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CAUSAL LINK BETWEEN MILITARY EXPENDITURE AND GDP-A STUDY OF SELECTED COUNTRIES

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Causal Link between Military Expenditure and GDP-A study of selected countries

There has been a great debate for long among the economists and political scientists on the issue of whether there has been any link or causations between GDP and military expenditure of a country. Professor Keynes does not believe on spending on military activities as it is wastage of resources, particularly when there is deficiency of aggregate consumption and investment demands in the economy. The present paper tries to examine whether there are causal link between GDP and military expenditure of randomly selected 20 countries in the world for the period 1988-2013. Applying the concerned time series econometric tools the study reveals that GDP causes military expenditure for seven countries including France, Germany and Italy and military expenditure causes GDP for five countries including USA, Canada, China and India. Bidirectional causalities are observed for Italy and Australia with no way causality observed in six countries including UK and Japan.

Keywords: GDP, military expenditure, unit roots, cointegration, error correction, Granger causality

Introduction

There is a great debate among the economists over the issue of whether public policy will allow sufficient allocation of governments' budget upon security heads like purchase of

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military weapons, employing crores and crores of defense personnel, purchasing arms, etc. at the cost of development, albeit of the fact of global and regional security threats. J. M. Keynes does not believe in such wastage of resources and strongly recommends in favour of economic spending by the governments particularly when the global economy is under depressionary situation. Military expenditure is wastage of resources and it is a lavish expense whenever the cross border tensions can be minimized by means of bilateral and multilateral talks.

Starting from the World War I and II there was a huge spending on defense items particularly by the developed countries of the capitalistic states headed by the USA and socialistic state headed by the Soviet Union. After the collapse of Japan in 1946 by the USA formally no such great wars did take place. But with the urgency of getting into recovery all the super military powers have felt to understand the economic loss of such unwanted circumstances. The phase of globalization under the umbrella of World Trade Organizations started to strike through the other nations. After that, although no formal war was continuing, informal wars or Cold War on different issues started developing between the two super powers USA and Soviet Union. In the mid terms after two world wars, till date, there were several distinct wars (baked by these two super powers) like Cuban nuclear conflict, Indo-Pak war, the Indo-Shino war, The Gulf War, Israel-Palestine war, war against the Taliban and Al Qaida, US-Iraq war and very recently the ISIS resistance and the Russia-Ukraine crisis. Hence, there is a lot to say about the rising security expenses by all the countries in the world irrespective of their status of developments.

A country with a high or low volume of national output may spend high or low or the reverse upon the purchase of defense items. The purpose of defense spending may be leading to increasing protection of the economy as well as volume of output or may be leading to rise in social cost as it is the wastage of resources; not being spent on productive purposes. It is now required to survey the existing literature on the interdependences between the national output and military or defense expenditure. Military and defense expenditures will be used interchangeably in the later part of the discussion.

Survey of Literature

The contribution of the existing literature in this respect should not be ignored to start up the entire study. The study of Faini, Annez and Taylor (1984) on the interrelationships among defense spending, economic structure and growth for 69 countries for the period 1952-70 have argued that the conventional wisdom of the positive impact of military spending upon the growth of the poor economies are wrong. A greater defense spending, to them, is associated with slower growth because of the fact that the high defense spending reduces savings and investment shares in GDP along with an associated tax hike to finance this activity. The research effort of Looney (1993), on the other hand, establishes the reverse argument. In this study on the effect of military expenditure on economic growth of the Third World countries have shown that defense expenditure may act as an economic

stimulus rather than retardation by means of financing heavy armaments industries, possessing advanced technologies and raising employment levels. The study also expresses that developing countries may attract investments through large military establishments and enhances countries' foreign exchange positions and the growth outcome persists for long because it adds the developments of human skills by learning by doing process. The work of Chowdhury (1991) investigates the causal relationship between economic growth and defense spending in fifty-five developing countries. The study establishes that the relationship between defense spending and economic growth cannot be generalized across countries because of differences in the sample periods as well as differences in the socioeconomic structure and type of government in each country. A study on South Africa by Dunne and Vougas (1999) analyzes causal relations between military spending and economic growth using standard "pre-cointegration" Granger causality techniques indicating a result that there is a significant negative impact of military spending on growth in South Africa. In a specific study on Greek economy, Antonakis (1997) investigates the growth effects of military expenditure over the post-war period, 1960-90. According to the study, military expenditure can affect economic growth through both direct and indirect spin-offs, the reallocation of resources and the creation of new resources. Using a simultaneous equation model comprising variables, growth, savings and military burden, the estimation results reveals that the combined effect of military expenditure on the output growth rate is negative. In a fundamental work, Dunne (2000) provides a survey of the issues and empirical studies involved in the debate over whether military spending has the economic effects in the developing countries. The survey of the empirical analyses within the Keynesian framework suggests that military expenditure has at best no effect on growth but is likely to have a negative impact; certainly there is no evidence of a positive effect. This suggests that disarmament does indeed provide an opportunity for improved economic performance with the understandings at the national and international level, including assistance from the developed world. Empirical investigation related to India and Pakistan, Schneider (1999) cites that they are two of the world's poorest countries, yet each devotes a substantial portion of its resources to defend itself against the other which is established by the fact that they have fought three wars and each accuses the other of waging proxy wars by aiding and assisting terrorists and insurgents since their independence in 1947. Applying the bureaucratic and strategic models the study observed that India was sensitive to Pakistani spending and both countries to have substantial bureaucratic inertia in their spending. The study also gave strong evidence that India behaved as if it were in a competitive arms race with Pakistan, but gave no indication that Pakistan was not influenced by Indian spending. Siddiqa-Agha (2000), in her study report, observed for Pakistan that security spending, threat perception, and the policy-making environment influenced by key actors' interests are inter-related elements. Islamabad's defense expenditure was based on threat perception that was primarily generated by the military establishment due to organizational and personal interests of its members. Bremmer and Kesselring (2007) have gone through both pair wise Granger-causality tests and impulse response functions from VAR models to show an asymmetric response of the growth rate in GDP of the North American countries

to a change in military spending. Increased military spending increases nominal GDP in Canada and Mexico. But increased military spending in the United States reduces the growth in nominal GDP. In a panel of ASEAN-5 countries, Hirnisa and Baharom (2009) tried to study the causal effect and long-run relationships between military expenditure and economic growth for the period 1965-2006. The results suggested that Indonesia, Thailand and Singapore exhibited long–run relationship between military expenditure and economic growth. There is bidirectional causality for Singapore and unidirectional causality from military expenditure to economic growth for Indonesia and Thailand with no meaningful relations observed for Malaysia and Philippines. Dicle and Dicle (2010), in their study, have argued that structural changes in data on significant economic or military events play an important role in analyzing whether there is a relation between growth and military expenditure. In the sample of 65 countries, for the 1975-2004 periods, causal relationship is observed between military spending and GDP growth for 54 countries in an individual analysis of the data. But for the overall sample, panel data Granger causality estimations provide evidence for bi-directional positive causal relationship between the two. The effort by Chen (2014) on examining the causality and co-integration relationships between defense expenditures and economic growth over the period of 1978-2013 for China have shown that there is only one co-integration relation between defense expenditures and GDP which is the Granger Causality of defense expenditures, but not vice versa.

Objective

The present paper further reviews empirically whether there is any sort of causal link between GDP and military expenditure of the selected twenty countries of different status of developments for the period 1988-2013.

Data and Methodology

We have used the World Bank data on GDP and military expenditure at current prices. Military expenditure includes all current and capital expenditures on the armed forces, including peacekeeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces and military space activities. These expenditures further include military and civil personnel, including retirement pensions of military personnel and social services for personnel; operation and maintenance; procurement; military research and development; and military aid. The selected twenty countries for which continuous time series data for both the determinants are available, are USA, Canada, UK, France, Germany, Italy, Russia, Australia, Japan, South Korea, Israel, Saudi Arabia and Kuwait like developed states and China, India, Turkey, Pakistan, Brazil, South Africa and Algeria like developing states.

Since we have a long series of data we need to test first whether both the series are free from unit root problem (or are stationary) before going for testing causal link. If they are found to be non stationary we need to go for whether their first difference is stationary or the series are integrated of order one i.e. I(1). If so

happens then we will go for testing whether there are any sort of long run relation among the both the series by means of Johansen Cointegration Test. If they are found to be cointegrated then the next task is to go for error correction over time by the technique of Engel & Granger (1987). If error correction coefficient is negative and significant then it is stated that the series converge after short run deviation from the long run equilibrium relation. The causality test is then done by the help of Granger (1969) technique after incorporation of the error correction term in cases the error is significant. Hence, there are four steps to go for Granger Causality Test (GCT).

Step 1: Unit Roots Test

To avoid getting spurious regression results from the application of OLS model in a non stationary bivariate data we need to test for staionarity or unit root test. For a data set (y_t, t = 1, 2, ...,T), where t denotes time let us consider the following linear regression set up for unit root test for two versions of the Dickey and Fuller (1979) *ADF(p)* regression–viz.,

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{j=1}^{p} \gamma j \Delta y_{t-j} + u_t \quad (1)$$

for the without time trend case and

$$\Delta y_t = \alpha + \delta t + \beta y_{t-1} + \sum_{j=1}^{p} \gamma j \Delta y_{t-j} + u_t \quad (2)$$

for the with time trend case.

Step 2: Johansen Cointegration Test

Given a data set on two variables (y, x) or (GDP, Mlt) the single equation cointegration test proceeds as follows:

First, the linear regression equation $y_t = \alpha + \beta x_t + u_t$ is estimated separately for individual countries and the estimated regression residuals given by the following equation

$$e_t = y_t - \hat{\alpha} - \hat{\beta} x_t, \; t = 1, 2, T \quad (3)$$

are obtained, where '$\hat{\beta}$'s denote the estimated parameters of the regression equation for each country. These estimated linear regression equations may be taken as estimate of the long run equilibrium relationship between y and the x, in case the variables turn out to be cointegrated.

Next, for each country the following *ADF (p) test* like Equation (1) is estimated. If the coefficient of $e_{t\text{-}1}$ is found to be unity from our given sample then it is concluded that there is no cointegration and if it is found to be less than one then it is said that y and x series are cointegrated for the said country.

Step 3: Error Correction Modeling (ECM)

Once the pair of variables (x, y) has been found to be cointegrated, the next step in the Engle –Granger methodology is to model the short run variations of the variables. This is done by estimating the *ECM* terms where $ECY_t = y_t - \theta_0 - \theta_1 x_t$ and $ECX_t = x_t - \mu_0 - \mu_1 y_t$ as the error correction (EC) terms. Here θ_0, θ_1, μ_0, and μ_1 represent the estimated coefficients.

Step 4: Granger Causality Test

For a bivariate model with both the series as non stationary and integrated of order one for all the countries the GCT is done by estimating the following equations in first difference form of the variables including the EC terms for y on x and x on y (Granger, op cit). The equations are:

$$\Delta y_t = \nu_{yx} + \sum_{j=1}^{T_{11}} \alpha_{1j} \Delta y_{t-j} + \sum_{j=1}^{T_{12}} \beta_{1j} \Delta x_{t-j} + \eta yx ECY_{t-1} + u_{1t} \quad (4)$$

$$\Delta x_t = \nu_{xy} + \sum_{j=1}^{T_{21}} \alpha_{2j} \Delta y_{t-j} + \sum_{j=1}^{T_{22}} \beta_{2j} \Delta x_{t-j} + \eta xy ECY_{t-1} + u_{1t} \quad (5)$$

Here Δ denotes the first difference operator; T_{lm}, $l,m = 1, 2$ denotes the number of lagged values of Δy and Δx that affect the current values of these differenced variables; ν, α, β and η denote regression parameters; u_{lt}, $l = 1, 2$ are the equation disturbance terms (that should be white noises when the *ECM* has been adequately specified). The parameters η_{yx} and η_{xy} in Equations (4) and (5) are called the adjustment parameters. They are expected to have negative values. For a bivariate case like the present one, the *ECM* is complimented by the well known *Granger Representation Theorem* (Hamilton, 1994). In this present set up the nature (or direction) of Granger causality is determined by the F statistics where the judgments are as follows:

1. If $\beta_{1j} = 0$, for all j and $\eta_{yx} = 0$, x may be said not to *Granger cause y*. 2. If $\alpha_{2j} = 0$ for all j and $\eta_{xy} = 0$, y may be said not to *Granger cause x*. 3. If (1) holds but (2) does not, *Granger causality* may be said to be *unidirectional from y to x*. 4. Conversely, if (1) does not hold but (2) does, *Granger causality* may be said to be *unidirectional from x to y*. 5. If both (1) and (2) do not hold, *Granger causality* between x and y may be said to be *bi- directional or feedback causality*. 6. If both (1) and (2) hold, *Granger causality* between x and y may be said to be absent, or there is no causal link.

Empirical Investigations

Before going to test the causal links between the series of GDP and Military Expenditure we present graphical views of the mean values of both the series. Figure 1 and Figure 2 present these two views. The descriptive statistics of both the concerned variables are presented in Table 1.

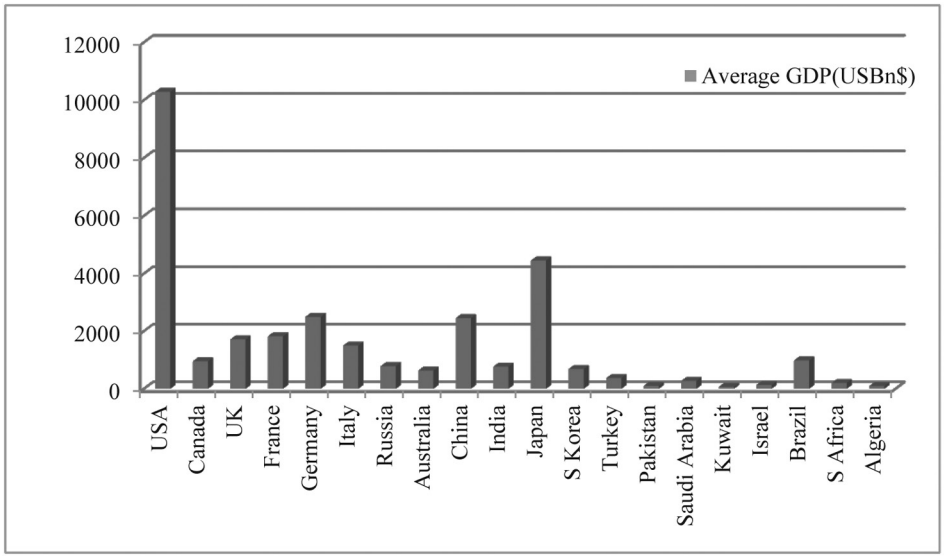

Figure 1: Average GDP of countries (in US Billion $) during 1988–2013

We observe from the figures that USA leads the list of the selected countries with an average GDP of US$ 10285 billion and average military expenditure of US$405 billion for the period 1988-2013. Japan stands in the second position which is followed by Germany and China in respect of GDP but China stands in the second position followed by France and Japan in respect of average military expenditure. Kuwait is in the bottom position with an average GDP of US$ 66 billion preceded by Algeria with US$ 90 billion, whereas Algeria and South Africa are in the bottom position in respect of military expenditure with the average figures of US$ 3.03 and 3.4 billion respectively.

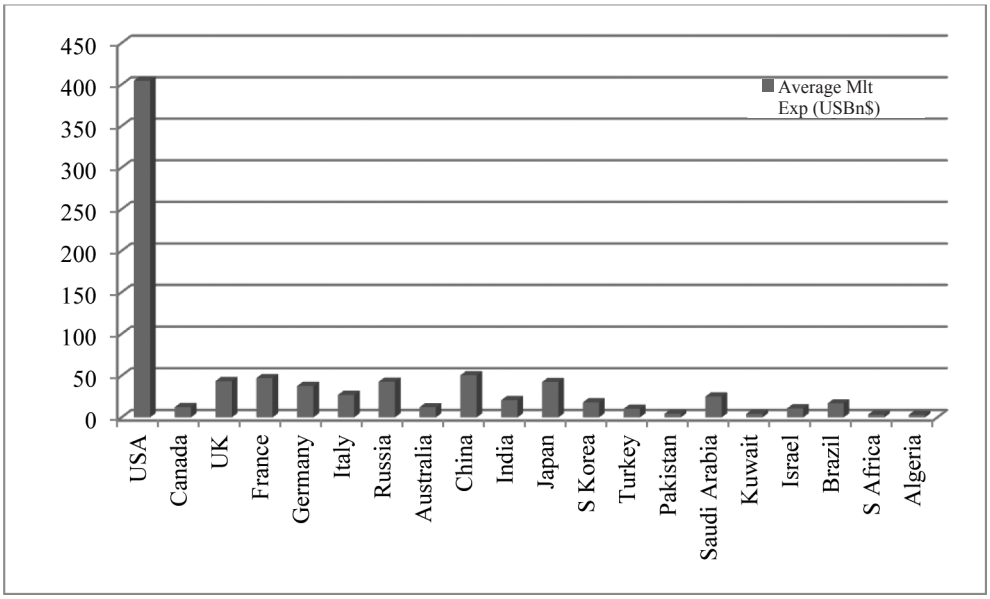

Figure 2: Average military expenditure of countries (in US Billion $) during 1988–2013

We observe wider magnitudes of variations of GDP and military expenditure

across the countries. The magnitudes of variations occur because of USA and China like outlier countries in the upper slot and Algeria, Kuwait like countries in the lower slot. Whenever we talk about the magnitudes of variations of these two variables for a particular country over years we also observe high magnitudes of variations in the top post countries like USA and China. The countries with lower levels of the values of these two variables under concern are also with lower magnitudes of variation (refer to Table 1).

Table 1: Descriptive statistics of GDP and Military (Mlt) expenditure (in US Bn $) of countries

Country	Mean GDP(USbn$)	Mean Mlt(USbn$)	S. D(GDP)	S. D(Mlt)	Correlation (GDP & Mlt)
USA	10285	404.6	3633	160.4	**0.91**
Canada	951	12.2	452	4.35	**0.91**
UK	1713	43.4	651	11	**0.94**
France	1816	47	618.8	10.6	**0.95**
Germany	2493	37.6	715.8	6.43	**0.76**
Italy	1494	27	470.6	6.7	**0.97**
Russia	785	42.8	597	34.6	**0.49**
Australia	631	12.1	399.5	6.5	**0.99**
China	2450	50.4	2631.2	54.2	**0.99**
India	765	20.6	552.6	13.6	**0.99**
Japan	4451	42.4	774	9.3	**0.97**
S Korea	682	18	335.1	7.9	**0.98**
Turkey	367	10.3	249.6	4.85	**0.97**
Pakistan	100	4.3	62.1	1.56	**0.97**
S. Arabia	271	25	189.8	13.9	0.09
Kuwait	66	4.2	55	2.9	**0.97**
Israel	130	10.8	67.5	2.4	**0.90**
Brazil	983	16.7	664.7	9.5	**0.34**
S Africa	199	3.4	95.7	1.06	**0.95**
Algeria	90	3	56	2.7	**0.95**

Note: Bold figures stand for significance at 1% for all except Brazil where it is at 5% level.

The above scenarios of mean and standard deviation provide us a possibility of correlations between the two variables. The correlation coefficient between these two variables are accordingly measured and also presented in Table 1. We observe a very high degree of correlation between the two for all countries except Saudi Arabia with statistically significant results. But it is also to note that correlation does not mean causation. We need to test by proper econometric methods of whether there are the existences of causal links between the level of GDP and military expenditure across the countries under selection. The analysis is given in the following sub section.

Unit root test results

Applying the Augmented Dickey Fuller (ADF) test for examining the unit root or non stationary nature of both the GDP and military expenditure series at levels in line with estimating Equation 1 and 2 we observe that the GDP series for Australia, China and Israel are stationary at levels or are free from unit root problems; the series for all the remaining countries are non stationary at levels up to 3 lag periods (refer to Table 2). Running the test for first difference of the GDP series we observe that all countries' series are stationary except Israel.

Table 2: Unit Roots test results for GDP Series

	GDP at Levels				GDP at First Differences			
Country	**ADF**	**Lag**	**Prob.**	**Remarks**	**ADF**	**Lag**	**Prob.**	**Remarks**
USA	1.68	2	>0.10	NS	–3.08	1	0.05	**S**
Canada	0.82	3	>0.10	NS	–3.18	1	0.05	**S**
UK	–0.51	3	>0.10	NS	–4.35	1	0.01	**S**
France	–0.26	3	>0.10	NS	–3.69	1	0.05	**S**
Germany	–0.38	3	>0.10	NS	–3.9	1	0.01	**S**
Italy	–0.21	3	>0.10	NS	–3.62	1	0.05	**S**
Russia	0.74	3	>0.10	NS	–3.24	1	0.05	**S**
Australia	2.65	2	0.10	**S**	–2.86	1	0.06	**S**
China	2.90	2	0.08	**S**	2.71	1	0.08	**S**
India	0.11	3	>0.10	NS	–2.7	1	0.10	**S**
Japan	–2.92	1	0.05	**S**	–3.3	1	0.06	**S**
S Korea	0.32	3	>0.10	NS	–4.69	1	0.01	**S**
Turkey	0.29	3	>0.10	NS	–3.24	1	0.05	**S**
Pakistan	1.54	3	>0.10	NS	–2.73	1	0.10	**S**
S. Arabia	3.33	3	0.05	NS	–2.84	1	0.10	**S**
Kuwait	1.40	3	>0.10	NS	–4.62	1	0.01	**S**
Israel	2.68	2	0.10	**S**	–0.62	3	>0.10	NS
Brazil	–1.10	3	>0.10	NS	–2.73	1	0.09	**S**
S Africa	0.15	3	>0.10	NS	–3.98	1	0.01	**S**
Algeria	1.14	3	>0.10	NS	–2.99	1	0.05	**S**

The stationary test results for the military expenditure for the countries at the base values are stationary for Russia, China, Japan, Saudi Arabia, Kuwait, Israel and Algeria. The series for all the remaining countries show the presence of unit roots problem (refer to Table 3). The first difference series of the military expenditure show stationary results for all the countries except China.

Table 3: Unit Roots test results for Military Expenditure Series

	Mlt Expenditure at Levels				Mlt Expenditure at First Differences			
Country	**ADF**	**Lag**	**Prob.**	**Remarks**	**ADF**	**Lag**	**Prob.**	**Remarks**
USA	–2.01	3	>0.10	NS	–2.72	3	0.10	**S**
Canada	–0.88	3	>0.10	NS	–3.03	1	0.05	**S**
UK	–0.37	3	>0.10	NS	–4.19	1	0.01	**S**
France	–0.67	3	>0.10	NS	–3.12	1	0.05	**S**
Germany	–0.71	3	>0.10	NS	–3.82	1	0.01	**S**
Italy	–0.60	3	>0.10	NS	–3.36	1	0.01	**S**
Russia	–2.86	1	0.06	**S**	–2.65	2	0.10	**S**
Australia	0.48	3	>0.10	NS	–2.83	1	0.07	**S**
China	3.56	1	0.05	**S**	1.11	3	>0.10	NS
India	0.85	3	>0.10	NS	–2.79	2	0.10	**S**
Japan	–2.73	1	0.08	**S**	–3.78	1	0.01	**S**
S Korea	0.57	3	>0.10	NS	–3.70	1	0.05	**S**
Turkey	0.52	3	>0.10	NS	–3.98	1	0.01	**S**
Pakistan	1.28	3	>0.10	NS	–2.72	2	0.10	**S**
S. Arabia	2.95	2	0.06	**S**	–2.80	2	0.10	**S**
Kuwait	–3.63	1	0.05	**S**	-12.63	1	0.10	**S**
Israel	3.24	4	0.05	**S**	–4.08	1	0.000	**S**
Brazil	–1.01	3	>0.10	NS	–5.52	1	0.01	**S**
S Africa	–1.43	3	>0.10	NS	–2.87	1	0.06	**S**
Algeria	3.16	1	0.05	**S**	5.90	2	0.01	**S**

The results of unit root test induce us to go for testing cointegration among the GDP and military expenditure series for all the countries except China and Israel as both the series of the countries are stationary at levels.

Johansen Cointegration test results

Cointegration test results are presented in Table 4. It is observed from the table that there are significant cointegration among GDP series and military expenditure series for all the countries except France, Italy and Turkey. No cointegration results are shown for China and Israel as the series are stationary at levels. This means there are long run equilibrium relations between these two series with different numbers of cointegrationg equations. The existence of long run equilibrium relations does not rule out the possibility of short run deviations from the equilibrium relation. In other way to state that there may be errors among the relations and it is now a question of whether these errors are corrected or not. This possibility persuade us to test for error correction and after incorporations of these error correction results we will go for testing causality between the base values of the series and first differences of the series wherever applicable.

Table 4: Johansen cointegration test results

Country	Eigen Value	Likelihood Ratio	Lag	Prob.	No. of CEs	Existence of Co integrating Relations
USA	**0.47**	**20.65**	1,1	0.01	2	Yes
Canada	**0.61**	**21.97**	2,2	0.01	2	Yes
UK	**0.52**	**19.65**	2,2	0.01	1	Yes
France	0.13	3.6	4,4	>0.10	0	No
Germany	**0.49**	**19.81**	2,2	0.01	2	Yes
Italy	0.12	3.3	4,4	>0.10	0	No
Russia	**0.64**	**25.74**	1,1	0.01	1	Yes
Australia	**0.62**	**23.47**	2,2	0.01	1	Yes
China	-	-	-	-	-	-
India	**0.55**	**19.76**	1,1	0.05	1	Yes
Japan	-	-	-	-	-	-
S Korea	**0.33**	**14.35**	2,2	0.05	2	Yes
Turkey	0.11	3.10	4,4	>0.10	0	No
Pakistan	**0.47**	**16.24**	2,2	0.05	1	Yes
S. Arabia	**0.65**	**26.88**	2,2	0.01	1	Yes
Kuwait	**0.91**	**56.09**	2,2	0.01	1	Yes
Israel	-	-	-	-	-	-
Brazil	**0.92**	**60.77**	2,2	0.01	1	Yes
S Africa	**0.52**	**19.34**	1,1	0.05	1	Yes
Algeria	**0.76**	**34.82**	2,2	0.01	1	Yes

Notes: The GDP and Mlt. expenditure figures for China, Japan and Israel at levels are stationary. So, no cointegration tests are carried out for them. Bold figures represent significant results at least at 5 % level.

Error correction and Granger causality test results

The results of error corrections and causality between the series are presented in Table 5 which is obtained by estimating Equation 4 and 5. We observe from the results that there are significant error corrections (that is the error correction terms are negative with probability values less than equal to 0.10) for USA, Italy, Russia, Australia, India, Turkey, Saudi Arabia, Kuwait, Brazil and South Africa. The speed of error correction is highest for Brazil followed by Saudi Arabia. The lowest speed is for USA.

The short run Granger causality test results show that military expenditure of China at levels is causing the GDP level and GDP level of Israel is causing the military expenditure at level. The countries where unidirectional causalities are running from change in GDP level to change in military expenditure level are France, Germany, Saudi Arabia, Kuwait, Brazil and Algeria. On the other hand, the countries where military expenditure at first difference causes the GDP at first difference in a unidirectional way are USA, Canada, India and South Korea. We observe only two countries, namely, Italy and Australia where the bidirectional causality works. In these two countries, both the variables are playing the

Table 5: Error correction and Granger Causality test results

Country	Values of Error Correction Terms	Prob.	Whether Errors corrected	Directions of Causality	Lag	Prob.
USA	**–0.13**	0.10	Yes	ΔMlt → ΔGDP	2	0.04
Canada	–0.12	0.32	No	ΔMlt → ΔGDP	2	0.08
UK	–0.16	0.17	No	No Causality	4	-
France	–0.10	0.40	No	ΔGDP → ΔMlt	2	0.09
Germany	–0.16	0.15	No	ΔGDP → ΔMlt	1	0.10
Italy	**–0.35**	0.07	Yes	ΔGDP ↔ ΔMlt	1	0.03 & 0.05
Russia	**–0.20**	0.008	Yes	No Causality	4	-
Australia	**–0.47**	0.05	Yes	ΔGDP ↔ ΔMlt	3	0.08 & 0.07
China	–	–	–	**Mlt → GDP***	1	0.004
India	**–0.49**	0.02	Yes	ΔMlt → ΔGDP	1	0.02
Japan	–	–	–	No Causality	4	-
S Korea	–0.02	0.81	No	ΔMlt → ΔGDP	3	0.07
Turkey	**–0.41**	0.004	Yes	No Causality	4	-
Pakistan	–0.14	0.32	No	No Causality	4	-
S. Arabia	**–0.82**	0.0009	Yes	ΔGDP → ΔMlt	1	0.009
Kuwait	**–0.67**	0.002	Yes	ΔGDP → ΔMlt	3	0.05
Israel	–	–	–	**GDP → Mlt***	1	0.001
Brazil	**–0.85**	0.0005	Yes	ΔGDP → ΔMlt	2	0.06
S Africa	**–0.18**	0.004	Yes	No Causality	4	-
Algeria	–0.16	0.25	No	ΔGDP → ΔMlt	2	0.09

Notes: Bold figures represent significant results at least at 10 % level.
* Marks represent causality at levels.

inputs for the other. The countries, namely, UK, Russia, Japan, Turkey, Pakistan and South Africa, for which we do not find any sort of causal linkages between these two variables either at levels or at first differences. Hence, whether military expenditure is making a cause to GDP is observed in only five countries and whether military expenditure is caused by GDP is observed for nine countries. There is a mixed result of whether there is causal link between GDP and military expenditure of the countries and they are varying across different status of countries.

Concluding Observations

The above study so far we have made on whether there is causal links between GDP and military expenditure of countries is now in a position to conclude. We observe mixed results on the directions of causality between the two across the countries. In nine out of twenty countries we observe GDP making a cause to military expenditure and in a few countries the reverse. Two countries show the results of bidirectional causality. Six countries do not show any directions of causations between the two. Hence, we cannot conclude in a

straight forward way that there are causal links between the status of development and military expenses.

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