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Economic Growth and Military Expenditure Linkages: A Panel Data Analysis

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ABSTRACT. This paper has made an attempt to examine relationship between military expenditure and economic growth using 56 country panel data spanning over 1995–2011. Panel fixed effect model has been estimated for all 56 countries and sub-groups classified on the basis of World Bank income criteria. The results of this study indicate a positive effect of military expenditure on economic growth but this positive effect is negligible compared to the alternative uses of scare resources on non-military expenditure. Thus, the effect of military expenditure on economic growth is very low compared to the effect of expenditure on capital formation, hence military expenditure as a sub-optimal means of increasing economic growth compared to alternative uses of government spending on formation of fixed capital. This study raises an important argument of huge opportunity cost of military expenditure. The present study concludes that the boosting of economic growth through higher military expenditure is neither effective nor efficient way of achieving higher growth in the economy.

KEYWORDS. Economic Growth; Military Expenditure; Fixed Effect Model, Sub-Optimal.

Introduction

Most of the least developed countries (LDCs) and developing countries (DCs) have suffered military or civil conflicts since 1990s. These conflicts sometimes take place within states rather than between them, but it also causes equal or more human suffering, economic dislocation, and wasted development opportunities. As a result, a significant portion of national budgets are incurred on military spending mostly on the basis of threat perception of political masters of nation states. The justification of much of the growth of military expenditure is usually explained in terms of the need to maintain national security, law and order, internal disturbances, etc.

As per SIPRI estimates of 2013, global military expenditure in 2013 was US $1747 billion, around 2.4 per cent of world GDP. At times, it seems illogical diverting scarce resources particularly in LDCs and DCs towards military expenditure at the cost of unattended basic human

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needs. Ever increasing size of military expenditure as proportion of national budgets and vested interested of arms industry have led to renewed debate over whether the increase of the military expenditure enhances or deteriorates economic growth and welfare. This phenomenon attracted the attention of researchers to examine short term and long term implication of military expenses on the economy.

Theoretically, there is no consensus about the impact of military expenditure on economic growth and causal linkages have also not been established explicitly. One of the reasons is the heterogeneity in the approaches of estimation and variation in sample sizes of data used in drawing evidences of linkages between military expenditure and economic growth[2]. Mostly empirical results are mixed and hence it is difficult to argue convincingly about the extent and direction of relationship.

In economics, military expenditure and economic growth linkages have been examined through a number of channels. Many researchers have argued that increase in military expenditure can have positive effects on an economy through an expansion of aggregate demand in Keynesian framework[3]. Increase in military expenditures can boost economic growth of an economy through the Keynesian multiplier mechanism especially in the period of mass unemployment. Therefore, it is important for the government to manage and to increase aggregate demand. On the other side, many researchers have argued that military expenditure affect negatively through a crowding out of investment[4] as theorised by classical macroeconomists. Different from the above positions, there are instances of findings showing no or mixed relationship between military expenditure and economic growth.

Empirically, Benoit[5] highlighted that the military expenditures may lead to growth by decreasing unemployment rate, engaging in variety of public works, scientific and technical innovations. There are positive externalities of military expenditure through the development of the military sector on the civilian side of the economy. For example, the development of military infrastructure (highway, airport, road and information technology) causes higher economic growth. Definitely, military spending provides protection to the nation citizen by maintaining internal and external security, thus creating positive trade and investment climate for domestic as well as foreign investors. Thus, military

[2] *Dunne, P.,* Nikolaidoua, E. and Vougas, D. (2005). Models of Military Expenditure and Growth: A Critical Review. Defence and Peace Economics, 16(6), 449 — 461.

[3] *Hassan, M. K., Waheeduzzaman, M. and Rahman, A.* (2003). Defense expenditure and economic growth in the SAARC countries. The Journal of Political Social and Economic Studies, 28(3), 275-293.

[4] *Deger, S.* (1986). Economic development and defense expenditure. Economic Development and Cultural Change, 35(1), 179–196.

[5] *Benoit, E.* (1973). Defence and Economic Growth in Developing Countries. Lexington Books.; Benoit, E. (1978). Growth and defense in LDCs. Economic Development and Cultural Change, 26(2), 271-280.

spending is expected to provide national security and subsequently enhance economic growth in the long-run[6].

On the other hand, many researchers argued that an increase in military expenditure can thwart economic growth. It is broadly use of resources for consumption which does not enhance productive capacity of an economy. There are research on the subject indicating towards trade-off hypothesis between military expenditures and alternative productive investments. In this context, there are also evidences of detrimental effects of military expenditures on growth[7]. One of these is the diversion of scarce resources from domestic capital formation, education, health, infrastructure, etc which are expected to be more growth oriented. Furthermore, military expenditure can cause balance of payments problems and inflationary pressures on the economy which might retard growth. Due to ever increasing conflicts and resultant increase in the military spending requires higher taxation to finance higher military spending which will depress growth prospects in long run.

Rest of this paper is organized as follows. Section 2 discusses recent trends in growth and military expenditure. Section 3 presents review of selected literature. Data and Methodology for analysis is discussed in section 4. Section 5 discusses empirical results. Concluding remarks are summarized in Section 6.

Recent Trends in Growth and Military Expenditure

Given the interconnectedness of global economy, financial problems in the United States and the Euro-Zone quickly spread to other countries, which have now turned into a global economic crisis due to interlinkages of financial and real sectors. This crisis brought many structural flaws and policy constraints to forefront that hinders more investment and faster productivity growth in the world's developed and major emerging economies. For instance, China needs to rebalance its economy from rapid investment-intensive 'catch-up' growth towards more a consumption and services-driven economy. India, Brazil, and Mexico face major structural challenges to unlock labour and product markets and create a more efficient resource allocation. Undoubtedly, globalisation has benefitted countries over recent decades through trade and investment flows but unregulated financial sector and dissolute pursuit of rent seekers has depressed investment flows in productive sectors and reduced productivity growth, making faster path of global growth more

[6] *Ram, R.* (1995). Defense expenditure and economic growth. Handbook of Defense Economics, edited by K. Hartley and T. Sandler. London: Elsevier, 251–273.

[7] *Chowdhury, A.R.* (1991). A causal analysis of defense spending and economic growth. The Journal of Conflict Resolution, 35(1), 80–97.

uncertain and unpredictable. The rate of economic growth has depressed significantly in most of the economies in the world since the financial crisis of 2008.

Table 1 show past, present and future trends of economic growth. It reflects volatile and unstable growth trends across countries. The trends of economic growth reveal that the growth pattern is asymmetrically distributed across different countries and regions of the world economy. It shows that the trends of economic growth reflect that all countries irrespective of its level of development has been affected negatively and rate of growth has declined to its half compared to its pre-crisis period. If we compare growth rates of these countries in the year 2005 to 2013, economic growth rates is less in eighteen countries out of twenty countries in 2013. The Conference Board Global Economic Outlook (2014) predicted growth rates for the period of 2014-19 and 2020-25 is also less than the growth rates in pre-crisis period in most of the countries. This is an indication of severity of present crisis which is in its depth and length seems to be no lesser than the crisis of 1929.

Table 1 **Trends of Economic Growth in Selected Developed and Developing Countries**[8]

Country	2005	2008	2010	2011	2012	2013	2014	2014-2019	2020-2025
Argentina	-2.9	3.6	8.3	5.5	1.5	4.3	2.8	3.0	2.7
Australia	3.1	2.7	2.6	2.4	3.7	2.4	2.6	2.3	2.2
Austria	2.4	1.4	1.8	2.8	0.9	0.4	1.6	1.1	0.6
Brazil	3	4.8	6.9	2.7	0.9	2.3	1.8	2.9	2.8
Canada	3	0.7	3.2	2.5	1.7	2	2.1	2	1.8
Chile	10.6	3.7	5.8	5.9	5.6	4.1	4.5	3.3	2.3
China	15.1	9.6	10.4	9.3	7.7	7.7	7.0	5.9	3.5
France	1.8	-0.1	1.7	2	0	0.2	0.9	1.4	0.9
Germany	0.7	1.1	4	3.3	0.7	0.4	1.7	1.6	1.4
India	9.5	6.7	9.3	6.2	5	4.6	5	4.8	3.6
Indonesia	5.7	6.0	6.2	6.5	6.2	5.8	5.6	5.1	4.5
Japan	1.3	-1.0	4.7	-0.6	1.9	1.5	5	1	0.6
Malaysia	5.3	4.8	7.2	5.1	5.6	4.7	5	5	4.2
Mexico	3.3	1.2	5.3	3.9	3.8	1.1	3.1	2.9	3.1
New Zealand	3.4	-1.8	0.2	2.2	3.2	2.5	2.6	2.8	2.8
Pakistan	9	5.0	2.6	3.7	4.4	3.6	3	4.6	4.6
Russian Federation	-4.1	5.2	4.5	4.3	3.4	1.3	1.7	1.8	1.2
South Africa	5.3	3.6	3.1	3.5	2.5	1.9	3	1.9	1.6
Turkey	8.4	0.7	9	8.8	2.2	4	2.7	1.9	1.8
United Kingdom	3.2	-0.8	1.7	1.1	0.1	1.7	1.9	1.9	1.1
United States	3.4	-0.3	2.5	1.8	2.8	1.9	2.3	2.4	1.7

[8] The Conference Board Global Economic Outlook, 2014 available at https://www.conference-board.org/data/globaloutlook (Accessed on 20 Sept., 2014)

As indicated above, economies globally are struggling to recover from global economic crisis but there are several risk factors which include conflicts in Europe, Americas, Middle East, Africa and many other regions. Some of the well known conflicts include Syrian civil war, South Sudanese civil war, Iraq crisis, Egyptian crisis, Libyan conflict, Central African Republic conflict, Niger Delta conflict, South Thailand insurgency, Northern Mali conflict, Nagorno-Karabakh conflict, South Yemen insurgency, internal conflict in Mozambique, Sri Lankan Civil war, Maoist rebels in India, Maoist confrontation in Nepal, India-Pakistan border disputes, India- China border disputes, internal conflict in Afghanistan, China's territorial disputes with Japan in the East China Sea, and with the Philippines and Viet Nam in the South China Sea, among others. These conflicts might have affected economic growth and military spending through various channels and created new challenges to the growth prospects.

There are many risk factors affecting growth and military expenditure since 2000s.

Table 2 depicts the military expenditure of top 15 countries in 2013 accounting for 79 percent of global military expenditure. The total military expenditure in the world was US $1747 billion in 2013, slightly less than the global military expenditure in 2012. This is the consequence of 7.8 percent decline in military expenditure of USA. Excluding USA, military spending in the rest of the world has increased by 1.8 percent. Despite decline in US military expenditure, USA spends US $640 billion on military expenditure that is the largest amount spent by any country. As per SIPRI estimates, China spent US $188 billion (11 percent of global military expenditures), 7.4 percent increase in 2013 compared with 2012, on the military expenditure in 2013 and second largest in the world. China's military spending increased by 170 percent during 2004-13. During the same period, SIPRI estimates that US military spending increased only 12 percent. SIPRI shows that Russia spent just short of $88 billion of the military in 2013, a 4.8 percent increase from 2012. Russia's military expenditure accounted for 4.1 percent of its GDP, more than twice as large a military burden as China. Among the largest spenders, Saudi Arabia has by far the highest military burden — that is, military spending as a share of GDP, 8.1 percent.

Despite the drop US military expenditure, the US remains the global leader in military expenditures, 37 percent of global military expenditure. It is revealed that USA and China together constitute around 50% of world military expenditure of the world. SIPRI reports that 18 of the 31 countries among NATO's European member countries have reduced military spending by more than 10 percent since the global financial crisis in 2008. Despite reduction in military spending by the US and Eu-

rope, military spending in the Middle East, North Africa and Asia has increased by 8.4 percent, 7.8 percent and 7 percent during 2003-09. For much of the 2000s, military spending increased fairly rapidly in Brazil and India. Apart from this, a total of 23 countries have doubled their military spending in real terms since 2004. It is an indication of a shift in the balance of world military spending from the rich Western countries to emerging regions (SIPRI Report, 2014).

Table 2 **Military Expenditure of Top 15 Countries in the World**[9]

Country	Spending, 2013 ($ b.)	Change, 2004–13 (%)	Spending as a share of GDP (%)-2004	Spending as a share of GDP (%)-2013
USA	640	12	3.8	3.9
China	188	170	2	2.1
Russia	87.8	108	4.1	3.5
Saudi Arabia	67	118	9.3	8.1
France	61.2	-6.4	2.2	2.6
UK	57.9	-2.5	2.3	2.4
Germany	48.8	3.8	1.4	1.4
Japan	48.6	-0.2	1	1
India	47.4	45	2.5	2.8
South Korea	33.9	42	2.8	2.5
Italy	32.7	-26	1.6	2
Brazil	31.5	48	1.4	1.5
Australia	24	19	1.6	1.8
Turkey	19.1	13	2.3	2.8
UAE	19	85	4.7	4.7
Total Top 15	1406.9			
World Total	1747	26	2.4	2.4

Review of Selected Literature

In the 20th century, world has witnessed two world wars and innumerable conflicts within the state and borders. A huge portion of public expenditure has been diverted towards strengthening military power. The size of military expenditure in post 2nd world war has attracted attention of intellectuals including economist to explore its socio economic

[9] SIPRI Report available at http://www.sipri.org/research/armaments/milex (Accessed on 10 Sept., 2014)

implications. Area of defence economics became popular after the pioneering work by Hitch and McKean[10]. As referred earlier, Benoit pioneered the empirical research on the subject. He shows that military expenditure and economic growth has positive correlation for the sample of 44 less-developed countries. Later many researchers interested in growth and military expenditure linkages try to assess the impact of military expenditure on economic growth or *vice versa*. To the date, the debate about linkages and its direction between military expenditure on economic growth is live and there is neither theoretical consensus nor conclusive empirical evidence about this relationship.

Many scholars argues that the military expenditure accelerate economic growth through its expansionary effect on aggregate demand and resultant Keynesian effects on output and employment, expansion of markets for suppliers, improved and enhanced infrastructure, innovation and technology development, more skilled workforce and stability and security in the nation. The positive externalities of spill-over effects of military expenditure in research and development (R&D) in the military industries are expected to benefit on general economic growth in an economy. On the basis of literature, Ram[11] has shown the existence of a positive relationship between military expenditure and economic growth. Later, Fredericksen and Looney[12], Weede[13], Stewart[14], Ward et al.[15], Mueller and Atesoglu[16], Murdoch et al.[17], Shieh et al.[18], Yildirim et al.[19], Aizenman and Glick[20] among others revealed in their research findings a positive impact of military spending on economic growth.

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[10] *Hitch, C. J. and Roland, N. M.* (1960). The Economics of Defense in the Nuclear Age. Harvard University Press.

[11] *Ram, R.* (1995). Defense expenditure and economic growth. Handbook of Defense Economics, edited by K. Hartley and T. Sandler. London: Elsevier, 251–273.

[12] *Fredericksen, P.C. and Looney, R.E.* (1982). Defense expenditures and economic growth in developing countries: some further empirical evidence. Journal of Economic Development, 7(1), 113–124.

[13] *Weede, E.* (1986). Rent seeking, military participation and economic performance in LDCs. Journal of Conflict Resolution, 30(2), 77–91.

[14] *Stewart, D.B.* (1991). Economic growth and the defence burden in Africa and Latin America: simulations from a dynamic model. Economic Development and Cultural Change, 40(1), 189–207.

[15] *Ward, M.D., Davis, D., Penubarti, M., Rajmaira, S. and Cochran, M.* (1991). Military spending in India: Country Survey. Defence Economics, 3(1), 41–63.

[16] *Mueller, M.J. and Atesoglu, H.S.* (1993). Defense spending, technological change and economic growth in the United States. Defence Economics, 4(3), 259–269.

[17] *Murdoch, J.C., Pi, C. R. and Sandler, T.* (1997). The impact of defense and nondefense public spending on growth in Asia and Latin America. Defence and Peace Economics, 8(2), 205–224.

[18] *Shieh, J., Lai C. and Chang, W.* (2002). The impact of military burden on longrun growth and welfare. Journal of Development Economics, 68, 443–455.

[19] *Yildirim, J., Sezgin, S. and Öcal, N.* (2005). Military expenditure and economic growth in Middle Eastern countries: a dynamic panel data analysis. Defence and Peace Economics, 16(4), 283–295.

[20] *Aizenman, J. and Glick R.* (2006). Military expenditure, threats and growth, Journal of International Trade and Economic Development, 15(2), 129-155.

Conversely, many scholars including Smith[21], Deger and Sen[22], Deger and Smith[23], 1983; Faini et al.[24], Cappelen et al.[25], Deger[26], Batchelor et al.[27], Dunne et al.[28] conclude that military expenditure exerts a negative effect upon growth through its crowding out effect on private investments and the wider effects of tax increases that are often necessary to finance the increased expenditure. It has been argued by many scholars that military expenditure takes resources away from productive investments and fails to mobilize and create additional savings.

There are number of researchers showing evidences of mixed relationship or non-existent. According to them, military expenditure doesn't have any impact on growth as the spillover effect being argued by the proponents of the military spending is ambiguous and the concept of crowding out private investments is not very clear, Khalid and Mustafa. There are many scholars including Aizenman and Glick[29], Biswas and Ram[30], Alexander[31], Huang and Mintz[32], Adams et al.[33], Huang and Mintz[34], Payne and Ross[35], Kollias and Makrydakis[36], Chowdhury[37],

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[21] *Smith, R.* (1980). Military expenditure and investment in OECD 1954–1973. Journal of Comparative Economics, 4(1), 19–32.

[22] *Deger, S. and Sen, S.* (1983). Military expenditure, spin-off and economic development. Journal of Development Economics, 13(1-2), 67-83.

[23] *Deger, S. and Smith, R.* (1983). Military expenditure and growth in LDCs. Journal of Conflict Resolution, 27(2), 335-353.

[24] *Faini, R., Annez, P. & Taylor, L.* (1984) Defense spending, economic structure, and growth: evidence among countries and over time. Economic Development and Cultural Change 32 487–498.

[25] *Cappelen, A., Gleditsch, N.P. and Bjerkholt, O.* (1984). Military spending and economic growth in the OECD countries. Journal of Peace Research, 21(4), 361–373.

[26] *Deger, S.* (1986). Economic development and defense expenditure. Economic Development and Cultural Change, 35(1), 179–196.

[27] *Batchelor, P., Dunne, P. and Saal, D.* (2000). Military spending and economic growth in South Africa. Defence and Peace Economics, 11(6), 553–571.

[28] *Dunne, P., Nikolaidoua E. and Vougas, D.* (2001). Defence spending and economic growth: a causal analysis for Greece and Turkey. Defence and Peace Economics, 12(1), 5–26.

[29] *Aizenman, J. and Glick R.* (2006). Military expenditure, threats and growth, Journal of International Trade and Economic Development, 15(2), 129-155.

[30] *Biswas, B. and Ram R.* (1986). Military expenditures and economic growth in less developed countries: An augmented model and further evidence. Economic Development and Cultural Change, 34(2), 361-72.

[31] *Alexander, W. R. J.* (1990). The impact of defence spending on economic growth: a multi-sectoral approach to defense spending and economic growth with evidence from developed economies. *Defense Economics,* 2(1) 39–55.

[32] *Huang, C. and Mintz, A.* (1990). Ridge regression analysis of the defense growth trade off in the United States. Defense Economics, 2(1), 19–37.

[33] *Adams, F. G., Behrman, J.R. and Boldin M.* (1991). Government expenditures, defense and economic growth in LDCs: a revised perspective. Conflict Management and Peace Science, 11(2), 19–35.

[34] *Huang, C. and Mintz, A.* (1991). Defence expenditures and economic growth: the externality effect. Defence and Peace Economics, 3(1), 35–40.

[35] *Payne, J.E. and Ross, K.L.* (1992). Defense spending and the macroeconomy. Defence Economics, 3(2), 161-168

[36] *Kollias, C. and Makrydakis, S.* (1997). Defense spending and growth in Turkey 1954–1993: a causal analysis. Journal of Defense and Peace Economics, 8(2), 189–204.

[37] *Chowdhury, A.R.* (1991). A causal analysis of defense spending and economic growth. The Journal of Conflict Resolution, 35(1), 80–97.

Dakurah et al.[38], Gerace[39], Lai et al.[40], Kollias, et al.[41], Pieroni[42], Heo[43], Dunne[44] who have argued that military expenditure may be growth enhancing or growth depressing depending on its nature of spending. Even if it is assumed that military spending exerts a positive impact upon growth, Batchelor et al.[45] and Shieh et al.[46] argued that military expenditure is a sub-optimal way of economic stimulation due to the greater positive impact of non-military spending on economic growth.

On the basis of selected literature survey, the linkages between military expenditure and economic growth are ambiguous; hence military expenditure may have positive, negative or insignificant effect on growth. Given the size of military expenditure, the present study has made an attempt to examine the effects of military expenditures upon economic growth. The findings of this study will be an addition to the existing literature on the subject.

Data and Methodology

To undertake empirical analysis, the present study used recent data available for 56 countries and their subsets for the period of 1995–2011. The choice of the countries mainly depends on the availability of consistent data for the variables, namely gross domestic product (GDP), military expenditure per capita and gross fixed capital formation. The data has been obtained from World Development Indicators (WDI) series by the World Bank[47] and Stockholm International Peace Research Institute (SIPRI)[48]. The data on gross domestic product at constant prices and gross fixed capital formation have been drawn from WDI online data. Military expenditure statistics has been drawn from SIPRI. The data series is annual ranging from 1995 to 2011 for 17 years.

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[38] *Dakurah, A.H., Davies, S.P. and Sampath, R.K.* (2001). Defense spending and economic growth in developing countries: a causality analysis. Journal of Policy Modeling, 23(6), 651–658.

[39] *Gerace, M.P.* (2002). US military expenditures and economic growth: some evidence from spectral methods. Defence and Peace Economics, 13(1), 1–11.

[40] *Lai, C.C., Shieh, J.Y. and Chang, W.Y.* (2002). Endogenous growth and defense expenditures: a new explanation of the Benoit hypothesis. Defence and Peace Economics, 13(3), 179–186.

[41] *Kollias, C., Naxakis, C. and Zarangas, L.* (2004a). Defence spending and growth in Cyprus: a causal analysis. Defence and Peace Economics, 15(3), 299-307.

[42] *Pieroni, L.* (2009b). Military expenditure and economic growth. Defence and peace economics, 20(4), 327-339.

[43] *Heo, Uk.* (2010). The Relationship betwen Defense Spending and Economic Growth in the United States. Political Research Quarterly, 63(4), 760-770.

[44] *Dunne, P.* (2011). Military Keynesianism: An Assessment. Working Papers 106, Department of Accounting, Economics and Finance, Bristol Business School, University of the West of England, Bristol.

[45] *Batchelor, P., Dunne, P. and Saal, D.* (2000). Military spending and economic growth in South Africa. Defence and Peace Economics, 11(6), 553–571.

[46] *Shieh, J., Lai C. and Chang, W.* (2002). The impact of military burden on longrun growth and welfare. Journal of Development Economics, 68, 443–455.

[47] World Bank (2014). World Development Indicators. Washington D.C.: World Bank.

[48] Stockholm International Peace Research Institute (2014). SIPRI reports shifting trend in global military expenditures. available at http://www.dw.de/sipri-reports (accessed on 3 Oct., 2014).

Econometricians have suggested panel estimates wherever time series data is limited. Panel approach is expected to deal better with the problem of measurement bias and the issues related to limited degrees of freedom. As our data series is consist of 56 cross section units and 17 years of time dimension, it is more suitable to apply panel estimation methods. In panel framework, the relationship between military spending and real gross domestic product (RGDP) may be expressed as:

$$Log(Y_{it}) = \alpha + \beta_1 Log(X_{it}) + \beta_2 \log(Z_{it}) + \varepsilon_{it} \quad \text{for } i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T \quad (1)$$

where Y_{it} is real GDP at time t of i[th] country, X_{it} is military spending at time t of i[th] country, and Z_{it} is gross fixed capita formation at time t of i[th] country and ε_{it} is a disturbance term at time t. To estimate this relationship, the following econometric methodology has been applied.

It is important to recognise that the inferences drawn from a regression of non stationary series are spurious and meaningless. Hence, panel unit root tests are conducted to examine whether the data series under investigation is a stationary series. If not, what is the order of integration of all series involved in panel equation? For robustness, the study has applied four panel unit root tests as proposed by Levin et al.[49], Im et al.[50], Maddala and Wu[51] using Eviews software. Summary details are given below.

The conventional ADF test for single-equation is based on the following regression equation:

$$\Delta X_{it} = \alpha_i + \beta_i X_{i,t-1} + \sum_{j=1}^{k} \lambda_{ij} \Delta X_{i,t-j} + \varepsilon_{it}, \quad (2)$$

where Δ is the first difference operator, X_{it} is the variable in question, ε_{it} is a white-noise disturbance with a variance of σ^2, and t = 1, 2,...., T indexes time. The unit root null hypothesis of $\beta_i = 0$ is tested against alternative hypothesis of $\beta_i < 0$. Accepting null hypothesis implies non-stationary series or vice versa. Levin, Lin and Chu[52] found that the panel approach substantially increases power in finite samples when compared with the single-equation ADF test, hence proposed a panel-based

[49] *Levin, A., Lin, C. F. and Chu, C. S.* (2002). Unit root tests in panel data: asymptotic and finite-sample properties. Journal of Econometrics, 108, 1-24.
[50] *Im, K.S., Pesaran, M.H. and Shin, Y.* (2003). Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115, 53–74.
[51] *Maddala, G.S. and Wu, S.* (1999). A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and Statistics, 61(S1), 631–652.
[52] *Levin, A., Lin, C. F. and Chu, C. S.* (2002). Unit root tests in panel data: asymptotic and finite-sample properties. Journal of Econometrics, 108, 1-24.

version of Equation (2) that restricts $\hat{\beta}_i$ by keeping it identical across cross- countries as follows:

$$\Delta X_{it} = \alpha_i + \beta X_{i,t-1} + \sum_{j=1}^{k} \theta_{ij} \Delta X_{i,t-j} + \varepsilon_{it}, \quad (3)$$

This test is popularly known as Levin, Lin and Chu (LLC) test of panel unit root.

Though LLC has become popular but it is based on restrictive assumption. It assumes that β is restricted by being kept identical across regions under both null and alternative hypotheses. Im et al.[53] relaxed the assumption of the identical first-order autoregressive coefficients of the LLC test and recommended alternative panel unit root test that allows β to vary across regions under the alternative hypothesis. This test is popularly known as Im-Pesaran-Shin (IPS) test of panel unit root.

IPS tests the null hypothesis of $\beta_1 = \beta_2 = ... = 0$ against the alternative of $\beta_i < 0,$ for some i. The IPS test is based on the mean group approach. They use the average of the t_{β_i} statistics from Equation (4) to perform the following *t*-bar statistic:

$$\overline{Z} = \sqrt{N}[\bar{t} - E(\bar{t})] / \sqrt{Var(\bar{t})} \quad (4)$$

where $\bar{t} = (1/N) \sum_{i=1}^{N} t_{\beta_i}$, $E(\bar{t})$ and $Var(\bar{t})$ are respectively the mean and variance of each t_{β_i} statistic.

Maddala and Wu[54] propose combining the observed significance levels (*p*-values) from N independent tests of the unit root null hypothesis using the inverse chi-square test (Fisher, 1932). If we define π_i as the *p*-value from any individual unit root test for cross-section, then under the null of unit root for all cross-sections, we have the asymptotic result that

$$-2 \sum_{i=1}^{N} \log(\pi_i) \to x_{2N}^2 \quad (5)$$

In addition, it demonstrates that:

$$Z = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \Phi^{-1}(\pi_i) \to N(0,1) \quad (6)$$

[53] *Im, K.S., Pesaran, M.H. and Shin, Y.* (2003). Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115, 53–74.

[54] *Maddala, G.S. and Wu, S.* (1999). A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and Statistics, 61(S1), 631–652.

where Φ^{-1} is the inverse of the standard normal cumulative distribution function.

It reports both asymptotic x^2 and standard normal statistics using ADF and Phillips-Perron individual unit root tests. The null and alternative hypotheses are the same as for the IPS test.

Generally, it is advised to transform non-stationary series into stationary series by appropriate differencing, before proceeding to empirical investigation. As economic theory is mostly expressed in levels and not in change in levels, hence transformation by differencing is also raise questions about its suitability for modelling economic behaviour despite being correct on statistical grounds. To use the information in levels, all possibilities must be explored. One possibility was being argued by Engle and Granger[55] to model non-stationary series at levels if series are integrated of same order and co integrated as well. They have shown that a long-run equilibrium relationship may exist despite the data series being non-stationary. Hence, panel co-integration tests are conducted to determine the suitability of applying a standard panel estimation method at levels.

Kao[56] developed both DF-Type test statistics and ADF test statistics to test cointegration in panel data. Under the null hypothesis of no cointegration, the residual series e_{it} should be non-stationary. The model has varying intercepts across the cross-sections (the fixed effects specification) and common slopes across *i*.

Kao[57] uses both DF and ADF to test for cointegation in panel similar to the standard approach adopted in the EG-step procedures. Also this test start with the panel regression model as set out in equation below.

$$L\log(Y_{it}) = \alpha + \beta_1 Log(X_{it}) + \beta_2 \log(Z_{it}) + \varepsilon_{it} \quad (7)$$

where Y and X are presumed to be non-stationary and :

$$\varepsilon_{it} = \rho\varepsilon_{it-1} + v_{it} \quad (8)$$

where $\varepsilon_{it} = L\log(Y_{it}) - \alpha - \beta_1 Log(X_{it}) - \beta_2 \log(Z_{it})$ are the residuals from estimating equation 7. To test the null hypothesis of no cointegrarion amounts to test $H_0 : \rho = 1$ in equation 8 against the alternative that Y and X are cointegrated (i, e., $H_1 : \rho < 1$). Kao constructed a bias-

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[55] *Engle, R.F. and Granger, C.W.J.* (1987). Cointegration and Error Correction: Representation, Estimation and Testing. Econometrica, 55, 251-76.

[56] *Kao, C.* (1999). Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. Journal of Econometrics, 90, 1-44.

[57] ibid

corrected serial correlation coefficient estimate and, consequently, the bias-corrected test statistics to test for cointegration.

Maddala and Wu[58] and Choi[59] suggested to cconsider the *p*-values from an individual cointegration test for cross-section and combine these *p*-values under the null hypothesis for the panel. This is $-2\sum_{I=1}^{N} Log(\pi_i) \to \chi^2$. EViews reports the χ^2 value based on MacKinnon-Haug-Michelis (1999) *p*-values for Johansen's cointegration trace test and maximum eigenvalue test.

Fixed-Effects Verses Random-Effects Model

A fixed effects model takes into account the country specific factors. The fixed effect model is given by

$$Y_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \eta_i + \varepsilon_{it} \qquad \text{for } i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T \qquad (9)$$

Where Y is dependent variable and X, and Z are independent variables. The panel data consists of *N*-units and *T*-time periods, and therefore you have *N* times *T* observations. Compared to classical linear regression model, the error term in fixed effect model is decomposed into two components as $\eta_i + \varepsilon_{it}$ where the component η_i represents all unobserved factors that vary across units but are constant over time and component ε_{it} represents all unobserved factors that vary across units and time. It is assumed that the net effect on Y of unobservable factors for the i^{th} unit that are constant over time is a fixed parameter, designated α_i. Therefore, the fixed effects model can be rewritten as

$$Y_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \gamma_1 + \gamma_2 + \ldots + \gamma_N + \varepsilon_{it} \qquad (10)$$

In equation 10, the error component η_i has been replaced with a set of fixed parameters, $\gamma_1 + \gamma_2 + \ldots + \gamma_N$, one parameter for each of the *N* units in the sample. These parameters are called unobserved effects and represent unobserved heterogeneity.

The random effects model may also be expressed in similar way, i.e.,

$$Y_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \eta_i + \varepsilon_{it} \qquad \text{for } i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T \qquad (11)$$

Where,

$$\eta_i = \alpha_0 + \upsilon_i \qquad \text{for } i = 1, 2, \ldots, N$$

[58] *Maddala G.S and Wu, S.* (1999). A comparative study of unit root tests with panel data and new simple test. Oxford Bullertin of Economics and Statistics, Speccial issue, 631-652

[59] *Choi, I.* (2001). Unit root tests for panel data. Journal of International Money and Finance, 20(2), 249-72.

The above two components of v_i may be explained as 1) a deterministic component α_0, 2) a random component η_i. In this model the *N* intercepts are not fixed parameters; rather they are random variables. The deterministic component α_0 is interpreted as the population mean intercept. The disturbance υ_i is the difference between the population mean intercept and the intercept for the i^{th} unit. It is assumed that the υ_i for each unit is drawn from an independent probability distribution with mean zero and constant variance. Thus, the random effects model can be rewritten as

$$Y_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \mu_{it} \qquad (12)$$

where $\mu_{it} = \eta_i + \varepsilon_{it}$. An important assumption underlying the random effects model is that the error term μ_{it} is not correlated with any of the explanatory variables.

In this study, Hausman specification test has been applied to choose between fixed and random effects models. This test is basically related to η_i in equation 11 & 12 which represents all unobserved factors that vary across units but are constant over time. If the unit dependent unobserved effects, η_i, are correlated with explanatory variables in the mode, then it is appropriate to select the fixed effects model and vice versa. The null and alternative hypotheses of Hausman test are as follows:

H_0: η_i is not correlated with explanatory variables

H_1: η_i is correlated with explanatory variables

The Hausman test statistic follows Chi-square distribution with *k* degrees of freedom, where *k* is the number of slope parameters in the model. If the p-value of Chi-square statistics is more than 0.05, then we reject the null and conclude that η_i is correlated with explanatory variables and therefore the fixed effects model is the appropriate choice for panel estimations.

It has been observed in the literature that the problem of serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient. It is pertinent to identify serial correlation in the error term in a panel-data model. Wooldridge[60] derived a test statistics for the detection of serial correlation in random or fixed-effects models. This test can be applied under general conditions and is easy to

[60] *Wooldridge, J.M.* (2002). Econometric Analysis of Cross Section and Panel Data. MIT Press.

implement in STATA (Drukker, 2003). The most common way of remedy is to assume that the disturbances for each cross-section unit over time follow an AR(1) process. Hence, Fixed Effects (Within) Model or Random effects with AR(1) disturbances has been recommended in such scenario.

Empirical Results

Descriptive statistics (DS) are calculated to illustrate the basic feature of data used in this paper. The mean value of GDP and military expenditure (ME) of 56 countries is US $ 639305.60 million and US $ 15623.98 million respectively. The standard deviation of GDP and ME is 1747661.00 and 64116.67 respectively. The gross fixed capital formation (GFCF) is US $ 136376.80 million while standard deviation of GFCF is US $ 373619 respectively. In all variables, the values of standard deviation indicate widespread inequalities among nations. The most interesting feature is the kurtosis, which measures the magnitude of extremes. If variable are normally distributed, then the kurtosis should be three, however it is found to be very high. Jarque-Bera statistics also suggest that the all variable series are not distributed normally. Probability of extreme values has been observed empirically. DS results are presented in table 3.

Table 3 **Descriptive statistics**

Descriptive Statistics	GDP (US $ Millions)	GFCF (US $ Millions)	ME (US $ Millions)
Mean	639305.60	136376.80	15623.98
Median	119534.70	24080.59	2296.37
Maximum	13846778.0	3071576.0	658389.40
Minimum	466.62	145.68	4.41
Std. Dev.	1747661.00	373619.00	64116.57
Skewness	5.48	5.45	7.55
Kurtosis	36.45	35.94	63.42
Jarque-Bera	49141.75	47763.00	153838.90
Probability	0.00	0.00	0.00
Observations	952	952	952

Empirical analysis in this paper has been undertaken for 56 countries covering period of 1995 to 2011 (17 years). These 56 countries are classified in three different income groups as High-Income Countries (22), Non-High-Income Countries (34), Low and Lower Middle Income Countries (19). The country details are given in appendix.

This is well known in empirical research that there is a risk of spurious results both in time series and panel data in case the data series is non-stationary. In view of this, the stationary properties of panel data have also been examined to detect and transform non-stationary series into stationary, individually or in combination, for a meaningful econometric analysis. First, the data on gross domestic product (GDP), military expenditure (ME) and gross fixed capital formation (GFCF) have been transformed by taking natural logarithmic values to correct for heterogeneity bias and then transformed series were tested for stationary using LLC test, IPS test, ADF – FC test and PP – FC test. The results are presented in table 4. The results suggest that gross domestic product (LNGDP), military expenditure (LNME) and gross fixed capital formation (LNGFCF) have a unit root in levels, hence non-stationary series. While unit root test results further reveals that the all series does not contain unit root in first differences, i.e., hence the data is non-stationary at levels but stationary at first differences.

Table 4 **Panel Unit Root Test Results**

Test	LNGDP		LNGFCF		LNME	
	Level	FD	Level	FD	Level	FD
	All 56 Countries					
LLC	-1.32 (0.09)	-20.41 (0.00)	-2.49 (0.00)	-15.90 (0.00)	-1.03 (0.15)	-19.14 (0.00)
IPS	4.47 (1.00)	-12.70 (0.00)	2.49 (0.99)	-14.04 (0.00)	0.45 (0.67)	-16.31 (0.00)
ADF – FC	104.67 (0.67)	349.58 (0.00)	82.24 (0.98)	395.57 (0.00)	125.31 (0.18)	455.20 (0.00)
PP – FC	139.37 (0.04)	372.04 (0.00)	76.92 (1.00)	430.52 (0.00)	104.13 (0.69)	533.55 (0.00)
High-Income						
LLC	-0.79 (0.21)	-9.56 (0.00)	-1.37 (0.08)	-7.98 (0.00)	0.01 (0.50)	-10.56 (0.00)
IPS	3.39 (1.00)	-6.05 (0.00)	-0.85 (0.20)	-6.31 (0.00)	0.57 (0.72)	-9.01 (0.00)
ADF – FC	24.23 (0.67)	108.66 (0.00)	56.96 (0.09)	111.32 (0.00)	46.24 (0.38)	163.59 (0.00)
PP – FC	16.16 (1.00)	155.00 (0.00)	26.72 (0.98)	98.02 (0.00)	39.59 (0.66)	206.09 (0.00)
Non-High-Income						
LLC	1.04 (0.85)	-18.23 (0.00)	-0.89 (0.18)	-14.19 (0.00)	-1.54 (0.06)	-15.99 (0.00)

Test	LNGDP		LNGFCF		LNME	
	Level	FD	Level	FD	Level	FD
	All 56 Countries					
IPS	7.31 (1.00)	-11.44 (0.00)	4.28 (1.00)	-12.67 (0.00)	0.11 (0.54)	-13.68 (0.00)
ADF – FC	34.25 (1.00)	237.47 (0.00)	33.46 (0.99)	273.05 (0.00)	79.07 (0.16)	291.61 (0.00)
PP – FC	44.05 (0.99)	239.31 (0.00)	29.81 (0.99)	315.85 (0.00)	64.54 (0.59)	327.46 (0.00)
Low and Lower middle income						
LLC	1.62 (0.94)	-16.10 (0.00)	-0.49 (0.31)	-11.01 (0.00)	-1.31 (0.09)	-11.45 (0.00)
IPS	6.07 (1.00)	-8.78 (0.00)	4.26 (1.00)	-10.66 (0.00)	0.56 (0.71)	-9.41 (0.00)
ADF – FC	22.08 (0.98)	130.28 (0.00)	11.51 (1.00)	169.09 (0.00)	45.03 (0.20)	152.35 (0.00)
PP – FC	27.82 (0.88)	110.52 (0.00)	12.23 (1.00)	213.30 (0.00)	32.09 (0.73)	168.15 (0.00)

Note: ** Probabilities for Fisher tests are computed using an asymptotic Chi- square distribution. IPS Test assumes asymptotic normality.

Since the panel root tests conducted above suggest that the data series is of integration (1), there is a need to test for panel cointegration. A panel co-integration test has also been applied in order to determine the suitability of applying a standard panel estimation method. Kao Residual Co-integration test and Johansen Fisher Panel Co-integration test have been applied. The results of these tests clearly reject the null of no co-integration between the three variables of LNGDP, LNME and LEGFCF. It implies that military expenditure and economic growth has long run equilibrium relationship, hence it is possible to apply standard panel estimation methods, such as a fixed effects or random effects model, to estimate equation (1) with the existing data series. The co-integration test results are shown in table 5 and 6.

Table 5 **Kao Residual Panel Cointegration Test Results**

Country Groups	Null hypothesis	Max. lag	Statistic	Prob.
All(56-country)	No cointegration	3	-6.80	0.00
High-Income	No cointegration	3	-3.49	0.00
Non-High-Income	No cointegration	3	-5.79	0.00
Low and Lower middle income	No cointegration	3	-2.60	0.00

Table 6 **Johansen Fisher Panel Cointegration Test**

Country Groupings	Hypothesized No. of CE(s)	Fisher Statistics from trace test	P- Values
All (56-country)	None	498.9	0.00
	At most 1	205.9	0.00
	At most 2	172.00	0.0002
High Income Countries	None	248.60	0.00
	At most 1	100.00	0.00
	At most 2	81.13	0.00
Non-High Income Countries	None	250.40	0.00
	At most 1	105.80	0.00
	At most 2	90.86	0.03
Low and Lower middle income	None	151.6	0.00
	At most 1	61.79	0.0087
	At most 2	49.11	0.1071

Having established the suitability of a standard panel method to estimate the model at level data, it is important is to select an appropriate method amongst the available alternatives. The most popular panel estimation methods are the fixed effects and random effects models. In the fixed effects model, country specific effects are assumed to be correlated with the explanatory variables, whereas the random effects model assumes that country specific effects are uncorrelated so they become part of the error term. The term "fixed effects" expresses non-random quantities are accounted for the heterogeneity. In order to determine the validity of the fixed effect model, Hausman specification test has been applied to validate our selection of the fixed effects model. Results reveal that null hypothesis has been rejected in all four groups, implying that the fixed effects model is preferred over the random effects model (see table 7).

Table 7 **Hausman Specification Test Results-Fixed Vs. Random Effects Model**

Country Groups	**Ho: difference in coefficients not systematic**	
	chi2(2) Values	**Prob.**
All(56-country)	122.00	0.00
High-Income	26.92	0.00
Non-High Income	70.36	0.00
Low and Lower middle income	31.34	0.00

It has also been observed that the presence of serial correlation distorts the fixed effect results. Wooldridge test for autocorrelation in panel data has been applied to detect autocorrelation. The test results are presented in table 8. The results rejects null hypothesis of no first-order autocorrelation in all groups. In view of this, the fixed model is estimated with AR(1) specification because the initial diagnostic test results indicate signs of auto-correlation. The estimated fixed effects model results are given in table 8.

Table 8 **Wooldridge test for autocorrelation in panel data**

Country Groups	H_0: no first-order autocorrelation	
All(56-country)	F(1, 55) = 514.68	Prob > F = 0.00
High-Income	F(1, 21) = 145.41	Prob > F = 0.00
Non-High Income	F(1, 33) = 386.13	Prob > F = 0.00
Low and Lower middle income	F(1, 18) = 221.94	Prob > F = 0.00

Results of Fixed Effects (Within) Model with AR(1) Disturbances are presented in table 9. The results indicate that military spending exerts a positive effect upon RGDP in all four country groups. Results indicate that 1% increase in military expenditure increases RGDP by 0.04% while 1% increases in GFCF increases RGDP by 0.35%. However, the impact of military expenditure is clearly positive on RGDP, it is very small. In comparison to military expenditure, the investment in fixed capital formation has substantial positive effect on RGDP. Examining the effect of military expenditure and gross fixed capital formation on RGDP on different income groups, the results reveal that 1% increase in military expenditure increases RGDP by 0.10% while 1% increases in GFCF increases RGDP by 0.29% for the group of rich and high income countries. In the group of other than high income countries, results indicate that 1% increase in military expenditure increases RGDP by 0.03% while 1% increases in GFCF increases RGDP by 0.38%. Results further indicate that 1% increase in military expenditure increases RGDP by 0.05% while 1% increases in GFCF increases RGDP by 0.44% for the set of lower and middle income countries.

The results of this study confirm the positive effect of military expenditure on economic growth, an indication of Keynesian expansionary effect of aggregate demand. It is valid to argue that military spending boosts RGDP in various groups of countries but this positive effect is negligible compared to the alternative use of scare resources as non-military expenditure. Military expenditure has huge opportunity cost. The present study categorise military expenditure as a sub-optimal means of increasing economic growth given that other alternative uses of

government spending such as on infrastructure, education or health care, etc. These alternative effects are likely to have a greater positive impact as discussed in Wijeweera and Matthew[61], Scheetz[62], Dunne et al.[63], Shieh et al.[64] among others. Our findings also broadly support those of other studies that found a positive relationship between military expenditure and economic growth, e.g., Weede[65], Stewart[66], and Yildirim et al.[67]. Though military expenditure in our study seems to have positive impact on economic growth but its relatively small size leads us to conclude that military spending is a sub-optimal means of increasing economic growth and therefore is not recommended as a tool to boost the economy.

Table 9 **Fixed Effects (Within) Results with AR(1) Disturbances**

Dependent Variable: LNGDP	All (56-country)	High-Income	Non-High Income	Low and Lower middle income
C	16.22 (0.085)	17.40 (0.135)	15.19 (0.110)	13.09 (0.175)
LNME	0.04*** (0.013)	0.10*** (0.023)	0.03*** (0.015)	0.05*** (0.020)
LNGFCF	0.35*** (0.018)	0.29*** (0.018)	0.38*** (0.016)	0.44*** (0.022)
R-sq: within	0.52	0.48	0.55	0.59
R-sq: between	0.99	0.99	0.98	0.98
R-sq: overall	0.99	0.99	0.98	0.98
N	896	352	544	304
F-Statistics	467.25***	155.39***	316.00***	211.22***
Prob > F	0.00	0.00	0.00	0.00

Notes: Numbers in round brackets are the standard errors respectively. *, ** and *** denote significance level at 10%, 5% and 1% respectively.

[61] *Wijeweera, A. and Webb, M. J.* (2011). Military Spending and Economic Growth in South Asia: A Panel Data Analysis. Defence and Peace Economics, 22(5), 545-554.
[62] *Scheetz, T.* (1991). The Macroeconomic impact of defence expenditures: some econometric evidence for Argentina, Chile, Paraguray and Peru. Defense Economics, 3(1), 65–81.
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Conclusions

In the history of conflict, internal conflict or border conflicts between nations caused diversion of resources to higher military expenditure, which more likely slowdowns economic growth, at least in counterfactual sense. In this regard, the present study has made an attempt to investigate the effects of military spending on economic growth. To tackle the problem of insufficient degrees of freedom in case of time series or cross section data sets, the study draws its inferences from the panel data. To take into account the regional and income heterogeneity, this paper makes use of a 56 country panel data spanning over 1995–2011. These 56 countries are further classified in three different income groups as High-Income Countries (22), Non-High-Income Countries (34) and Low and Lower Middle Income Countries (19).

The present study indicate that the military expenditure has positive effect on economic growth but the size of positive effect is negligible compared to the alternative use of scare resources as non-military expenditure. Hence, the study put forward an important argument of higher opportunity cost of scarce resources used for military purposes; therefore increasing military expenditure to boost economic growth is not an optimal way. It also concludes that private investment is more productive and military spending may be having dampening effect on private investment. There are better alternative uses of resource spending on other public goods such as infrastructure, education or health care, etc. The present study concludes that the boosting of economic growth through higher military expenditure is neither effective nor efficient way of achieving higher growth in the economy. It is pertinent to note that the diversion of resources in least developed and developing countries towards military expenditure become a question of utmost importance as millions of people are struggling for basic human needs.

Finally, it may be concluded that the substantial amount of public expenditure that is currently directed towards military purposes has a negligible impact upon economic growth. It is also reflection of political governance of majority of nations where resource allocation is made on the perceptions of elites. This study broadly support those of other studies that found positive relationship between military expenditure and economic growth but a net negative effect on economic growth considering opportunity cost of resources. Finally, empirical results conclude by indicating that resource use on productive capital formation is three to twelve times more growth enhancing compared to the resource use on military expenditure. Relatively, the opportunity cost of military expenditure is higher in LDCs and DCs compared to rich countries.

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Appendix-Country Groups

All Countries-56		High Income 22	Non-High Income-34	Low and Lower middle income-19
Albania	Norway	Australia	Albania	Bangladesh
Australia	Pakistan	Austria	Bangladesh	Burkina Faso
Austria	Philippines	Canada	Botswana	Cameroon
Bangladesh	Poland	Denmark	Brazil	Cabo Verde
Botswana	Portugal	Finland	Burkina Faso	El Salvador
Brazil	Romania	France	Cameroon	Egypt, Arab
Burkina Faso	Rwanda	Germany	Cabo Verde	Ethiopia
Cameroon	South Africa	Israel	Colombia	Guatemala
Canada	Spain	Italy	Dominican Republic	India
Cabo Verde	Sri Lanka	Japan	El Salvador	Indonesia
Colombia	Swaziland	Korea, Rep.	Egypt, Arab Rep.	Kenya
Denmark	Sweden	Malta	Ethiopia	Pakistan
Dominican Republic	Switzerland	New Zealand	Guatemala	Philippines
El Salvador	Tanzania	Norway	Hungary	Rwanda
Egypt, Arab	Thailand	Poland	India	Sri Lanka
Ethiopia	Tunisia	Portugal	Indonesia	Swaziland
Finland	Turkey	Spain	Jordan	Tanzania
France	Uganda	Sweden	Kenya	Uganda
Germany	United Kingdom Kingdom	Switzerland	Malaysia	Nepal
Guatemala	United States	United Kingdom	Mauritius	
Hungary	Uruguay	United States	Mexico	
India	Nepal	Uruguay	Pakistan	
Indonesia			Philippines	
Israel			Romania	
Italy			Rwanda	
Japan			South Africa	
Jordan			Sri Lanka	
Kenya			Swaziland	
Korea, Rep.			Tanzania	
Malaysia			Thailand	
Malta			Tunisia	
Mauritius			Turkey	
Mexico			Uganda	
New Zealand			Nepal	

Note: Above Classification is based on Income Criteria of World Bank.