatrix}ECT_{t-1}+\begin{bmatrix}e_{1t}\\ e_{2t}\\ e_{3t}\\ e_{4t}\end{bmatrix} \quad (10)$$

$$\begin{bmatrix}\Delta logNGDP_t\\ \Delta logCAP_t\\ \Delta logLAB_t\\ \Delta logDEF_t\end{bmatrix}=\begin{bmatrix}\alpha_1\\ \alpha_2\\ \alpha_3\\ \alpha_4\end{bmatrix}+\begin{bmatrix}b_{11p}\ b_{12p}b_{13p}b_{14p}\\ b_{21p}\ b_{22p}b_{23p}b_{24p}\\ b_{31p}\ b_{32p}b_{33p}b_{34p}\\ b_{41p}\ b_{42p}b_{43p}b_{44p}\end{bmatrix}\times\begin{bmatrix}\Delta logNGDP_t\\ \Delta logCAP_t\\ \Delta logLAB_t\\ \Delta logDEF_t\end{bmatrix}+\begin{bmatrix}\gamma_1\\ \gamma_2\\ \gamma_3\\ \gamma_4\end{bmatrix}ECT_{t-1}+\begin{bmatrix}e_{1t}\\ e_{2t}\\ e_{3t}\\ e_{4t}\end{bmatrix} \quad (11)$$

In above equations, t symbolizes time, ε_t is the error term and ECT is the lagged error correction term. The significance of ECT coefficient will determine long run causality. Short run causality can be determined through joint significance of the lagged coefficients of variables based on the F-test.

4. RESULTS INTERPRETATION

Results of ADF test are given in Table 1. These results indicated that study variables are trended and non-stationary when considered them at level. However, after taking variables at first difference, all variables became stationary and integrated of order one i.e. I (1). Now, one can apply cointegration test to determine long run relationship among variables of Model 1, Model 2, and Model 2. Before proceeding to long run relationship it was confirmed through Akaike information criteria that the order of lag length is one for all the three models of the study, because appropriate lag length for cointegration test is very necessary.

Table-1. Unit Root Results

Variables	level	first difference		conclusion
logGDP	-2.59	Δ*logGDP*	-3.97[a]	*I (1)*
logOGDP	-2.62	Δ*logOGDP*	-3.36[a]	*I (1)*
logNGDP	-2.75	Δ*logNGDP*	-3.44[a]	*I (1)*
logDEF	-2.66	Δ*logDEF*	-3.38[a]	*I (1)*
logCAP	-0.95	Δ*logCAP*	-3.45[a]	*I (1)*
logEMP	-1.48	Δ*logEMP*	-4.19[a]	*I (1)*

[a] shows significant at 1 percent level.

Results of cointegration test for Model 1 are shown in Table 2. These results indicated that there are two cointegration vectors as values of both trace statistics and maximum-eigen statistics are greater than their critical values. Hence; variables of Model 1 are cointegrated in the long run. Thus, it is deduced from this result that GDP, defense, capital and labor are possessing relationship in the long run.

Table-2. Cointegration Results for Model 1

Series: *logGDP logDEF logCAP logEMP*				
Hypothesized No. of CE(s)	**Trace Statistic**	**0.05 Critical Value**	**Max-Eigen Statistic**	**0.05 Critical Value**
None	70.1325*	40.17493	38.6066*	24.15921
At most 1	31.5259*	24.27596	22.9076*	17.79730
At most 2	8.618256	12.32090	8.020361	11.22480
At most 3	0.597895	4.129906	0.597895	4.129906

* indicates rejection of null hypothesis.

Long run cointegration results for Model 2 are given in Table 3. Again, cointegration test results confirmed that there are two cointegration vectors and there exists long run relationship among oil GDP, defense expenditure, capital and labor. Table 4 presents long run cointegration results in case of Model 3. Test statistics confirmed two cointegration vectors and suggested that long run relationship exists among non-oil GDP, defense expenditure, capital and labor.

Table-3. Cointegration Results for Model 2

Series: *logOGDP logDEF logCAP logEMP*				
Hypothesized No. of CE(s)	**Trace Statistic**	**0.05 Critical Value**	**Max-Eigen Statistic**	**0.05 Critical Value**
None	64.7540*	40.17493	39.8697*	24.15921
At most 1	24.8843*	24.27596	17.8667*	17.79730
At most 2	7.017552	12.32090	6.083406	11.22480
At most 3	0.934146	4.129906	0.934146	4.129906

* indicates rejection of null hypothesis.

Table-4. Cointegration Results for Model 3

Series: *logNGDP logDEF logCAP logEMP*				
Hypothesized No. of CE(s)	**Trace Statistic**	**0.05 Critical Value**	**Max-Eigen Statistic**	**0.05 Critical Value**
None	52.7220*	40.17493	24.9117*	24.15921
At most 1	29.8103*	24.27596	18.0247*	17.79730
At most 2	11.78556	12.32090	10.57076	11.22480
At most 3	1.214793	4.129906	1.214793	4.129906

* indicates rejection of null hypothesis.

Once it is found that there exists cointegration among variables of the study one can apply FMOLS to estimates long run coefficients. Variables are considered in natural log so coefficient can be explained as respective variable elasticity. Table 5 presents long run estimates in case of Model 1. Capital formation and labor came out with expected sign and having significant positive impact on GDP whereas the coefficient of defense expenditure is also positive but its probability is a little high however; its probability is not so much high and can be accepted as it is only 0.12. Thus, it is concluded that all three explanatory variable of Model 1 are having positive effect on GDP in long run in Saudi Arabia. One percent increase in defense expenditure, capital formation and labor will increase GDP by 0.11, 0.23, and 0.27 percent respectively.

Table-5. Long Run Estimates for Model 1

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
logDEF	0.110426[(a)]	0.070134	1.574492	0.1133
logCAP	0.234689[a]	0.063032	3.723311	0.0006
logEMP	0.268956[b]	0.128660	2.090445	0.0430
Const.	5.109283	1.417245	3.605082	0.0009
R-squared	0.890030	*Adj. R-squared*	0.881782	

[a] and [b] shows significance level at 1 and 5 percent respectively. [(a)] Probability is not very high so we accept result as significant.

Now we turn into disaggregated data as GDP is divided into oil GDP and non-oil GDP. Results for Model 2 in which oil GDP worked as dependent variable are provided in Table 6. This result highlighted that all explanatory variable are insignificant so neither of the variables have impact on oil GDP in long run.

Table-6. Long Run Estimates for Model 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
logDEF	-0.000422	0.153665	-0.002744	0.9978
logCAP	0.187104	0.138105	1.354790	0.1831
logEMP	0.044386	0.281897	0.157456	0.8757
Const.	9.113722	3.105218	2.934971	0.0055
R-squared	0.229815	Adj. R-squared	0.172051	

[a] shows significance level at 1 percent.

Long run estimation result for Model 3, in which non-oil GDP is dependent variable, depicted in Table 7. Defense expenditure has positive and significant effect on non-oil GDP in long run. A one percent increase in defense expenditure will stimulate non-oil GDP by 0.14 percent. Capital formation also has positive significant effect on non-oil GDP and one percent increase in capital formation will lead to 0.16 percent in non-oil GDP. Similarly, labor force also came out a positive and significant contributor to non-oil GDP in long run. A one percent increase in labor force will increase non-oil GDP by 0.58 percent.

Table-7. Long Run Estimates for Model 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
logDEF	0.142019[a]	0.050744	2.798762	0.0079
logCAP	0.160491[a]	0.045605	3.519115	0.0011
logEMP	0.574649[a]	0.093089	6.173148	0.0000
Const.	0.560191	1.025410	0.546309	0.5879
R-squared	0.973419	*Adj. R-squared*	0.971425	

[a] shows significance level at 1 percent.

Results of causality analysis based on VECM for Model 1 are presented in Table 8. Last column of table shows long run causality. Results confirmed that defense expenditure and labor force causing GDP in long run while two-way causality in long run is witnessed between GDP and capital formation. Now we succeed to short run causality results. Defense expenditure and GDP causing each other in short run. Similarly bidirectional causality in short run is found between capital and GDP. One-way causation is confirmed from capital formation to defense expenditure and from labor force to GDP in short run.

Table-8. Causality Results for Model 1

Variable	Δ*logGDP*	Δ*logDEF*	Δ*logCAP*	Δ*logEMP*	ECT
Δ*logGDP*	---	4.54[a]	3.15[c]	0.37	-3.83[a]
Δ*logDEF*	7.01[a]	---	4.51[a]	1.62	-0.22
Δ*logCAP*	4.32[b]	0.09	---	0.50	4.31[a]
Δ*logEMP*	3.41[b]	1.24	0.99	---	0.40

[a, b] and [c] shows significance level at 1 and 5 percent respectively.

Table 9 depicts causality results for Model 2. It is found that unidirectional causality is running from defense expenditure and capital formation to oil GDP in long run. Bidirectional causality is assured between oil GDP and labor force in long run. Furthermore unidirectional causality in long run is running from defense expenditure and

capital formation to labor force. Two-causation is determined between defense expenditure and capital formation in the short run while one-way causation is found from defense expenditure and labor force to oil GDP in the short run.

Table-9. Causality Results for Model 2

Variable	Δ*logOGDP*	Δ*logDEF*	Δ*logCAP*	Δ*logEMP*	ECT
Δ*logOGDP*	---	0.88	1.24	0.30	-2.69[b]
Δ*logDEF*	4.29[b]	---	4.99[b]	2.07	0.76
Δ*logCAP*	1.48	2.95[b]	---	0.84	0.16
Δ*logEMP*	3.24[b]	0.32	1.08	---	4.85[a]

[a] and [b] shows significance level at 1 and 5 percent respectively.

Long run and short run causality results are provided in Table 10 in case of model 3. Results confirmed that there is bidirectional causality between non-oil GDP and labor force in the long run whereas unidirectional causality is witnessed from defense expenditure and capital formation to non-oil GDP in the long run. In the short run, bidirectional causality between defense expenditure and non-oil GDP is confirmed while unidirectional causality is found from capital formation to defense expenditure and from capital formation to non-oil GDP.

Table-10. Causality Results for Model 3

Variable	Δ*logNGDP*	Δ*logDEF*	Δ*logCAP*	Δ*logEMP*	ECT
Δ*logNGDP*	---	11.14[a]	4.10[b]	1.20	-3.15[a]
Δ*logDEF*	6.15[a]	---	2.65[c]	0.96	-0.47
Δ*logCAP*	1.70	1.44	---	0.96	-0.81
Δ*logEMP*	0.48	1.06	0.49	---	-2.87[a]

[a] and [b] shows significance level at 1 and 5 percent respectively.

5. CONCLUSION

The role of defense expenditure as economic stimulator has got attention from researchers however; it is not settled yet whether it positively or negatively affects economic growth. This study carried out time series analysis for Saudi Arabian economy over period from 1969 to 2013 to determine whether defense expenditure has contributed to economic growth process. Defense expenditure is introduced in production function along with capital and labor. The output was replaced with GDP, oil GDP and non-oil GDP in three distinct models. The problem of non-stationarity was assessed with unit root test and results showed that variables got rid of non-stationarity problem by taking their first difference. Johansen cointegration determined long run relationship in all three models of the study as variables were cointegrated. This confirmed that defense expenditure is one of the factor of economic growth and also these findings are opposing the claims made by Al-Jarrah (2005) and Alshahrani and Alsadiq (2014) that defense expenditure is not a vital factor of economic growth in Saudi Arabia. For long run estimates, this study employed DOLS as this method possesses some distinguish features. The results indicated that defense expenditure, capital and labor force has positive and significant effect on GDP and non-oil GDP in long run. The positive and significant effect of defense expenditure on economic growth is opposing the findings of Alshahrani and Alsadiq (2014). However, none of the explanatory variables has significant effect on oil GDP in long run. The causality analysis was performed through VECM as models were cointegrated in the long run. The good point about VECM is that one can get both short run and long run causality between variables.

Defense expenditure and labor force causing GDP while there is bidirectional causality between capital and GDP in long run. In short run it is witnessed that defense expenditure causing GDP and vice versa, similarly it is true about capital and GDP. Capital and defense expenditure is causing oil GDP in long run and bidirectional causality exists between labor force and oil GDP. None of the variables is causing oil GDP in short run. Defense expenditure and

capital is causing non-oil GDP while there is two-way causation between labor force and non-oil GDP in the long run. Furthermore, non-oil and defense expenditure is causing each other in short run while unidirectional causality runs from capital to non-oil GDP in short run. The unidirectional causality from defense expenditure to GDP, oil GDP and non-oil GDP indicates that military expenditure is playing a crucial role the economic development of Saudi Arabia and also military expenditure will ensure security of the Kingdom not just from external aggression as if one look to the geopolitical situation of the Kingdom but also from internal security threats.

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REFERENCES

Adams, G. and D. Gold, 1987. Defense spending and the economy: Does the defense dollar make a difference? , Washington, DC: Defense Budget Project.

Al-Jarrah, M., 2005. Defense spending and economic growth in an Oil-Rich country: The case of Saudi Arabia. Pakistan Economic and Social Review, 43(2): 151-166.

Alshahrani, A.A. and A.J. Alsadiq, 2014. Economic growth and government spending in Saudi Arabia: An empirical investigation. IMF Working Paper WP/14/3.

Atesoglu, H.S., 2002. Defense spending promotes aggregate output in the United States: Evidence from cointegration analysis. Defense Peace Economics, 13(1): 55–60.

Barro, R.J., 1991. Economic growth in a cross-section of countries. Quarterly Journal of Economics, 106(2): 407–443.

Deger, S., 1986. Economic development and defense expenditures. Economic Development and Cultural Chang, 35(1): 179–196.

Dickey, D. and W. Fuller, 1979. Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74(366a): 427–731.

Gold, D., 1990. The impact of defense spending on investment, productivity and economic growth. Washington, DC: Defense Budget Project.

Halicioglu, F., 2004. Defense spending and economic growth in Turkey: An empirical application of new macroeconomic theory. Review of Middle East Economics and Finance, 2(3): 193–201.

Heo, U., 1999. Defense spending and economic growth in South Korea: The indirect link. Journal of Peace Research, 36(6): 699–708.

Heo, U., 2010. The relationship between defense spending and economic growth in the United States. Political Research Quarterly, 63(4): 760–770.

Huang, C. and A. Mintz, 1991. Defense expenditures and economic growth: The externality effect. Defense Economics, 3(1): 35–40.

Johansen, S., 1988. Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12(2): 231-254.

Johansen, S. and K. Juselius, 1990. Maximum likelihood estimation and inference on cointegration with applications to money demand. Oxford Bulletin of Economics and Statistics, 52(2): 169-210.

Killer, K., P. Panu and W. Andreas, 2006. Military draft and economic growth in OECD countries. IZA Discussion Papers, No. 2022.

Mintz, A., 1989. Guns versus butter: A disaggregated analysis. American Political Science Review, 83(4): 1285–1293.

Mintz, A. and C. Huang, 1991. Guns versus butter: The indirect link. American Journal of Political Science Review, 35(3): 738–757.

Ocal, N. and J. Brauer, 2007. Asymmetric effects of U. S. military expenditure on U. S. aggregate output. Unpublished Manuscript. Department of Economics, Augusta State University.

Rasler, K. and W. Thompson, 1988. Defense burdens, capital formation, and economic growth: The systemic leader case. Journal of Conflict Resolution, 32(1): 61–86.

Sandler, T. and K. Hartley, 1995. Defence economics. Oxford University Press. Sezgin, S., 1997. Country survey X: Defense spending in Turkey. Defense Peace Economics, 8(4): 381–409.

Shahbaz, M., N.C. Leitão, G.S. Uddin, M. Arouri and F. Teulon, 2013. Should portuguese economy invest in defense spending? A revisit. Economic Modelling, 35: 805–815.

Sivard, R.L., 1977. Military budgets and social needs: Setting world priorities. New York: Public Affairs Committee.

Smith, J.S. and M.H. Tuttle, 2008. Does defense spending really promote aggregate output in the United States? Defense Peace Economics, 19(6): 435–447.

Stock, J.H. and M. Watson, 1993. A simple estimator of cointegrating vectors in higher order integrated systems. Econometrica, 61(4): 783-820.

Wang, T.P., S.H.P. Shyu and H.C. Chou, 2012. The impact of defense expenditure on economic productivity in OECD countries. Economic Modelling, 29(6): 2104–2114.

Ward, M. and D. Davis, 1992. Sizing up the peace dividend: Economic growth and military spending in the United States, 1948–1996. American Political Science Review, 86(3): 748–755.

Ward, M., D. Davis and C. Lofdahl, 1995. A century of tradeoffs: Defense and growth in Japan and the United States. International Studies Quarterly, 39(1): 27–50.

Wijeweera, A. and M.J. Webb, 2009. Military spending and economic growth in Sri Lanka: A time series analysis. Defense Peace Economics, 20(6): 499–508.

Wijewerra, A. and M. Webb, 2011. Military spending and economic growth in South Asia: A panel data analysis. Defense Peace Economics, 22(3): 545–554.

Yakovlev, P., 2007. Arms trade, military spending, and economic growth. Defense and Peace Economics, 18(4): 317–338.