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Military Expenditure and Economic Growth Nexus in the Post-reform Era of India

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ABSTRACT

The effect of military expenditure on the economy is a controversial area of research among economists. Particularly, in the last four decades, there has been a growing interest in the role of military spending in developing countries. The issue that has received the most attention has been whether military expenditure helps or hinders economic growth. A possible beneficial effect of defense expenditure lies in its role in creating effective demand when there is slack in the economy. Within the Keynesian framework of macroeconomic analysis, government expenditure on goods and services including defense is an important force in the determination of output and employment. On the other hand, military spending cannot contribute to a nation's ability to produce more economic goods and services in the future. More public expenditure in the military sector leads to crowding out of private investment and less investment on public goods like health, education, infrastructure and research and development. Under these circumstances this paper tries to reinvestigate this relationship in India specially in the post reform era. This study finds defense spending is not significantly helping economic growth of India within the time horizon of the study. On the other hand, capital formation is playing a significant role for economic growth of India.

Keywords: Military, economic growth, employment, macroeconomic

Military expenditure is an essential part for any economy. To protect the motherland from foreign invasion, to maintain peace and stabilize border tension, to maintain a balance in strength among neighboring countries military expenditure is inevitable. Similarly, to conduct smooth and fair election process, to control riot and violence among nations, to help the people with flood, cyclone, earthquake, drought or other natural calamity affected areas militaries are essential.

On the other hand, if huge money is spent to continue the war-war game with nabouring countries, huge foreign exchange is spent to import foreign made modern weapons just to please the developed powerful countries results less amount is available for investing in health, education, infrastructure, industrialization, import of foreign sophisticated technology for the own nations. Thus it becomes a very old issue whether military expenditure helps economic growth or hampers economic growth.

Objective, Data and Methodology of the Study

An attempt has been taken in this paper to reinvestigate the military expenditure and economic growth nexus in India. The data is taken from world development indicator data. The type of data is annual time series data and the time period covers from 1990 to 2015 that is the post reform era in India. The variables in this study are used as GDP at constant prices, Military expenditure, GDP, Total Labour force, Capital Formation etc. OLS regression technique is used in this study.

Theoretical Foundation

We start with neo-classical production function

approach to analyse the military expenditure and economic growth nexus. The neo-classical production function states that output depends on labour, capital and military expenditure. (Biswas Basudeb, 1992). Hence, taking total derivatives and manipulating the expression we can derive the following equation.

$$Y = Y(L,K,M) \quad \ldots(1)$$

Taking total derivative we get,

$$DY = Y_l\, DL + Y_k\, DK + Y_m\, DM \quad \ldots(2)$$

Dividing both sides by Y,

$$DY/Y = Y_l\, DL/Y + Y_k\, DK/Y + Y_m\, DM/Y \quad \ldots(3)$$

With some manipulation equation (3) can be rewritten as,

$$\frac{DY}{Y} = \frac{L}{Y} Y_l \frac{DL}{L} + \frac{K}{Y} Y_k DK/K + \frac{Y_m M}{Y} DM/M \quad \ldots(4)$$

Or,

$$\dot{Y} = \beta_1 \dot{L} + \beta_2 \dot{K} + \beta_3 \dot{M} \quad \ldots(5)$$

Equation (5) can be rewritten as an econometric equation in the following way,

$$\dot{Y} = \beta_0 + \beta_1 \dot{L} + \beta_2 \dot{K} + \beta_3 \dot{M} + U \quad \ldots(6)$$

Where β_0 is the intercept, β_1 is the elasticity of output with respect to labour, β_2 is the elasticity of output with respect to capital and β_3 is the elasticity of output with respect to military expenditure and finally *U* is the stochastic disturbances.

The above equation states that output growth depends on that is, growth of labour force and growth capital formation and growth of Military expenditure.

Findings

The results of the estimated regression equation (6) is shown in the table 1.

From the table 1 it is clear that β_2 is statistically significant. It implies growth of capital stock plays a significant role in economic growth but the growth of military expenditure has negligible impact on economic growth. Another interesting finding is that the growth of labour force shows negative impact on economic growth and it is statistically significant. It implies the growth mainly consists of unskilled, labour force. Moreover, the efficiency or the work culture of the laborers' specially in the government sector or disguised employment in agriculture may be responsible for this negative relationship.

Diagnostic checking

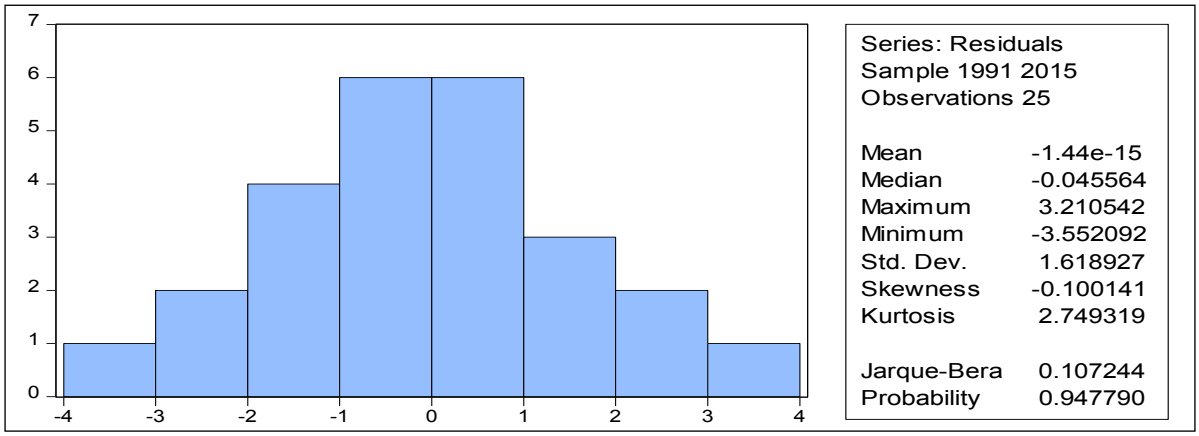
The normality of the regression residual shown in the figure below shows the residuals are more or less normal. Hence, it increases the reliability of the estimation.

Augmented Neo-classical Approach in the analysis of Military Expenditure and Economic Growth Nexus

According to this approach total output is divided into two parts. One is for civilian output sector and the other is military output sector. So basically it is a two sector model. The civilian output is a function of labour, capital and one externality factor that is military output on the other hand military output is simply a function of labour and capital. It also assumes there is a difference between the ratios of marginal productivities of two factors. All these can be written in the following equations.

Table 1: results of regression equation (6)

coefficient	Estimated value	Standard error	t- statistic	Prob.	R^2=0.45 Adj.R^2 =0.37
$*\hat{\beta}_1$	-0.69	0.37	-1.86	0.07	F statistic= 5.88, Prob.=0.00
$**\hat{\beta}_2$	0.12	0.03	3.44	0.00	Statistically significant
$\hat{\beta}_3$	0.01	0.05	0.18	0.85	not significant
$\hat{\beta}_0$	6.66	0.83	7.93	0.00	



$$Y = C + M \quad \ldots(7)$$

Where, $C = C\,(L,K,M)$ …(8)

and, $M = M(L,K)$ …(9)

taking total derivative of equation (7) we get,

$$DY = DC + DM \quad \ldots(10)$$

And,

$$DC = \frac{\partial c}{\partial L}DL + \frac{\partial c}{\partial k}DK + \frac{\partial c}{\partial m}DM \quad \ldots(11)$$

Putting the value of (11) in (10)

$$DY = \frac{\partial c}{\partial L}DL + \frac{\partial c}{\partial k}DK + \frac{\partial c}{\partial m}DM + DM \quad \ldots(12)$$

Dividing both sides by Y we get,

$$\frac{DY}{Y} = \frac{\frac{\partial c}{\partial L}DL}{Y} + \frac{\frac{\partial c}{\partial k}DK}{Y} + \frac{\frac{\partial c}{\partial m}DM}{Y} + \frac{DM}{Y} \quad \ldots(13)$$

$$\frac{DY}{Y} = C_l.\frac{L}{L}.\frac{DL}{Y} + C_k.\frac{DK}{Y} + C_m\frac{M}{M}\frac{DM}{Y} + \frac{DM}{Y} \quad \ldots(14)$$

$$\frac{DY}{Y} = C_l.\frac{L}{Y}.\frac{DL}{L} + C_k.\frac{I}{Y} + C_m\frac{M}{Y}\frac{DM}{M} + \frac{M}{M}\frac{DM}{Y} \quad \ldots(15)$$

$$\dot{Y} = \beta_0\dot{L} + C_k.\frac{I}{Y} + C_m\frac{M}{Y}\dot{M} + \frac{M}{Y}\dot{M} \quad \ldots(16)$$

$$\dot{Y} = \beta_0\dot{L} + C_k.\frac{I}{Y} + \theta\dot{M} + (1+\delta-\delta)\frac{M}{Y}\dot{M} \quad \ldots(17)$$

Where, $C_m = \frac{\partial c}{\partial m}$ is the marginal externality effect of military output on the civilian sector. Another important assumption of this model is that the ratio of marginal factor productivities in the two sectors differs from unity by a factor δ, that is $\frac{M_l}{C_l} = \frac{M_k}{C_k} = (1+\delta)$. And θ is the elasticity of civilian output with respect to military output. Therefore equation (17) can be rewritten as,

$$\dot{Y} = \beta_0\dot{L} + C_k.\frac{I}{Y} + \theta\dot{M} + (1+\delta-\delta)\frac{M}{Y}\dot{M} \quad \ldots(18)$$

$$\dot{Y} = \beta_0\dot{L} + \beta_1.\frac{I}{Y} + \theta\dot{M} + \beta_2\frac{M}{Y}\dot{M} \quad \ldots(19)$$

Where, $\dot{Y}$ = Economic Growth, $\dot{L}$, Labour Growth, $I = DK$, $\dot{M}$ = Growth of Military expenditure, $\frac{M}{Y}$ is the ratio of military expenditure and total income, $\beta_1 = C_k$ and $\beta_2 = \{C_m + (1 + \delta - \delta)\}$ = relative factor Productivity differential, and θ is the elasticity of the civilian output with respect to military output.

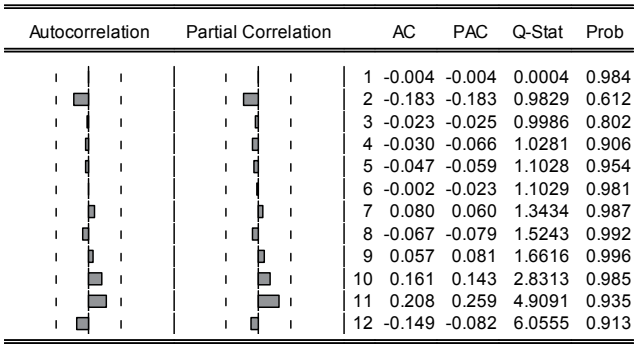
Table 2 Results of the regression equation (19) is shown in the table below:

Co-efficient	Estimated value	Standard error	t-statistic	Prob.	$R^2 = 0.34$ Adj. $R^2 = 0.20$
$\hat{\beta}_0$	-0.74	0.45	-1.63	0.11	F statistic = 2.58, prob. = 0.06
** $\hat{\beta}_1$	3.42E+14	1.43E+14	2.39	0.02	significant
$\hat{\theta}$	-0.01	0.15	-0.03	0.97	Not significant
$\hat{\beta}_2$	2.72E-14	8.61E-14	0.315	0.75	Not significant

The results of the above regression shows that investment output ratio plays significant role in economic growth. The growth of labour force again shows negatively related with economic growth but the estimated parameter is not statistically significant. The elasticity of civilian output with respect to military output is negative. This implies increase of military output reduces civilian output but the estimated parameter is not statistically significant.

Dignostic checking

The correlogram structure of the regression (equation 19) residuals shows no auto correlation structure among the error series. Hence the residuals are white noise. This increases the reliability of the estimation.



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.004	-0.004	0.0004	0.984
		2	-0.183	-0.183	0.9829	0.612
		3	-0.023	-0.025	0.9986	0.802
		4	-0.030	-0.066	1.0281	0.906
		5	-0.047	-0.059	1.1028	0.954
		6	-0.002	-0.023	1.1029	0.981
		7	0.080	0.060	1.3434	0.987
		8	-0.067	-0.079	1.5243	0.992
		9	0.057	0.081	1.6616	0.996
		10	0.161	0.143	2.8313	0.985
		11	0.208	0.259	4.9091	0.935
		12	-0.149	-0.082	6.0555	0.913

ACKNOWLEDGEMENTS

Motoivated with the study of Basudeb Basu for his work "Defence Spending and Economic Growth in Developing Countries", (1992), this paper also tries to reinvestigate the military expenditure and economic growth relationship with few recent data and applying the simple neo classical production function model and taking only the case of India.

CONCLUSION

The effect of military expenditure on the economy is a controversial area of research among economists. Particularly, in the last four decades, there has been a growing interest in the role of military spending in developing countries. The issue that has received the most attention has been whether military expenditure helps or hinders economic growth. (Masoud Ali Khalid and Zaleha Mohd Noor, 2015).

A possible beneficial effect of defense expenditure lies in its role in creating effective demand when there is slack in the economy. Within the Keynesian framework of macroeconomic analysis, government expenditure on goods and services including defense is an important force in the determination of output and employment, (Biswas Basudeb, 1992). On the other hand, military spending cannot contribute to a nation's ability to produce more economic goods and services in the future. More public expenditure in the military sector leads to crowding out of private investment and less investment on public goods like health, education, infrastructure and research and development. Under these circumstances this paper tries to reinvestigate this relationship in India especially in the post reform era. This study finds defense spending is not significantly helping economic growth of India within the time horizon of the study. On the other hand capital formation is playing a significant role for economic growth of India. Moreover, the growth of labour force is negatively affects economic growth. This is a matter of great concern. This may be large scale employment of unskilled labour in government sector, or the deteriorating work culture in government sectors due to various reasons, or over burden in agriculture. Hence more and more reforms and privatization of defense sector (except some cases where nation's security and sovereignty is involved) may stimulate economic growth.

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Data

Growth of labour force	Growth of Capital	GDP Growth	Growth of Military Expenditure	YEAR
2.36101439	-9.97868056	1.056831432	-6.53123783	1990
2.366446692	15.20479194	5.482396022	-1.95343984	1991
2.38527409	-6.7625266	4.750776219	9.3477892	1992
2.426741829	16.78102186	6.658924067	0.657687412	1993
1.994904815	18.52270927	7.574491841	4.094943079	1994
1.892312868	-8.86461925	7.549522248	3.140095281	1995
1.923000483	18.25526555	4.049820849	11.41201255	1996
1.943170826	5.167108146	6.184415821	9.375844303	1997
1.948295294	21.96875152	8.845755561	18.0203304	1998
1.946331805	-6.76877679	3.840991157	3.550742274	1999
2.846466609	10.98744637	4.823966264	3.953278906	2000
2.85732381	2.860074168	3.803975321	0.340735865	2001
2.853537451	11.72569266	7.860381475	2.171789032	2002
2.83374922	31.74049817	7.922936613	14.00772255	2003
2.80658748	16.29733399	9.284831507	6.431950813	2004
0.216470877	15.53869486	9.263958898	0.217193377	2005
0.206193437	20.73658406	8.6082046	3.846418192	2006
0.192947919	-5.22414014	3.890957062	13.09579336	2007
0.176755354	17.25295272	8.479783897	23.08318859	2008
0.16440322	14.07918387	10.25996306	3.171030162	2009
0.66020665	3.940115125	6.6383638	1.264966626	2010
0.648899318	4.189133502	5.618562773	0.993704636	2011
1.630482561	-1.10060728	6.638812736	3.637578131	2012
1.559828545	6.002042067	7.243471746	8.289726275	2013
1.933904547	3.808902059	7.56336718	4.678243221	2014