Military Spending Response to Defense Shocks? International Evidence

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Abstract: All preceding studies that investigate the consequences of "defense news" shocks (like war or terrorism) on military spending assumed a permanent deviation from its growth path. Using 25 years of military spending annual data for more than hundred high, middle and low countries (based on the definitions of income levels suggested by the World Bank), this paper provide new evidence on the effect of exogenous shocks on military spending. By employing more powerful panel unit root tests that accounts for both cross-sectional dependence across countries and structural breaks, we find robust evidence supporting the stationarity of military spending for all the panels (full, high, middle and low income countries) highlighting that any exogenous shock to military spending has a temporary effect, meaning that military spending will return to its time trend. The stationary characteristic of military spending is fundamental for forecasting defence budget in response to exogenous shocks (terrorism and military conflicts).

Keywords: Military Spending, Transitory or Permanent, Global Evidence

1. Introduction

Influenced by the seminal work of Benoit (1973, 1978), a large number of defense economics literature emerged to investigate the link between economic growth and military spending in both developed and developing countries (Ram 1995, Sandler and Hartley 1995, Devarajan et al. 1996, Chang et al. 2011, d'Agostino et al. 2011, Shahbaz et al. 2013a, b, c, Tiwari and Shahbaz 2013, Chen et al. 2014, Chang et al. 2015, Lau et al. 2015). The impact of military spending on external debt is a topic that has received wider attention lately (See for example Brzoska 1983, Alami 2002, Dunne et al. 2004, Günlük-Senesen 2004, Perlo-Freeman et al. 2004, Smyth and Narayan 2009, Wolde-Rufael 2009, Alexander and Robert 2013, Shahbaz et al. 2014, Zhang et al. 2016). However, the empirical findings of the impact of military spending on economic growth and external debt are rather inconclusive and therefore are not beneficial to policy makers to construct a comprehensive defense and economic policy at the global level.

However, a rapidly changing environment of globalization induced international conflicts among countries and thus the understanding of unit root properties of military spending is important on several grounds. If military spending is found to be stationary at level, then any shock[1] affecting military spending will not have a long-lasting effect over time. As such, the governments' fiscal policies will not be effective as the military spending will return to its actual equilibrium. On the contrary, if any shock affecting military spending contains a unit root indicating the non-stationary behavior, policy making will be effective in the presence of permanent shocks.

The classical school of thoughts contends that military spending has negative effect on the macro-economy and may increase federal indebtedness due to war spending. The raises in fiscal deficit crowds-out private (capital) investment, which not only reduces net productive capital stock but also lowers domestic production. Military spending occurs at the cost of development spending may increase unemployment. It may reduce domestic production by lowering export potential of an economy and hence exports volume in international market (Dunne et al. 2008). Military spending influences economic growth negatively through the crowding-out effects on public and private investments (Sandler and Hartley, 1995).On the contrary, the Keynesian school of thought believes the potential role of aggregate demand in stimulating military spending via generation of output and employment for a nation (Gold 1990, Chan 1995).Furthermore, military spending raises human quality via spending money on education, research and technical trainings (Adam and Gold, 1987). This has positive spill-over effects in an economy (Dunne and Tian, 2015). Finally, military spending also promotes investment climate via maintaining stability and gears towards creating new business in the economy with collaboration of foreign investors (Heo, 2010).

Due to the enormous importance for a nation, it is crucial to study whether countries should increase or decrease military spending. Figure-1 reveals that the estimated military spending was $US1600 billion in 1988, which increased to $US 1756 billion in 2012[2]. It is noted that growth of military spending over the period is 9.75%. This military spending corresponds to 2.5% of world GDP (gross domestic product). Figure-2 shows that world military spending increased significantly in the last decade due to rapid increase in military spending in USA for her involvement in Iraq and Afghanistan. The USA spends 39% of world military spending in

[1]Military spending shocks are defined by a spending growth above the trend that is accompanied by expectations about future military conflicts.

[2]It is the highest military spending after World War II.

2012 and China spends 9.5%, Russia spends 5.2%, UK spends 3.5%, Japan amounts to 3.4%, next 10 countries consume21.2% and the rest of world spend 18.2% of global military spending, respectively. Due to global financial and economic crisis during 2008-09, many countries reduced their public spending but surprisingly, continued to increase military spending till 2011-12.China and India continue to increase military spending due to their rapid economic growth.[3]The behaviour of regional spending over the time period of 1988-2012 can be seen in Figure-3. Figure-3 shows that military spending of US has been higher during 1988-2012 in comparison to the rest of region's military spending in the world.

Figure-1: World Military Spending (1988-2012)

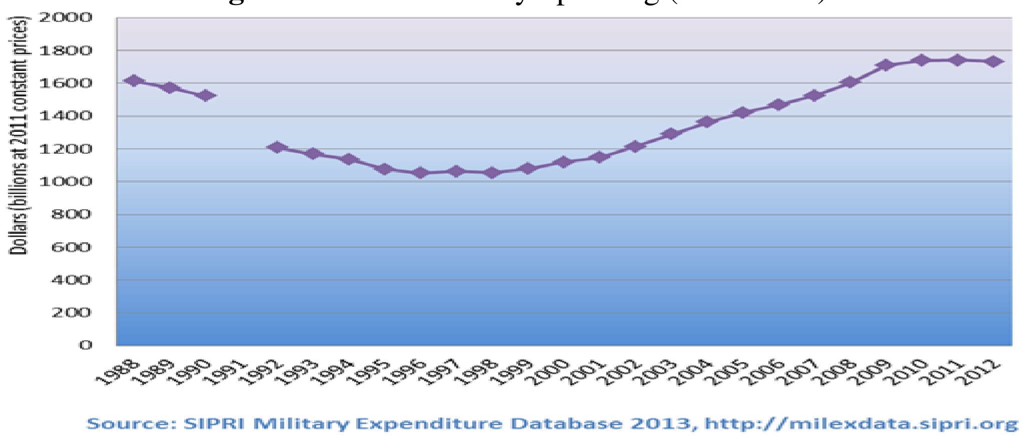


Figure-2: Global Distribution of Military Spending in 2012

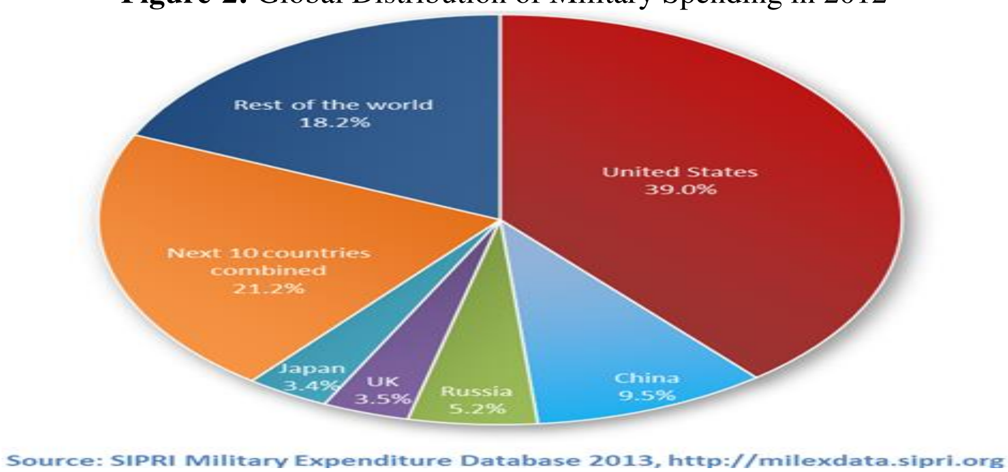
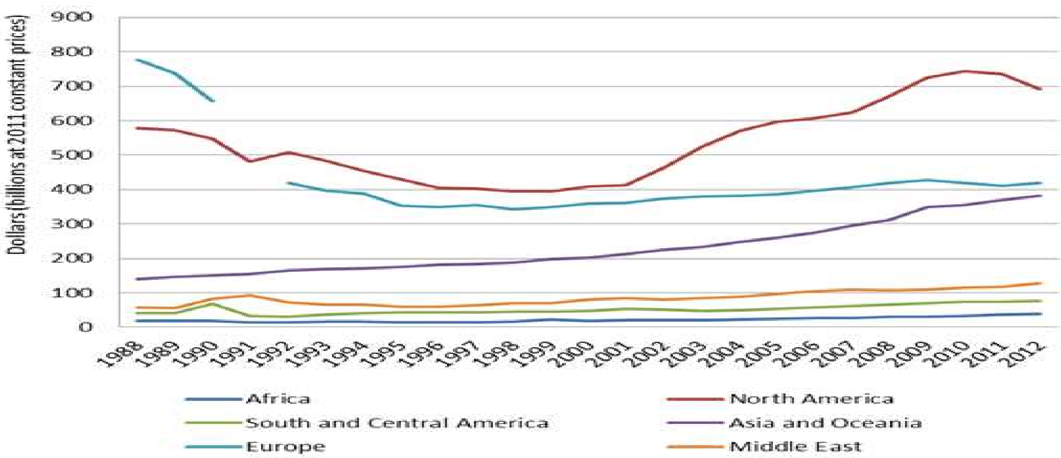


Figure-3: Regional Military Spending (1988-2012)

[3]Tiwari and Shahbaz, (2013) noted that economic growth adds in military spending in India and it is also consistent with the findings of Ali and Dimitraki (2014) for the Chinese economy.



Source: SIPRI Military Expenditure Database 2013, http://milexdata.sipri.org

In light of the above context, the objective of the paper is to investigate whether the fluctuations in military spending are transitory or permanent across high, middle and low income economies. If the series (military spending) is stationary, then fluctuations to military spending return to an asymmetric path and will have no effect on aggregate demand, employment generation and economic growth. Military spending will be ineffective to stimulate domestic economy in the long run. As such, the government must rely on short-run economic policies regarding military spending. On the other hand, if the series contains a unit root then fluctuations in military spending are permanent. The series may show consistency, stability and path dependence. The path dependence in military spending indicates that any change in military spending will have permanent effect on economic growth via labor and goods markets. Military spending may also have pass through effect on other factors such as physical capitalization, development spending, trade, internal and external debts, and human development etc. Therefore, it is vital to know for researchers and policy makers whether shocks affecting military spending are temporary or permanent within full and sub-panels framework.

The forecasts in military spending also play an important role in designing economic policies. The reliable forecasts enable policy makers to allocate funds for military spending to attain sustainable economic growth in the long run. The past behaviour is suitable for forecasts if the series contains a stationary process. On the contrary, if the series contains a unit root process then past behaviour of military spending is no more used for future forecasts. It becomes difficult for policy advisors to forecast the exact influencing behaviour of military spending on economic growth. Therefore, it is very important to know for researchers, policy advisers and fiscal governments of all sampled countries whether shocks affecting military spending are transitory or permanent for modelling purpose. A unit root in military spending indicates that factors affecting the series have permanent effect on it and vice-versa. Finally, the presence of stochastic process in military spending is an indication of persistence behaviour.

Table-1: Brief Literature Review

No.	Autours	Time Period	Unit Root Tests	Conclusion
1	Kollias, (1997)	1954-1993	ADF, KPSS,	Transitory
2	Chang et al. (2001)	1952-1995	ADF, KPSS, ZA	Transitory
3	Dunne et al. (2001)	1960-1996	DF, ADF	Permanent
4	Dunne and Nikolaidou, (2001)	1960-1996	DF	Permanent
5	Sezgin, (2001)	1956-1994	ADF	Permanent
6	Al-Yousif, (2002)	1975-1998	ADF, PP	Permanent
7	Karagol and Palaz, (2004)	1955-2000	ADF	Permanent
8	Kalyoncu and Yucel, (2006)	1956-2003	ADF	Permanent
9	Lee and Chen, (2007)	1988-2003	LLC, IPS, Hadri	Permanent
10	Karagianni and Pempetzoglu, (2009)	1949-2004	ADF	Permanent
11	Wijeweera and Webb, (2009)	1976-2007	ADF	Transitory
12	Abu-qarn, (2010)	1988-2004	ADF	Permanent
13	Dicle and Dicle, (2010)	1975-2004	ADF, N-P, ZA	Permanent
14	Pradhan, (2010)	1988-2007	IPS, LLC, ADF, PP	Permanent
15	Shahbaz and Shabbir, (2012)	1971-2009	N-P	Permanent
16	Eryigit et al. (2012)	1950-2005	LS	Permanent
17	Shahbaz et al. (2013a)	1972-2008	N-P	Permanent
18	Alexander (2013)	1988-2009	LLC, IPS	Transitory
19	Tiwari andShahbaz(2013)	1971-2010	ZA	Permanent
20	Ali and Dimitraki, (2014)	1953-2008	DF-GLS	Transitory
21	Farzanegan, (2014)	1959-2007	ADF, PP	Transitory
22	Yilgör et al. (2014)	1980-2007	SURADF, CADF	Transitory
23	Topcu and Aras, (2015)	1973-2010	ADF, PP, ZA	Permanent
24	Chang et al. (2015)	1988-2010	LLC, IPS, MW	Permanent
25	Lau et al. (2015)	1952-2007	NCADF	Mixed
26	Zhang et al. (2016)	1997-2012	LLC, IPS, Hadri	Permanent
27	Huang et al. (2016)	1996-2014	LLC, IPS	Transitory
28	Jalil et al. (2016)	1960-2-13	ADF, PP	Transitory
29	Manamperi, (2016)	1970-2013	ZA	Permanent

Note: Lee and Strazicich (2001, 2013), nonlinear cross-sectional augmented Dickey–Fuller. DF, ADF, KPSS, ZA, PP, LCC, IPS, N-P, LS, DF-GLS, SURADF, CADF, MW and NCADF stand for Dickey-Fuller, Augmented Dickey-Fuller, Kwiatkowski–Phillips–Schmidt–Shin, Zivot-Andrews, Philips-Perron, Levin-Lin-Chu, Im-Pesaran-Shin, Ng-Perron, Lee-Strazicich, DF-Generalized Least Square, Seemingly-Unrelated-Regression ADF, Cross-Sectional ADF, Maddala-Wu and Nonlinear Cross-Sectional ADF.

Though non-stationary property of energy consumption has been addressed substantially in the field of resource and energy economics over the past decade (Narayan and Singh 2007, Narayan et al. 2008, Smyth 2013, Lean and Smyth 2014, Shahbaz et al. 2013a, b, Dogan 2016), but an empirical investigation on unit root properties of military spending was not addressed widely in defense spending literature. This implies that examining unit root properties of military spending across different income groups has far from settled in the field of defense economics literature. In addition, a limited number of studies are available in the literature investigating the unit root properties of military spending using time series and panel non-stationary techniques (Table-1). 31% of the studies conclude that fluctuations in military spending are transitory while

3% of the studies present mixed results. 66% of the studies show that shocks in military spending are permanent. This ambiguity in empirical findings provides rationale for researchers to move further for consistent and reliable empirical evidence for all sampled countries.

Influenced by the research gap, our study appears to be the first one which comprehensively examines the non-stationary property of military spending using the large panel data of 104 high, middle and low income countries over the period of 1988-2012. This study contributes to the existing literature of peace and defence economics in several ways. First, we perform a series of panel unit root tests accommodating both cross-sectional dependence and structural breaks arising in the series. To the best of our knowledge, it is the first study to do that. The underlying motivation of our study is to capture cross-sectional dependence and structural breaks in the series. It appears to be unavoidable due to growing competition and various endogenous and exogenous shocks affecting military spending in the real world.[4]Second, we also employ multiple panel unit root tests to produce consistency and robustness results of military spending under full and sub-panels investigation based on the recent views of Karanfil (2009)[5] and Smyth (2013)[6] in the field of energy policy and applied energy. We, therefore, believe that our study will provide deeper understanding of the effect of military spending to the generalist audiences and technical readers. Overall, this is the contribution of our study emerging from doing unit root properties of defense spending and also helping each and every country to implement standardized defense policy for the minimization of conflicts with each other in the long-run.

The rest of the paper is structured as follows. Section 2 discusses econometric methodology used for empirical panel estimation. Section 3 analyses the data description. Section 4 summarizes the discussion of empirical results. Section 5 deals with the discussion of conclusion and policy implications.

2. Econometric methodology

2.1 The Second-Generation of Panel Non-Stationary Tests

We applied Moon and Perron (hereafter MP, 2004), Pesaran (2007) and Choi (2001, 2002) tests. The presence of unit root (in across sectionally dependent panel) can be tested by applying the factor model (MP, 2004) MP (2004). The MP model supposes the presence of common factor in the error terms:

$$y_{i,\,t} = (1-\lambda_i)\mu_i + \lambda_i y_{i,\,t-1} + \mu_{i,\,t} \qquad (1)$$

[4]Zhang et al. (2016) pointed out that cross-sectional dependence among countries play an important role in affecting the series because different countries have different public and private investment, varying economic and political development, heterogeneous social and cultural backgrounds along different security system. In addition, structural breaks play a vital role in affecting series because different economies have been affected due to various internal and external policy shocks over the time. In the presence of cross-country panel investigations, if we do not account for these concerns jointly, then it may lead to misleading results and limiting deeper analysis.

[5]Karanfil (2009) argued that policy advisers give much importance to the robustness and consistency results rather than time periods and econometrics techniques used in the study. This implies that both robustness and consistency results can be obtained via using multiple panel unit root tests.

[6]Smyth (2013) also advices the use of multiple panel non-stationary techniques to enable the results reliable and consistent.

For $i = 1,...., N$ and $t = 1,...., T$

$$\mu_{i,t} = \delta_i^{'} F_t + \varepsilon_{i,t} \quad (2)$$

where F_t is a $(K \times 1)$ vector of commons factors, δ_i is the coefficients vector corresponding to the common factors and $\varepsilon_{i,t}$ is an idiosyncratic error term. Moon and Perron, (2004) proposed to test the null hypothesis λ_i=1 for $i = 1,...., N$ against the heterogeneous alternative hypothesis $H_1 : \lambda_i < 1$ for some *i*. To do so, the author suggested the following steps: firstly, MP proposed to estimate the first order autoregressive coefficient by using a pooled ordinary least square (OLS). Secondly, they used principal component analysis to construct another estimator for the error terms from the specific one of the first step. Finally, they eliminated the common factor by projecting the original data onto orthogonal space data (de-factoring the data). MP (2004) suggested using the following two t-statistics:

$$t_a^* = \frac{\sqrt{N}T(\hat{\lambda}^* - 1)}{\sqrt{\frac{z\phi_e^4}{\hat{\omega}_e^4}}} \to N(0,\ 1) \quad (3)$$

$$t_b^* = \sqrt{N}T(\hat{\lambda}^* - 1)\sqrt{\frac{1}{NT^2} tr(Y_{t-1} Q\hat{\Delta} Y_{t-1}^{'})}\left(\frac{\hat{\omega}_e}{\hat{\varphi}_e^2}\right) \to N(0, 1) \quad (4)$$

Where$tr(.)$ is the trace operator and $Y_t = \left(y_{1,t}, \dots, y_{N,t}\right)^t$, $\hat{\lambda}^*$ denotes the modified pooled OLS estimator, w_e^2 is the cross-sectional average of the long-run variances $w_{e_i}^2$ of residuals e_{it}, γ_e^4 refers to the cross-sectional average of $w_{e_i}^4$ and $Q\hat{\Delta}$ is the projection matrix. For each $e_{i,t}$ the short run and long run variances are defined as follows: $\sigma_{e_i}^2 = \sum_{j=0}^{\infty} \gamma_{i,j}^2$ and $\omega_{e_i}^2 = \left(\sum_{j=0}^{\infty} \gamma_{i,j}\right)^2$. The $\varphi_{e_i} = \sum_{l=1}^{\infty} \sum_{j=0}^{\infty} \gamma_{i,j} \gamma_{i,j+l}$ design the sum of positive autocovariance of idiosyncratic error term. The non-zero averages of these parameters can be written as follows:

$$\sigma_e^2 = \frac{1}{N} \sum_{i=1}^{N} \sigma_{e_i}^2 \ ; \ \omega_e^2 = \frac{1}{N} \sum_{i=1}^{N} \omega_{e_i}^2 \text{and} \varphi_e^2 = \frac{1}{N} \sum_{i=1}^{N} \varphi_{e_i}^2$$

In order to eliminate the cross-sectional correlations and removing deterministic trends, Choi (2002) proposed to transform the following series by eliminating the individual and time effects:

$$y_{it} = \alpha_i + \theta_t + v_{i,t} \quad (5)$$

$$v_{i,\ t} = \sum_{j=1}^{p_i} d_{i,j} v_{i,t-j} + \varepsilon_{i,t} \quad (6)$$

As a result, the author performed the unit root test on the new orthogonalized variable. Choi (2002) proposed to combine the p-value p_i of the Dickey-Fuller unit root t-statistics in each cross-sectional unit and employing the following three statistics:

$$p_m = \frac{1}{N}\sum_{i=1}^{N}[\ln(p_i)+1] \rightarrow N(0,1) \quad (7)$$

$$Z = \frac{1}{N}\sum_{i=1}^{N}\Phi^{-1}(p_i)+1 \rightarrow N(0,1) \quad (8)$$

$$L^* = -\frac{1}{\sqrt{\pi^2 N/3}}\sum_{i=1}^{N} N\ln(p_i/1-p_i) \rightarrow N(0,1) \quad (9)$$

where Φ is the standard cumulative normal distribution function.

Pesaran, (2007) extended the IPS test structure by adding an unobserved common factor f_t and an individual specific factor γ_i:

$$\mu_{i,t} = \gamma_i f_t + \varepsilon_{i,t} \quad (10)$$

where $\varepsilon_{i,t} \sim iid(0,\sigma^2)$ and $E(\varepsilon_{i,t}^4) < \infty$. As suggested by Pesaran (2007), the presence of unit root can be tested by using the cross-sectional Augmented Dickey-Fuller (CADF)statistics:

$$\Delta y_{i,\,t} = \alpha_i + \rho_i y_{i,\,t-1} + c_i\left[(1/N)\sum_{i=1}^{N} y_{i,\,t-1}\right] + d_i\left[(1/N)\sum_{i=1}^{N} y_{i,\,t}\right] + \upsilon_{i,\,t} \quad (11)$$

Given that cross-sectionally Augmented Dickey-Fuller statistic for i is denoted by $t_i(N,T)$, Pesaran proposed a panel root t-statistic called the *Cross Sectional Augmented IPS*:

$$CIPS(N,T) = \frac{1}{N}\sum_{i=1}^{N} t_i(N,T) \quad (12)$$

2.2 The Third-Generation of Panel Non-Stationary Tests

We applied panel unit root test with structural breaks to check for the robustness of the unit root test results. We used the Lagrange Multiplier (LM)-based unit-root test proposed by Im et al. (2005). The ILS test is based on Lee and Strazicich's model:

$$\Delta y_{i,\,t} = \gamma_t^{'}\Delta Z_{i,t} + \delta_i \hat{S}_{i,\,t-1} + \varepsilon_{i,\,t} \quad (13)$$

where $\hat{S}_{i,\,t} = y_t - \psi_x - Z_t\delta$ for (t = 2,…T) and Z_t is a vector of exogenous variables defined by the data generating process; δ is the vector of coefficients in the regression of Δy_t on ΔZ_t respectively with Δ the difference operator; and $\psi_x = y_1 - Z_1\delta$, with y_1 and Z_1 the first observations of y_t and Z_t respectively. In order to test the null hypothesis $\delta_i = 0$, the authors constructed the panel LM test statistic from the t-statistic, t_i^*, of each individual unit root:

$$\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_i^* \tag{14}$$

They suggested sub-sequently the following standardized panel LM test statistic:

$$LM(\bar{t}) = \frac{\sqrt{N}(\bar{t} - E(\bar{t}))}{\sqrt{V(\bar{t})}} \tag{15}$$

$E(\bar{t})$ and $V(\bar{t})$ are tabulated by Im, Lee and Tieslau (2005).

3. Data Description

The data for military spending (constant 2005 US$) across high, middle and low income economies is collected from World Development Indicators (CD-ROM, 2014). The classification of countries into high income, middle income and low income economies is also followed by the World Bank's website. We use total population series to convert military spending data into per capita units. The data on military spending per capita (US$) is transformed into natural-log. The study uses the annual time period of 1988-2012.

4. Results Discussions

On the other hand, we applied the panel non-stationary techniques to investigate the existence of temporary or permanent shocks affecting military spending in a panel of 104 economies, followed by a sub-panel analysis for 36-high income countries, 52-middle income countries, and16-low income countries. We begin by applying the cross sectional dependence tests (Pesaran's (2004), Friedman's (1937) and Frees (1995) tests). The results are displayed in Table-2. We found that null hypothesis of cross-sectional independence is rejected for most panels. Next, we employed "the first and the second generation of panel non-stationary tests" for the four panels. The results are reported in Table-3. The tests provide evidence to reject the null hypothesis that military spending contains a unit root for the four panels (entire panel of 104 countries including high, middle and low income countries). Our analysis, therefore, indicated that the battery of panel unit root tests show stationarity across all panels. This finding was corroborated by the results of LM panel unit root test which allow for structural breaks. The Im, Lee and Tieslau, (2005) test rejects the hypothesis of non-stationary process for entire panel of 104 countries; high, middle and low income countries (Table-4). Overall the panel non-stationary tests without and with structural breaks provide evidence of stationary process for all panels.

Table-2: Test of Cross-Sectional Dependence Analysis

Cross dependence test	Sampled Panel Data Classifications			
	Full Panel	High	Low	Middle
Frees' test of cross sectional independence (p-value)	30.25 (0.00)	1.60 (0.00)	1.38 (0.00)	3.73 (0.00)
Pesaran's test of cross sectional independence (p-value)	77.29 (0.00)	5.72 (0.00)	-3.83 (0.01)	1.18 (0.29)
Friedman's test of cross sectional independence (p-value)	695.91 (0.00)	86.53 (0.00)	11.97 (0.07)	40.74 (0.01)

Table-3: Panel Data Non-Stationary Analysis[7]

Second-Generation Panel Non-Stationary Tests: Full Sampled Countries Panel				
Types of test statistic	*Test statistic*	*1 % CV*	*5 % CV*	*10 % CV*
Moon Perron1 statistic (ta_bar statistic)	-34.702	-2.326	-1.645	-1.282
Moon Perron2 statistic (tb_bar statistic)	-12.649	-2.327	-1.645	-1.282
Pesaran test, (2007) statistic	-1.904	-2.727	-2.608	-2.545
Choi test statistic (P_m)	8.658	2.327	1.645	1.282
Choi test statistic (Z)	-5.762	-2.327	-1.645	-1.282
Choi test statistic (Lstar)	-5.999	-2.327	-1.645	-1.282
Second-Generation Panel Non-Stationary Tests: High Income Countries Panel				
Moon Perron1 statistic (ta_bar statistic)	-25.136	-2.327	-1.645	-1.282
Moon Perron2 statistic (tb_bar statistic)	-7.851	-2.327	-1.645	-1.282
Pesaran test, (2007)	-1.889	-2.875	-2.715	-2.630
Choi test statistic (P_m)	2.358	2.327	1.645	1.282
Choi test statistic (Z)	-2.162	-2.327	-1.645	-1.282
Choi test statistic (Lstar)	-2.130	-2.327	-1.645	-1.282
Second-Generation Panel Non-Stationary Tests: Low Income Countries Panel				
Moon Perron1 statistic (ta_bar statistic)	-7.196	-2.327	-1.645	-1.282
Moon Perron2 statistic (tb_bar statistic)	-4.269	-2.327	-1.645	-1.282
Pesaran test, (2007)	-1.566	-3.071	-2.836	-2.727
Choi test statistic (P_m)	5.514	2.327	1.645	1.282
Choi test statistic (Z)	-4.023	-2.327	-1.645	-1.282
Choi test statistic (Lstar)	-4.385	-2.327	-1.645	-1.282
Second-Generation Panel Non-StationaryTests: Middle Income Countries Panel				
Moon Perron1 statistic (ta_bar statistic)	-28.264	-2.327	-1.645	-1.282
Moon Perron2 statistic (tb_bar statistic)	-12.117	-2.327	-1.645	-1.282
Pesaran test, (2007)	-1.743	-2.934	-2.754	-2.668
Choi test statistic (P_m)	8.889	2.327	1.645	1.282
Choi test statistic (Z)	-5.784	-2.327	-1.645	-1.282

[7]The Matlab codes used for estimating Panel non-stationary tests are available on Christophe Hurlin's homepage (http://www.univ-orleans.fr/deg/masters/ESA/CH/churlin_R.htm)

Choi test statistic (Lstar)	-6.161	-2.327	-1.645	-1.282

Table-4: Panel Non-Stationary Techniqueswith Accommodating Structural Breaks (Im et al. 2005)[8]

Panel Classifications	Without break	Single break	Double breaks
Full Panel	-29.604***	-84.348***	-110.928***
High Income Panel	-15.724***	-43.715***	-55.986***
Middle Income Panel	-18.094***	-62.252***	-80.755***
Low income Panel	0.208	-29.499***	-36.901***

Note: The critical values for panel LM non-stationary tests with structural breaks are-2.326,-1.645 and -1.282 at 1%, 5% and 10% levels, respectively. *, ** and *** denote significance levels at 10%, 5% and 1% levels.

5. Conclusion and policy implications

Since the pioneering work of Benoit (1973, 1978) on the nexus between defense spending and economic growth, a large number of studies emerged to verify the stationary property of military spending within time series and panel frameworks. A majority of these studies fails to reject non-stationarity in the series. The results of the previous studies could be biased, inconsistent and inconclusive due to their failure to account for cross-sectional dependence among countries and structural breaks arising from data series and may lead to incorrect policy measures. We accommodate both cross sectional dependence and structural breaks in the series for our stationarity tests and thus correct for the biases. Therefore, our study made a humble effort to contribute to the research gap in the existing defence economics literature. We have deployed the battery ofpanel stationarity tests which incorporate cross-sectional dependence among countries and structural breaks arising in the series to examine the unit root proprieties of military spending variable of 104 high, middle and low income countries from 1988 till 2012.Our findings strongly reject the existence of a unit root in military spending, thus lending firm support to the existence of income groups-wise stationarity for our panel of countries.

In terms of empirical findings, we conclude that any shock to military spending has a temporary impact for full, high, middle and low income countries, suggesting mean reverting rather than following random walk behaviour over the time. More intuitively, this suggests that any endogenous and exogenous shocks affecting military spending in these countries will be temporary in nature. Given this consistent findings, it is possible for us to suggest a common policy theme for policy makers and fiscal governments of high, middle and low income countries of the world. On policy front, the study, therefore, suggests that the policy makers in high, middle and low income countries should not design or re-design any adverse long-term policies of military spending which is expected to have negative effects on crucial national and international security, peace and stability as both endogenous and exogenous shocks affecting military spending are not long-lived. In doing so, it is also believed to have damaging impacts on internal and international migration, labour employment, investments and sustainable economic growth and development. It is also not effective for fiscal governments of high, middle and low income countries to use military spending as a tool to protect the internal and external stability as the series is stationary. Another implication of the findings is that policy makers can use past

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[8]The Gauss codes used for estimating the Im, Lee and Tieslau (2005) panel non-stationary test is available on Junsoo Lee's homepage (http://old.cba.ua.edu/~jlee/gauss).

behaviour of military spending to forecast future military spending. In addition, the researchers can use stationary military spending series in level form and there is no need for them to go for differencing the spending series for model predictions. Finally, we leave for further studies to investigate the integration properties of military spending separately for high, middle and low income countries coming under the four geopolitical panels (Africa, Europe, Middle East & South Asia, and Pacific Rim). Though for now, this research gap is beyond the scope of our analysis.

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