Defence Expenditure and Economic Growth: Evidence from India

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Abstract:

In this study by applying VECM analysis in the Dreger model we found bi-directional causality between GDP and defense expenditure, unidirectional causality from GDP to merchandise trade and from gross domestic savings to merchandise trade and no causality from any of the test variable to gross domestic savings. Merchandise trade found to be having positive response in one SD structural shock in defense expenditure and GDP found to be having negative response in one SD structural shock in defense expenditure.

Key Words: Defence expenditure, economic growth, VECM, IRFs.

1. INTRODUCTION

Defence expenditure is one of the most important topics in the government budgets allocation destinations of overall budget allocations of all countries and is a major user of scarce resources. In countries like India a greater amount of budget is still allocated every year for defence purposes implying the sacrifice of alternative civil expenditures. The relationship between military expenditure and economic growth has frequently been explored empirically in the defense economics literature since the seminal empirical research of Benoit (1973, 1978), which suggested that military spending had a positive impact on economic development. The results of Benoit's ad hoc studies are derived from the existence of a series of spin-offs, spill-overs and positive externalities which led to a significant number of empirical studies.

There are, broadly, two groups of empirical research in the defense literature. The first group consists of those studies which uses single regression equations in order to test the impact of military expenditure on growth via Neoclassical[1] or Keynesian[2] approaches. Whereas the Neoclassical models have focused on the supply-side (i.e., modernization positive externalities from infrastructure, technological spin-offs), the Keynesian models have focused on the demand-side (i.e., crowding-out of investment, exports, education, health). The Neoclassical or supply-side model of growth and defense is based on the work of Feder (1982), Ram (1986) and Biswas and Ram (1986), which is referred to as the Feder–Ram model. The Keynesian or demand-side models are based on the initial work of Smith (1980). To overcome the problem of single equation by concentrating on the demand or supply-side only, models were developed in simultaneous equation framework with a Keynesian aggregate demand and supply-side function, in the form of a growth equation derived from an aggregate production function. Those studies which uses simultaneous equation models by incorporating both the demand and supply sides to measure the impact of the military expenditure on growth forms the second group of empirical studies. These models are based on the work of Deger and Smith (1983) and Deger (1986) and is known as the Deger type model. However, from the empirical studies it appears that there is no clear-cut agreement among the researchers about the nature and extent of the growth effects of military expenditure. For example, by using the Feder–Ram models, Ram (1986), Atesoglu and Mueller (1990) and Ward et al. (1991) found a positive impact, while Biswas and Ram (1986), Alexander (1990) and Huang and Mintz (1991) concluded that there exists no relationship at all. With regard to the single demand-side equations, Smith (1980) and Rasler and Thomson (1988) showed a negative impact of military spending on growth. Finally, evidence from most of the simultaneous equation models indicates a negative impact of military expenditures on economic growth (Deger, 1986; Antonakis, 1997). Sezgin (1997),

[1] Examples of Neoclassical studies include: Feder (1982), Ram (1986), Biswas and Ram (1986), Alexander (1990), Sezgin (1997) and Murdoch, Pi and Sandler (1997).

[2] Examples of Keynesian studies include: Smith (1980), Lim (1983), Faini, Annez and Taylor (1984), and Chletsos and Kollias (1995).

employing a Feder–Ram model, found a positive effect, while Ozsoy (2000), using the same method, found no impact in case of Turkey. However, these findings are considered to be dubious (Brauer, 2002), as Sandler and Hartley (1995, pp. 206–209) states that the Feder-Ram type model is inherently structured to find a positive impact of military expenditure on economic growth. Moreover, using the Granger–Causality analysis, Sezgin (2000) showed that there exists a negative impact of military expenditure on economic growth. Sezgin (1999, 2001), on the other hand, using a Deger type model showed a positive effect of military expenditures on growth in the Turkey. Yildirim and Sezgin (2002) also showed a positive impact of military expenditures on economic growth by using a non-theoretical VAR model, which included real income, real savings, real military expenditure, labor force, and real balance of trade variables. Joerding (1986) using Granger causality tests, investigated the direction of causality between defence spending and growth for 57 LDCs over the period of 1962 to 1977. He found that causality runs from growth to defence, and there was little evidence of causality from defence to growth. On the other hand, Chowdhury (1991) did not find any causality between defence spending and growth for most of a group of 55 LDCs. Dunne and Vougas (1998) found that military burden has a negative impact on the economic growth in South Africa.

2. OBJECTIVES, DATA SOURCE, DATA TYPE, VARIABLES DESCRIPTION, AND METHODOLOGY

The main objective of the study is to analyse the direction of the causality between the economic growth and defence expenditure in both static and dynamic framework. To the best of our knowledge this kind of analysis has not be carried out in the context of India. Therefore, objective set in this study is justified. This study has used time series data sourced from Handbook of statistics of Reserve Bank of India (RBI) and World Development Indicator (WDI) accessed on May 19, 2010. In this study, the growth equation used in Deger model has been adopted for estimation purpose. The extracted growth equation from Deger model is:

$$Y = a0 + a1\ S + a2\ T + a3\ D + a4\ L \ldots\ldots(1)$$

where Y is gross GDP, S is gross domestic savings, T is total trade, D is defense expenditure, L is labour force. Given these, it is predicted that S and L are positively correlated to economic growth, which is standard from any basic growth theoretic model[3]. The positive coefficient of total trade implies that total trade increases economic growth and negative sign for the coefficient of total trade imply the net capital inflow from abroad which stimulate economic growth. Defence spending variable assumed to have direct positive effect on economic growth through Keynesian aggregate demand and modernisation effect.

However, in the present study we have preferred to use all variables in percapita form. Therefore, our model is turned out to be $Y_{PC} = a0 + a1\ S_{PC} + a2\ T_{PC} + a3\ D_{PC\ldots\ldots}$(2). It is to be noted that interpretation of all explanatory variables will remain unaffected after modifying our

[3] See Deger and Smith (1983), Faini et. al (1984), Deger (1986) and Lebovic and Ishaq (1987).

equation of estimation. To know the causality among the test variables used in the equation (2) in the VECM framework there are certain pre-estimations (like testing the stationarity of the variables included in the VECM analysis and seeking the cointegration of the series) we should carry out without which, conclusions drawn from the estimation will not be valid. Therefore, in the first step we have carried out unit root analysis by applying three different tests namely, (Augmented) Dickey Fuller (hereafter, DF/ADF) test, Phillips and Perron (hereafter, PP) (1988) test and Ng and Perron (hereafter, NP) (2001) test. In all cases, we will test the unit root property of the variables by employing the model suggested by the graphical plot of the variables in question. Augmented form of the DF test is used when there is problem of serial correlation and to choose appropriate lag length Schwarz Information Criteria (hereafter, SIC) has been preferred. Since, PP test has advancements over DF/ADF test in the sense that whereas DF/ADF test use a parametric autoregression to approximate the ARMA structure of the errors in the test regression, PP test correct for any serial correlation and heteroskedasticity in the errors. Therefore, it is also used for analysis. In PP test to select appropriate lag length we have adopted Newey-West using Bartlet kernel method. In both tests, null hypothesis is that series is nonstationary that is series has a unit root. For all cases if critical value (which is based on Mackinnon, 1996) exceeds the calculated value in absolute terms (less in negative terms) null hypothesis will not be rejected implying that that series is nonstationary. In both these tests, test involves the testing of coefficient associated with one year past value of dependent variable.

However, Ng and Perron (2001) has suggested that PP test suffers from severe size distributions properties when error term has negative moving-average root. When root is close to minus one (e.g., -.79) the rejection rate can be as high as 100%. (see, Schwert, 1989). Ng and Perron (2001) has proposed three tests which are based on Modified SIC and Modified AIC, while DF/ADF test and PP test are based on nonmodified information criteria. Two tests of Ng and Perron (2001) test are said to be more powerful namely MZ(α) and MZ(t) (Mollick, 2008). Hence, in this study results of these two statistics are reported.

When it is found that variables used in this study are nonstationary and having same order of integration we have proceed for cointegration analysis. In this study we have preferred Johansen and Juselius (1990) (hereafter JJ) method (as Gonzalo, 1994 has suggested that JJ test is superior to other tests of cointegration). JJ test provides two Likelihood Ratio (LR) test statistics for cointegration analysis. First test is trace (λ_{trace}) statistics and the second one is maximum eigenvalue (λ_{max}) statistics. The trace statistics tests the null hypothesis that the number of cointegrating relations is r against of k cointegration relations, where k is the number of endogenous variables. The maximum eigenvalue test, tests the null hypothesis that there are r cointegrating vectors against an alternative of r+1 cointegrating vectors. Critical value for estimation has been obtained from Mackinnon-Haug-Michelis (1999) which differs slightly from those provided by JJ. For both tests if the test statistic value is greater than the critical value, the null hypothesis of r cointegrating vectors is rejected in favor of the corresponding alternative hypothesis.

Once the cointegrating vectors have been estimated among a set of variables one can proceed to carry out VECM analysis. If variables in the system are nonstationary and cointegrated, the Granger-causality test in VCM framework will be based on the following equations:

$$\Delta X_t = \alpha_x + \sum_{i=1}^{k} \beta_{x,i} \Delta X_{t-i} + \sum_{i=1}^{k} \gamma_{x,i} \Delta Y_{t-i} + \varphi_x ECT_{x,t-i} + \varepsilon_{x,t} \text{........(3)}$$

$$\Delta Y_t = \alpha_y + \sum_{i=1}^{k} \beta_{y,i} \Delta Y_{t-i} + \sum_{i=1}^{k} \gamma_{x,i} \Delta X_{t-i} + \varphi_y ECT_{y,t-i} + \varepsilon_{y,t} \text{........(4)}$$

Where, φ_x and φ_y are the parameters of the ECT term, measuring the error correction mechanism that drives the X_t and Y_t back to their long run equilibrium relationship.

The null hypothesis (H_0) for the equation (3) is

$$H_0 : \sum_{i}^{k} \gamma_{x,i} = 0$$

suggesting that the lagged terms ΔY do not belong to the regression i.e., it do not Granger cause ΔX. Conversely, the null hypothesis (H_0) for the equation (4) is

$$H_0 : \sum_{i}^{k} \gamma_{y,i} = 0 ,$$

suggesting that the lagged terms ΔX do not belong to regression i.e., it do not Granger cause ΔY. The joint test of these null hypotheses can be tested either by F-test or Wald Chi-square (χ^2) test. In the present study Wald Chi-square (χ^2) test has been preferred. This F-test gives us an indication of the 'short-term' causal effects or strict exogenity of the variables. If the coefficients of $\gamma_{x,i}$ are statistically significant, but $\gamma_{y,i}$ are not statistically significant, then X is said to have been caused by Y (unidirectional). The reverse causality holds if coefficients of $\gamma_{y,i}$ are statistically significant while $\gamma_{x,i}$ are not. But if both $\gamma_{y,i}$ and $\gamma_{x,i}$ are statistically significant, then causality runs both ways (bidirectional). Independence is identified when the $\gamma_{x,i}$ and $\gamma_{y,i}$ coefficients are not statistically significant in both the regressions. On the other hand, the significance of the lagged error-correction term(s) (measured through t-test) will indicate the Granger causality (or endogenity of the dependent variable). The coefficient of the lagged error-correction term, however, is a short-term adjustment coefficient and represents the proportion by which the long-term disequilibrium (or imbalance) in the dependent variable is being corrected in each short period. The non-significance or elimination of any of the lagged error-correction terms affects the implied long-term relationship and may be a violation of theory. The non-significance of any of the 'differenced' variables which reflects only the short-term relationship, does not involve such a violation because, the theory typically has nothing to say about short-term relationships. The non-significance of both the t-test(s) as well as the F-tests in the VECM will imply econometric exogenity of the dependent variable.[4]

Diagnostic checks analysis has been performed to the models used for VECM to test the stochastic properties of the model such as residuals autocorrelation, heteroskedasticity, normality parameters stability (by applying Chow's test), Wald-test of lag exclusion, ARCH-LM test[5] and finally VECM stability[6] analysis has been carried out. This was because if the model is stochastic then only further analysis based on the model is possible and inference drawn from the results of VEC modelling will not be biased. If any of these tests support the null hypothesis then we have adopted lag structure suggested by AIC and again model selection test, cointegration test and finally VECM analysis has been carried out. Again we have performed diagnostic checks unless we have obtained a good estimated model. After obtaining write specification we have carried out Impulse Response Functions (IRFs) analysis. Since F-test and t-test in VECM may be interpreted as within sample causality tests since they only indicate the Granger-exogenity or endogenity of the dependent variable within period under consideration (see Masih and Masih, 1996). These tests do not provide information regarding the relative strength of the Granger causal chain amongst the variable beyond the period under study. In order to analyze the dynamic properties of the system the Impulse Response Functions (IRFs) are computed.[7] Impulse response function traces the impact of a shock in a variable into the system, over a period of time (in present study 10 years). More specifically, an IRF traces the effect of a one standard deviation shock to one of the innovations (error terms) and its impact on current and future values of the endogenous variables.

3. DATA ANALYSIS AND RESULTS INTERPRETATION

First of all unit root test has been carried out for all variables using Dickey-Fuller (DF) or Augmented Dickey-Fuller test (ADF) (if the problem of autocorrelation is found to exist),

[4] The lagged error-correction term contains the log-run information, since it is derived from the long-term cointegration relationship(s). Weak exogenity of the variable refers to ECM-dependence, i.e. dependence upon stochastic trend.

[5] Presence of autocorrelation/serial correlation has been tested by using Lagrange Multiplier (LM) test and adopted same lag order as that of corresponding lag order in VECM by following Harris (1995, 82). Presence of heteroskedasticity has been tested by using White heteroskedasticity test. Normality of residuals has been tested through Jarque-Bera (JB) normality test following Urzua's (1997) method of residual factorization (orthogonalization) as it makes a small sample correction to the transformed residuals before computing JB test as sample elicit size of the present study is small. Further, in case of ARCH-LM we have used same as used in VECM analysis.

[6] If the estimated VECM is stable then the inverse roots of characteristics Autoregressive (AR) polynomial will have modulus less than one and lie inside the unit circle. There will be kp roots, where k is the number of endogenous variables and p is the largest lag.

[7] To compute IRFs generalized approach has been preferred over Choleskey orthogonalization approach or other orthogonalization approaches because it is invariant of ordering of the variables as results of IRFs are sensitive to the ordering of the variables.

Phillips-Perron (PP) test and finally Ng and Perron (NP) test. Results of unit roots are reported in table 1.

Table 1: Results of unit root

Variables	Unit root tests					
	Constant	Constant and trend	DF/ADF (k)	PP (k)	NP	
					(MZa) (k)	(MZt) (k)
LNDEFENCEEXPENDITUREPC	----	Yes	-1.923781 (0)	-2.024058 (1)	-7.71373 (0)	-1.8398 (0)
D(LNDEFENCEEXPENDITUREPC)	Yes	------	-6.243307* (0)	-6.25320* (3)	-12.837** (0)	-2.47994** (0)
LNGDPPC	------	Yes	-0.874104 (0)	-0.874104 (0)	-0.15925 (0)	-0.06312 (0)
D(LNGDPPC)	Yes	----	-5.291278* (0)	-5.33219* (3)	-17.5218* (0)	-2.8553* (0)
D(LNGDPPC)	----	Yes	-7.410436* (0)	-7.98869* (4)	-17.7986* (0)	-2.9799* (0)
LNGROSSDOMESTICSAVINGPC	----	Yes	-1.830170 (0)	-1.938677 (1)	-7.55843 (0)	-1.76648 (0)
D(LNGROSSDOMESTICSAVINGPC)	Yes	------	-5.896940* (0)	-5.89694* (0)	-19.5834* (0)	-3.10118* (0)
D(LNGROSSDOMESTICSAVINGPC)	------	Yes	-5.929050* (0)	-5.92878* (1)	-18.612** (0)	-3.04777** (0)
LNMERCHANDISETRADEPC	----	Yes	-4.654594* (1)	-4.0178** (13)	-10.0831 (1)	-2.17227 (1)
D(LNMERCHANDISETRADEPC)	Yes	--------	-3.010127** (0)	-2.869*** (6)	-12.147** (0)	-2.45482** (0)

*denotes significant at 1% level, **denotes significant at 5% level. (K) Denotes lag length.
Note: selection of lag length in NP test is based on Spectral GLS-detrended AR based on SIC and selection of lag length (Bandwidth) and in PP test it is based on Newey-West using Bartlett kernel.

Source: Author's calculation

It is evident from the table (1) that all variables are nonstationary in their level form and they are turning to be stationary after first difference i.e., (I). Since all variable are (I) therefore we can proceed for cointegration analysis. To proceed for cointegration first step is selection of appropriate lag length. Therefore, we have carried out a joint test of lag length selection which suggests (basing upon SBIC) we should take one lag of each variable[8]. However, when we have proceeded with lag length as suggested by SBIC and we have obtained appropriate model, we have carried out cointegration analysis and using that cointegrating vector VECM analysis has been carried out and finally when we have performed diagnostic checks[9] (using Wald test for lag exclusion, JB test for normality analysis, White heteroskedastic test to test for problem of heteroskedasticity and LM test for checking problem of serial correlation) specification of VECM models was found to be incorrect then we have proceeded to choose lag length suggested by AIC and for all cases we again have preferred SBIC. So, we have chosen lag

[8] Results of lag length selection can be obtained by request to the Author's.
[9] Results of all these analysis can be obtained upon request to the Author's.

intervals (1, 3) and then joint test for cointegrating vector and model selection has been performed, that is what we call Pantula Principle[10]. We found from the results of Pantula Principle that SBIC and AIC have preferred model 5. Since, model 1 and model 5 has been said to be theoretically inappropriate therefore we have preferred the model in which we have obtained minimum value of SIC and AIC i.e., model 4. Further, choosing model 4, and lag interval (1, 3) we have carried out JJ cointegration test. Results of cointegration test are reported in the following table 4.

Table 4: Cointegration test

Cointegration test [Trend assumption: Linear deterministic trend (restricted) Lags interval (in first differences): 1 to 3]					
Unrestricted Cointegration Rank Test (Trace)					
H_0	H_a	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None*	At most 1	0.673550	85.04217	63.87610	0.0003
At most 1 *	At most 2	0.547527	46.97987	42.91525	0.0186
At most 2	At most 3	0.302900	20.01697	25.87211	0.2251
At most 3	At most 4	0.203803	7.748890	12.51798	0.2729
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)					
H_o	H_a	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Prob.**
None *	At most 1	0.673550	38.06230	32.11832	0.0083
At most 1 *	At most 2	0.547527	26.96290	25.82321	0.0353
At most 2	At most 3	0.302900	12.26808	19.38704	0.3906
At most 3	At most 4	0.203803	7.748890	12.51798	0.2729
* denotes rejection of the hypothesis at the 0.05 level and **MacKinnon-Haug-Michelis (1999) p-values					
Source: Author's calculation					

It is evident from the table (4) that both Trace and Eigenvalue criteria rejects the null hypothesis of at most one cointegrating vector against the alternative of two cointegrating vectors. Result of Engle-Granger causality analysis has been reported in the following table 6.

Table 6: VECM and Engle-Granger causality analysis

VEC Granger Causality Short Run (Wald test/χ^2)				
Independent variables (k)	Dependent variables			
	D(LNGDPPC)	D(LNDEFENCEEXPPC)	D(LNGROSSDOMESTICSAVINGPC)	D(LNMERCHANDISETRADEPC)
D(LNGDPPC)	------	8.182625**	1.497831	6.671760***
D(LNDEFENCEEXPPC)	7.048***	------	2.082330	1.048207
D(LNGROSSDOMESTICSAVINGPC)	5.490762	5.460909	-------	6.495416***

[10] Results of model selection test can be obtained by request to the Author's

D(LNMERCHANDISETRADEPC)	1.204352	4.996867	1.272536	---------
VEC Granger Causality Long Run				
CointEq1	0.443708 [1.01576]	-2.832228* [-2.98710]	0.700762 [0.57543]	-0.618677* [-3.29807]
CointEq2	-0.045370 [-0.46453]	-0.583594** [-2.75289]	0.184215 [0.67656]	-0.088875** [-2.11900]
Note: (1)*, **and ***denotes significant at 1%, 5%, and 10% level respectively; (2) 'D" denotes first difference; (3) (k) denotes lag length.				
Source: Author's calculation				

It is evident from table (6) that defense expenditure Granger cause GDP and GDP Granger cause defense expenditure which implies that bi-directional causality exist between defense expenditure and GDP. It is also found that GDP and saving Granger cause merchandise trade not the vice versa which implies that unidirectional causality exist from GDP and saving to merchandise trade. It is interesting to note that no variable Granger cause saving.

Cointegrating vectors i.e., error terms are significant when dependent variable is defense expenditure and merchandise trade which implies that long run causality exist between combined effects of four variables in relevant equation when dependent variable is defense expenditure and merchandise trade. It can also be concluded that GDP and saving are weakly exogenous.

To check the validity of VECM and Granger causality, we have carried out diagnostic checks analysis employing Wald test for lag exclusion, LM test for serial correlation, White test with cross products for heteroskedasticity and to check the specification of VECM, and J-B test for normality. Results of diagnostic checks are reported in the following table 7.

Table 7: Diagnostic checks analysis

VEC Lag Exclusion Wald Tests (Chi-squared test statistics for lag exclusion) for Dlag 3. (Joint test)		P-Value
20.33450		[0.205531]
VEC Residual Serial Correlation LM Tests		
1lag	26.64647	0.0456
2lag	19.04940	0.2661
3lag	18.87034	0.2754
VEC Residual Normality Tests-Joint J-B test (Orthogonalization: Residual Covariance (Urzua)		
57.12743		0.3960
VEC Residual Heteroskedasticity Tests (Joint test of Chi- square)		
286.7157		0.3784
Source: Author's calculation		

It is evident from the table (7) that the specification of VECM is correct as no test is rejecting the null hypothesis.

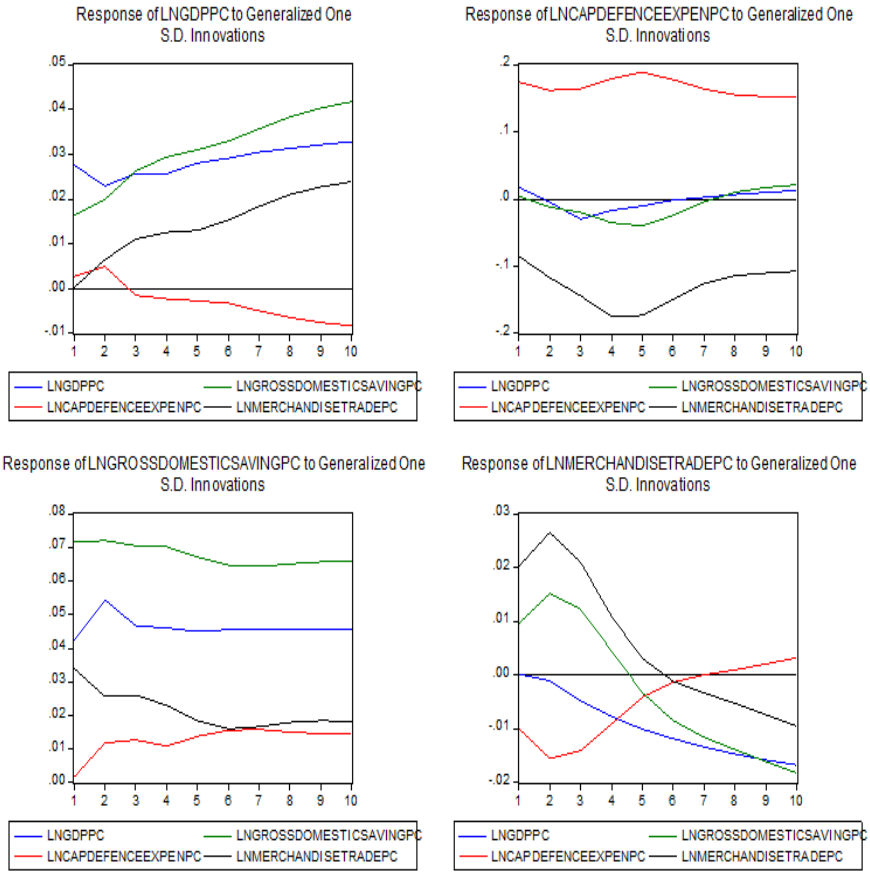
Finally, we have carried out VECM stability test and result is reported in table (8). It is evident from the table that moduli of all roots are less than unity and lie within the unit circle. So the estimated VECM is stable or stationary.

Table 8: VECM stability analysis

Roots of Characteristic Polynomial and Lag specification: 1 3	
Endogenous variables: LNGDPPC LNDEFENCEEXPPC LNGROSSDOMESTICSAVINGPC LNMERCHANDISETRADEPC	
Eigenvalue	Modulus
1	1
1	1
.9762984	.976298
-.4521642 + .6657157	.804754
-.4521642 - .6657157	.804754
.4920663 + .603955	.779032
.4920663 - .603955	.779032
.3666735 + .6771981	.770095
.3666735 - .6771981	.770095
.6378998 + .3208186	.714031
.6378998 - .3208186	.714031
-.6070628	.607063
-.2928496 + .3982765	.494353
-.2928496 - .3982765	.494353
-.4898099	.48981
.01645781	.016458
Note: The VECM specification imposes 2 unit moduli	
Source: Author’s calculation	

Since our VECM performs well in all kind of diagnostic checks we have performed and also it is stable which allows us to proceed for IRFs and VDs analysis. A combined graph of IRFs has been drawn and named fig.1.

Figure1: IRFs



It is evident from the figure that response of GDP in any structural shock/innovation in itself has positive effect i.e., shock in GDP increases GDP however, up to the 2nd year it decreases GDP; any structural innovation in saving and merchandise trade increases GDP rapidly in all 10 years. While any structural innovation in defense expenditure will increase GDP up to 2nd year thereafter its impact is decreasing and from the 3rd year onwards its impact is negative but not severe.

Response of defense expenditure in any shock in itself has fluctuating pattern however, its impact is positive in all years. Response of defense expenditure in any one standard deviation (SD) innovation in saving and GDP first decreases defense expenditure and in the 2nd year it turns out to be negative and after 5 years (i.e., 7th year from the shock year) it again turns to be positive, while response of defense expenditure to one SD in merchandise trade is negative throughout the 10 years.

Response of saving in one SD in itself is roughly constant, in GDP has shown a slight improvement, in trade has shown decreasing value. However, in defense it has increased in all the years.

Response of trade in one SD in merchandise trade and saving is same i.e., up to 2nd year it increases and from 2nd year onwards it starts to decrease and in 5th year for saving and 6th year for merchandise trade it turns out to be negative. Response of trade to one SD in GDP is negative throughout the 10 years. And response of trade in one SD in defense expenditure is negative for 7th years (though negative value is decreasing) and thereafter its effect is positive. Response of trade in one SD is negative through the 10 years.

4. CONCLUSIONS

Results of Granger causality analysis reviles that there is bi-directional causality between GDP and defense expenditure. Which implies that increase in either defense expenditure or GDP will bring momentum and both will increase over the time. It is found that GDP Granger causes merchandise trade but merchandise trade does not Granger causes GDP. Similarly gross domestic savings Granger causes merchandise trade not the vice-versa. It is interesting to note that no variable (among the variables included in the model) found to Granger cause gross domestic savings.

Merchandise trade found to be having positive response in one SD structural shock in defense expenditure and GDP found to be having negative response in one SD structural shock in defense expenditure. Which implies that any sudden increase in defense expenditure will give positive indication to trader on the security aspect therefore they will be willing to trade more in one hand but it has a high opportunity cost in terms of as huge fund will be used which could have been used for other productive purposes. Therefore, we can say that if defense expenditure increases in India it will increase openness one the one hand but it has negative impact on GDP on the other hand. Trade linkages of India with trading parterres will enhance. It is also found that any sudden increase in defense expenditure will give positive indication to domestic savers therefore domestic saving will also increase. Further, policy makers of India should try to minimize the shocks in merchandise trade as it has negative impact on defense expenditure. Here the question is what could be done to just have a balance on the positive and negative effects of shocks on defense expenditure or to minimize the negative impact on one hand and maximize that positive impact of defense expenditure. Since here we have a problem that shock in defense expenditure increases openness and domestic savings but decreases GDP. Increase in domestic savings may be due to the fear people have for investment if it is for some section of society then it is not a problem but if whole nation starts to save then we have a problem of what is called “Saving paradox”. Therefore, the issues that need to be addressed is to analyze the role of capital and revenue defense expenditure and which section of the society is more sensitive to shocks in defense expenditure. It should be noted that results drawn in the study has been obtain without analyzing structural breaks therefore our results hold good subject to structural breaks.

Reference

Alexander, W. R. J. The Impact of Defence Spending on Economic Growth: A Multi-Sectoral Approach to Defence Spending and Economic Growth with Evidence from Developed Economies, Defence Economics. 2: 39–55, (1990).

Antonakis, N. Military Expenditures and Economic Growth in Greece, 1960–1990, Journal of Peace Research. 34: 89–100, (1997).

Atesoglu, H. S. and Mueller, M. J. Defence Spending and Economic Growth, Defence Economics. 2: 89–100, (1990).

Benoit, E. Defense and Economic Growth in Developing Countries. Boston: Lexington Books (1973).

Benoit, E. Growth and Defense in Developing Countries, Economic Development and Cultural Change. 26: 271–287, (1978).

Biswas, B. and Ram, R. Military Expenditures and Economic Growth in Less Developed Countries: An Augmented Model and Further Evidence, Economic Development and Cultural Change. 34: 361–372, (1986).

Brauer, J. Survey and Review of the Defense Economics Literature on Greece and Turkey: What have we Learned?, Defence and Peace Economics. 13: 85–107, (2002).

Chletsos, M. and Kollias, C. The Demand for Turkish Military Expenditure 1960-1992, Cyprus Journal of Economics. 8: 64-74, (1995).

Chowdhury, A. A Causal Analysis of Defence Spending and Economic Growth, Journal of Conflict Resolution. 35: 80-97, (1991).

Deger, S. and Smith, R. P. Military expenditures and growth in less developed countries, Journal of Conflict Resolution. 27: 335–353, (1983).

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

Faini, R., Annez, P. and Taylor, L. Defence Spending, Economic Growth, and Growth Evidence Among Countries Over Time, Economic Development and Cultural Change. 32: 487–498, (1984).

Faini, R., Annez, P. and Taylor, T. Defence Spending, Economic Structure and Growth Evidence among Countries and Overtime, Economic Development and Cultural Change. 32: 487-498, (1984).

Feder, G. On exports and economic growth, Journal of Development Economics. 12: 59–73, (1982).

Gonzalo, J. Five Alternative Methods of Estimating Long-Run Equilibrium Relationships, Journal of Econometrics. 60: 203–233, (1994).

Harris R. Using Cointegration Analysis in Econometric Modeling. London: Prentice Hall (1995).

Huang, C. and Mintz, A. Defence Expenditures and Economic Growth: The Externality Effect, Defence Economics. 3: 35–40, (1991).

Joerding, W. Economic Growth and Defence Spending: Granger causality, Journal of Development Economics. 21: 35-40, (1986).

Johansen, S., Juselius, K. Maximum Likelihood Estimation and Inference on Cointegration with Applications to Money Demand, Oxford Bulletin of Economics and Statistics. 52: 169-210, (1990).

Lebovic, J. H. and Ishaq, A. Military Burden Security Needs and Economic Growth in the Middle East, Journal of Conflict Resolution. 31: 106-138, (1987).

Lim, D. Another look at Growth and Defence in Developed countries, Economic Development and Cultural Change. 31: 377-384, (1983).

Mackinnon, J. G. Numerical Distribution Functions for Unit Root and Cointegration Test, Journal of Applied Econometrics. 11: 601-618, (1996).

Mackinnon, J. G., Alfred A. Haug, and Leo Michelis. Numerical Distribution Functions of Likelihood Ratio Test for Cointegration, Journal of Applied Econometric. 14: 563-577, (1999).

Masih, A.M.M., Masih, R. Energy Consumption, Real Income and Temporal Causality: Results from a Multi-Country Study Based on Cointegration and Error-Correction Modelling Techniques, Energy Economics. 18: 165-83, (1996).

Mollick, A.V. Employment Responses of Skilled and Unskilled Workers at Mexican Maquiladoras: The Effects of External Factors, World Development. 37: 1285-1296, (2008).

Murdoch, J.; Pi, C-R.; Sandler, T. The Impact of Defence and Non-Defence Public Spending on Growth in Asia and Latin America, Defence and Peace Economics. 8, 205-224, (1997).

Ng, Serena, and Pierre Perron. Lag Length Selection and the Construction of Unit Root Tests with Good Size and Power, Econometrica. 69: 1519-1554, (2001).

Ozsoy, O. The Defence Growth Relation: Evidence from Turkey. In: The Economics of Regional Security: NATO, the Mediterranean, Southern Africa, edited by Jurgen Brauer and Keith Hartley (Amsterdam: Harwood Academic Publishers), 139–159, (2000).

Phillips, P., and Pierre Perron. Testing for a Unit Root in Time Series Regression, Biometrica. 75: 335-346, (1988).

Ram, R. Government Size and Economic Growth: A new Framework and Some Evidence from Cross-Section and Time-Series Data, American Economic Review. 76: 191–203, (1986).

Rasler, K. and Thompson, W. R. Defense Burdens, Capital Formation, and Economic Growth, Journal of Conflict Resolution. 32: 61–86, (1998).

Sandler, T. and Hartley, K. Defence Economics. Oxford: Oxford University Press (1995).

Schwert, G. W. Tests for Unit Roots: A Monte Carlo Investigation, Journal of Business and Economic Statistics. 7: 147-160, (1989).

Sezgin, S. Country Survey X: Defence Spending in Turkey, Defence and Peace Economics. 8: 381–409, (1997).

Sezgin, S. Defence Expenditure and Economic Growth in Turkey and Greece: A Disaggregated Analysis, Paper presented at the ‘Arms Trade, Security, and Conflict’ Conference, Middlesex University Business School, London, June 11–12, (1999).

Sezgin, S. A Causal Analysis of Turkish Defence Growth Relationships: 1924–1996, Ankara University Journal of Political Sciences. 55: 113–124, (2000).

Sezgin, S. An Empirical Analysis of Turkey’s Defence-Growth Relationships with a Multi-Equation Model (1956–1994), Defence and Peace Economics. 12: 69–81, (2001).

Smith, R. Military Expenditure and Investment in OECD Countries, 1954–1973, Journal of Comparative Economics. 4: 19–32, (1980).

Urzua, C. M. Omnibus Test for Multivariate Normality Based on a Class of Maximum Entropy Distributions, Advances in Econometrics. 12: 341-358, (1997).

Ward, M. D., Davis, D., Penubarti, M., Rajmaira, S. and Cochrane, M. Military spending in India – country survey, Defence Economics. 3: 41–63, (1991).

Yildirim, J. and Sezgin, S. A System Estimation of the Defense-Growth Relation in Turkey. In: Arming the South: The Economics of Military Expenditure, Arms Production and arms Trade in Developing Countries, edited by Jurgen Brauer, J. Paul Dunne (London: Palgrave Publishing), 319–325 (2002).