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# MILITARY EXPENDITURE AND ECONOMIC GROWTH IN THE CASE OF CHINA: USING ARDL APPROACH

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***ABSTRACT****: In recent decades, the potential contribution of military expenditure to economic growth has been a subject of much controversy among development economists. While some contend that military expenditure has an adverse effect on economic growth as it crowds out investment. Others are of the view that military spending improves economic performance as it tends to expand aggregate demand. Taking advantage of recent developments in time series econometric methods, this paper re-examines the relationships between military expenditure and economic growth in China, from annual data for the period 1980–2011. The study used autoregressive distributed lag (ARDL) to test for the long-run and short run relationships while granger causality techniques used to examine the direction of causation. The results however indicate that there is an inverse relationship between economic growth and military spending in the short run while the long run results suggest that the correlation among the variables is inconclusive. Similarly, the granger causality tests revealed a unidirectional relationship running from GDP to military spending***.**

**KEYWORDS**: Military expenditure; Economic growth; ARDL; Granger Causality, China

## INTRODUCTION

The relationship between military expenditure and economic growth has been widely debated among scholars. Many argue that huge infusion of economic resources into the defense sector would crowd out investment on productive sectors of the economy. While, others contend that the defense sector could have a spillover effect on the economy through technological progress, infrastructure and human capital formation. As Deger and Sen (1995) argued that, from a purely economic point of view, the defense spending was widely regarded as the quintessential unproductive expenditure, except for insurance against war. However, Smith and Smith (1980) argue that defense spending protects countries from external threats and internal aggression and thus encourages foreign investment.

Furthermore, a number of empirical studies have emerged on the defense–growth nexus (e.g. Yildirim *et al*, 2005; Benoit, 1973 and 1978; Dunne & Nikolaidou, 1999). Despite the growing number of empirical studies on the subject, with the exception of a handful of studies, most of the studies focus is on the relationship between economic growth and military spending rather than the other way round and the findings have been mixed. For instance, Yildirim *et al*, (2005) have found no evidence of any relationship between the two variables. This is against the traditional opinion that excessive spending on military expenditure is bad on economic growth, until the

seminal contribution by Benoit (1973, 1978) who found a positive and significant relationship between military expenditure and economic growth.

These variations in the findings are attributed largely to differences in the methods employed, the reliability of the existing data (Blasko et al., 2007). Since Benoit, the research focus and the methodologies applied in analyzing the effects of this category of spending have changed significantly. For example, in the last two decades most of the contributions to the defense-growth debate were cross-sectional studies. More recently, however, single-country studies have become more popular since they overcome the heterogeneity issue and take into account the historical and institutional information unique for each country (Dunne & Nikolaidou, 1999). The important contribution of this study to the existing literature is that, the study is on China, which is particularly interesting because of its strong military tutelage, and is the second largest economy in the world. Secondly, there has been limited empirical evidence on this subject within the Asian region. Another important contribution of this study is it examined both the relationship and the causality between economic growth and military spending using more rigorous econometric techniques.

The remainder of the paper is structured as follows: Section 2 describes in brief the Chinese economy, its military might and politics. Section 3 describes the methodology of the study. In Section 4, we provide the empirical results and discussion. Section 5 is the conclusion.

## THE CHINESE ECONOMY, MILITARY MIGHT AND POLITICS

China has been going through a continuous period of economic growth since its economic reform policies in the early 1980s. The Chinese GDP was approximately 6.6% per year from 1978 to 2003 compared with 1.8% per year in Western Europe and the USA, and four times faster than the world average (Maddison, 2007). Additionally, China's rapid industrialization and substantial development have been brought about by reallocation of resources to most productive sectors (Wu, 2003). The high rate of economic growth has made the country become the world's second largest economy behind the USA, emerging in the global economy as a key trading partner by mobilizing as many economic resources as possible for economic growth.

Earlier research has discussed that China should also be deemed to be a major military power beside its economic growth (Kim, 2003). However, in spite of China's prominent economic growth, there are no a clear signs to indicate that it is also a rising military power (Nolt, 2002).4 Although China set a developmental strategy for the military sector after 1979, such a strategy was mostly defensive aiming to safeguard its economic infrastructure and its territorial autonomy as well as to control any internal threats (Wood, 2010). Therefore, the allocation of adequate economic resources to the military sector was for maintaining national security and stability. The Chinese military sector is going through changes as it adapts to military modernization needs, national security challenges and socio-economic changes (Cordesman and Yarosh, 2012).

China's economic growth has accelerated in the past few decades. However, the extent of this growth seems to be increasingly accompanied by uncertainties about China's military development

(Cavelty et al., 2012). Most of the concerns, though, exist due to a lack of information on the exact size of China's military build-up and its future strategic intentions. Legro (2007), for instance, suggests that if the Chinese economy continues to grow the way that it has done over the past decade, the Chinese military expenditure will increase by between $185 billion and $400 billion by 2025. This is still less than the US military budget proposed for 2013, $613.9 billion. According to SIPRI (2012), China's defense expenditure was estimated to be about $143 billion compared with the US spending of $711 billion at 2011 constant prices. Moreover, while the US military spending constitutes approximately 4.7% of GDP, the corresponding spending of China is approximately 2% of GDP (SIPRI, 2012).

China's biggest challenge is to manage its own rise and to enlarge its regional influence without provoking regional instability, which could undermine its long-run economic prosperity and integration. The Chinese defense spending is the subject of policy decisions (Chen, 1993). Therefore, the allocation of economic resources to military expenditure can also be considered an indicator of policymaking with regard to the Chinese security concerns along with its involvement in the UN's peacekeeping.6 On the other hand, identifying China's real defense expenditure is hard since the published Chinese figures do not always match the estimates of outside observers (Shambaugh, 2002).7 While the Chinese government discusses that the defense budget reflects partly its economic growth process, the Pentagon has identified that the only country that can challenge the USA in the future is China (Chen and Feffer, 2009).

Security issues and political tensions are clearly at the center of the Chinese national agenda, which make it absolutely necessity for military spending. The Chinese defense spending is of great importance, given the Chinese leadership's increasing appeal for domestic harmony and concerns about their political legitimacy and international image. Therefore, a re-examination of the Chinese performance might provide new perceptions on the nature of economic growth in relation to defense expenditure, namely whether the Chinese economic development has been a cause of its defense expenditure or an effect of it.

| Year | 1989-1993 | 1994-1998 | 1999-2003 | 2004-2008 | 2009-2012 |
|---|---|---|---|---|---|
| | 2.589408 | 1.802983 | 1.895692 | 2.070324 | 2.241108 |
| | 2.624841 | 1.727153 | 1.854567 | 2.049342 | 2.082125 |
| | 2.447031 | 1.756195 | 2.070126 | 2.089551 | 1.995333 |
| | 2.559103 | 1.68412 | 2.177297 | 2.057859 | 2.019941 |
| | 2.071665 | 1.777209 | 2.120411 | 2.031553 | |
| Average | 2.458409 | 1.749532 | 2.023618 | 2.059726 | 2.084627 |

Table I: China Military expenditure as a percentage of GDP (1989-2012).

Source: SIPRI.

As we can observe from Table I, average military expenditure as a share of GDP was 2.4584 between 1989 and 1993, this percentage regularly has decreased between 1994 and 1998 to 1.7495%,. However, in the average of military expenditure as a share of GDP slightly has increased between 2004 and 2012 from 2.0597 to 2.08462. It means that China beside its rapid economic growth has begun to raise its military power and provide much resource to this sector to stimulate economic growth.

## METHODOLOGY

### Data

The three variables used in this study, namely real gross domestic product, real military expenditure and population, using time-series data for over the period 1980–2011. The data are collected from various sources. For example, the data of gross domestic product (GDP) and population are collected from World Development Indicator (WID), and the data for military expenditures are obtained from Stockholm International Peace Research Institute (SIPRI).

### Analysis

Moreover, we begin the empirical analysis with an investigation of the unit root test for the variables. We assumed that, the data we have used in this estimation are stationary. If the results of stationarity are violated, this might lead to spurious results. In examining the time-series data properties, there are several models to test the stationarity, but the most important one are the Augmented Dickey–Fuller (ADF) (Dickey and Fuller, 1979, and the Phillips–Peron (PP) (Phillips and Peron, 1988) unit root tests.

*Autoregressive Distributed Lag (ARDL) Model and Co-integration Analysis*

To analyze time series data with different order I(1) and I(0) together, Pesaran et al. (2001) suggested that, the Autoregressive distributed lag approach (ARDL) to test for co-integration as an alternative way to co-integration model for Engle-Granger (1989). This study uses ARDL model to investigate the long and short run relationship between military expenditure and GDP in the case of China. The ARDL bound testing approach for co-integration can be written:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta GDP_{t-i} + \sum_{i=0}^{p} b_i \Delta ME_{t-i} + \sum_{i=0}^{p} c_i \Delta POP_{t-i} + \delta_1 GDP_{t-1} + \delta_2 ME_{t-1} + \delta_3 POP_{t-1} + \mu_t \quad (1)$$

Here, $\Delta$ is the first difference operator, $\Delta GDP_t$ Stands the natural log of real GDP, $\Delta ME$ Stands the natural log of real government military expenditure, $\Delta POP$ Stands the natural log of population, and $\mu_t$ Stands the error correction term.

The *F* test is used to determine whether the long-run relationship exists between the variables through testing the significance of the lagged levels of the variables. When, the long-run relationship exists, then, the *F* test shows which variable should be normalized.

The null hypothesis of no co-integration amongst the variables in equation (1) is H0=B1=B2=B3=B4=B5=B6=B7=0 against the alternative hypothesis H1≠B1≠B2≠B3≠B4≠B5≠B6≠B7≠0.

The *F* test has not a standard distribution which depends on; (1) whether the variables are included in the ARDL model are I(0) or I(1); (2) the number of independent variables; (3) whether the ARDL model contains an intercept and a trend; and (4) the sample size of the variables. The rejection of the null depends on F-test and the critical bound tabulated value for small sample size according to Narayan (2005).

The long run relationship among the variables exists if the calculated value of F - statistic is greater than the upper critical bound test, and if the calculated value of F- statistic is smaller than the lower critical bound, the long run relationship does not exist, if calculated value of F-statistic comes in between the range of LCB and UCB then the long run relationship is inconclusive ( Mintz, 1991; Hassan & Kalim, 2012). The Akaike Information Criterion (AIC) is used for the optimal lag selection. According to Narayan (2005) the maximum lags for small sample size are two lags.

## EMPIRICAL RESULTS

Table II shows the result of stationary test for ADF-test and PP test respectively for the case of China. Both tests revealed that GDP has a unit root at level, but it becomes stationary at first difference, which implies that GDP is I (1). Nevertheless, other two variables were found to be significant at the level, and thus it indicates that the variables are I (0). As the results point out, the variables are I(0) or I(1), therefore implying that we can confidently apply ARDL approach which capable of handling both stationary at level I(0) and first difference I(1) (Narayan, 2005).

Table III represents the long run co-integration test analysis, and existence of long run relationship which has been found among the model's variables. Results illustrate that the computed F-statistics is 5.1653. The relevant critical value bounds at ten percent level (with unrestricted intercept and no trend) are 3.437 and 4.470 and for the lower and upper bounds respectively. Subsequently, the computed F-statistics is higher than the critical value of the upper bound, the null hypothesis of no long run co-integration relationship among the variables can be simply rejected. Having established that, the existence of the long run associated between real GDP per capita, real government military expenditure, and real export. The model can be used to estimate long run and short run parameters.

Table V demonstrates the selected long and short run ARDL model, based on Akaike Information Criterion (AIC). The results show negative and significant relationship between real gross domestic product ($GDP_t$), real government military expenditure($ME_t$) in the short and, these relationships are statistically significant at 1%. The results revealed that improvement in government military expenditure is not associated with improvement in gross domestic product,

and any increase in the military sector will lead to decrease the economic growth A negative and significant relationship between military spending and economic growth has been reported in the literature similar to Mintz and Huang (1991); Ward, (1995). Furthermore, Pavel Yakovlev (2007) found that higher military spending and arms exports separately lead to lower economic growth, but higher military spending is less detrimental to growth when a country is an arms exporter. Surprisingly, these relationships between two variables are positive and insignificant, this result is agree with Chletsos and Kollias (1995) who found that, the relationship between military spending and economic growth was inconclusive. These results are also agree and corroborated with the results found by Biswas, B.and Rati, R., (1986) and Alexander, W.R.J, (1995) who found inconclusive relationship between defense spending and economic growth. Interestingly, the relationship between economic growth and population($POP_t$) is positive and significant at 1%. To be precise, improvement of the population by 1% leads to increase by 47.54% in GDP per capita in China.

Table VI reveals the result of Granger causality test, there is a unidirectional relationship running from GDP per capita to the military expenditure. This is shows that GDP is very important to the military sector in China and efforts need to be geared towards improving the GDP per capita to increase the defense spending and development in China.

Table II: Augmented Dickey-Fuller and Phillip-Perron unit root test results USA.

| | ADF | | Philip-Perron | |
|---|---|---|---|---|
| | Level | | | |
| | intercept | Intercept and trend | intercept | Intercept and trend |
| $GDP_t$ | -1.715171 | -2.459618 | -1.861813 | -1.590107 |
| $ME_t$ | -4.968409 * | -6.015342* | -4.932968* | -10.71829* |
| $POP_t$ | -4.222475* | -8.006610* | -6.617158* | 0.624630 |
| First Difference | | | | |
| $GDP_t$ | -4.621860* | -4.794549* | -4.394975* | -4.667337* |
| $ME_t$ | -8.239342* | -8.108106* | -18.99220* | -18.53070* |
| $POP_t$ | -3.522087 ** | 0.189614 | 0.051997 | -3.039105 |

** Denotes significant at 1%, ** Denotes significant at 5%, *** Denotes significant at 10%.*

Table III: ARDL Bounds Test for Co-integration

| Lag structure: | | | | | | 1,2,2 |
|---|---|---|---|---|---|---|
| F-statistics | 1% Critical value | | 5% Critical value | | 10% Critical value | |
| | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) |
| 5.1653*** | 6.183 | 7.873 | 4.267 | 5.473 | 3.437 | 4.470 |
| K=2 , N=40 | | | | | | |

The critical value according to Narayan (2005) (Case III: Unrestricted intercept and on trend)
*, (**), (***) Significant at 1 %, 5% and 10% respectively.

Table IV: Short and Long Run Model (Dependent variable: LGDP

| | Short Run | | Long Run | |
|---|---|---|---|---|
| variables | *Coefficient* | *T-Ratio [Prob]* | *Coefficient* | *T-Ratio [Prob]* |
| Constant | -16.4296 | -1.8130[.083] | 269.7418 | .90861[.374] |
| $ME_t$ | -.21173 | -2.8892[.009] | 1.3453 | 1.1579[.261] |
| $POP_t$ | 47.5472 | 2.5228[.019] | -13.7120 | -.91104[.373] |
| $ECT_{t-1}$ | -.060909 | -.69747[.493] | n/a | |

**, (**), (***) denotes Significant at 1%, 5% and 10% respectively. Lag lengths are* 1,2,2 *selected based on Schwarz Bayesian criterion (SBC).*

Table V: Granger Causality Test

| Null Hypothesis | F-Statistic(Prob.) |
|---|---|
| LGDP does not Granger Cause LME | 5.42311 (0.0042) |
| LME does not Granger Cause GDP | 0.85102 (0.5340) |

**, (**), (***) denotes Significant at 1%, 5% and 10% respectively. The number of lags is 2.*

## CONCLUSION

This paper re-examined the relationship between the rapid military expenditure and the rising level of income in China by using the ARDL model and granger causality test. This is to determine whether the increased trend in the military expenditure in the country primarily for international politics and geopolitical security purposes as well as safeguarding domestic stability could as well be an important source of economic development. The results of the study indicate that there is a correlation between the variables in the short run. That is the military expenditure has a negative association with the rate of growth of the economy. While the result of the causal relationship indicate that the rising level of income has causes the military expenditure to rise. It is comforting to note that the direction of causation from growth to military spending conform to established theories.

What the study cannot tell is for how long this trend in the economic growth and expenditure will continue. Similarly, the increasing trend in the military expenditure would have an adverse effect on other categories of public spending. Therefore, we recommend for further research in these areas.

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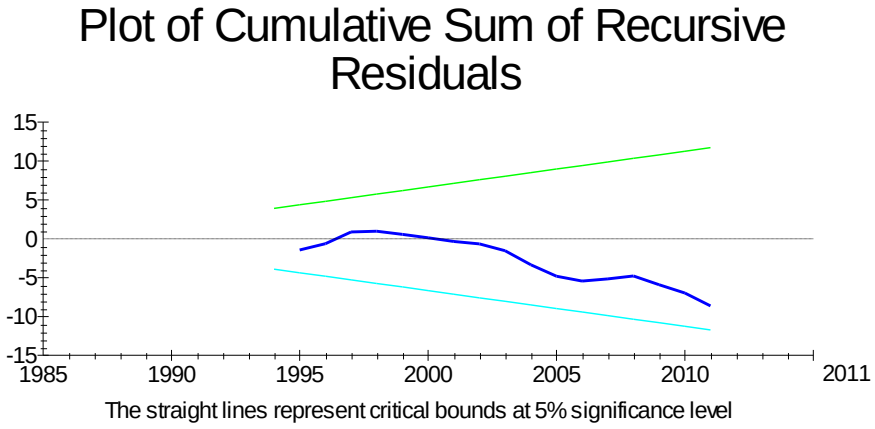
Appendix 1 (CUSUM TEST)
Figure 1



Appendix 2 (CUSUM Square TEST)
Figure 2