

## DOES MILITARY EXPENDITURE INCREASE EXTERNAL DEBT? EVIDENCE FROM ASIA

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This article empirically explores the effect of military spending on external debt, using a sample of ten Asian countries over the years from 1990 to 2011. The Hausman's test suggests that the random-effects model is preferable; however, both random-effects and fixed-effects models are used in this research. The empirical results show that the effect of military spending on external debt is positive, while the effects of foreign exchange reserves and of economic growth on external debt are negative. For developing countries caught in security dilemma, military expenditure often requires an increase in external debt, which may affect economic development negatively.

*Keywords:* External debt; Military spending; Income; Foreign exchange reserves; Panel data; Asia

*JEL Codes:* C23, F31, H56, H63, O4, O53

Economic growth and security are two pressing issues for many developing countries. While there has been a substantial body of empirical studies on external debt and economic growth and on military spending and economic growth, respectively, there is only a limited number of works devoted to the nexus between external debt and military spending. Built on the scanty, yet growing, research on the relationship between the two, we focus our current investigation on ten Asian countries. Typically, these countries are in need to develop their economy and at the same time are confronted with security dilemma of international and domestic instabilities. We hope that our work will shed some light on the dynamics and mechanisms between economic development and national security among these countries and will provide useful implications for the rest of the world. This paper is designed as follows. First, we present an introduction, along with an overview of military spending and external debt, both in general and specifically for Asia. Next, we review the literature on the research regarding external debt and military expenditure. Following that, we discuss the methodology including model specification and data description. Then, we present estimation and analysis. Finally, we provide concluding remarks of the study.

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## INTRODUCTION

The relationship between military spending and external debt remains an important issue for developing economies where rapid expansion in military expenditures spells both security and economic consequences. At present, many developing economies are faced with rising fiscal deficits due to excessive expenditures, including military spending. To maintain financial balance and stability in the government operating budget, developing countries frequently resort to borrowing overseas, when taxation or seigniorage does not work well. Though, initially, the influx of financial resources produces immediate benefits boosting the economy, in the long run, continuous borrowing may impose a serious burden on the country when the rescheduling of external debt enlarges fiscal deficits, resulting in debt overhang (Shabbir 2013).

Fischer and Easterly (1990) demonstrate the dilemma of dependence on external borrowing to manage budget deficits. During the 'lost decade' (the 1980s) in Latin America, many countries in the region suffered from excessive borrowing and their economies declined sharply. Some countries had to default their debt, ushering in devastating political as well as economic crises. In many developing countries after the 1980s, the ratios of external debt, along with debt servicing, are one of the most visible factors influencing economic growth. The government position on debt issues generates political and economic ramifications. Reversals of national policies on foreign debts happen from time to time. With all possible justifications, external debts may cause dismal crises, worsening economic, social and political conditions in developing countries, where servicing of external debt may jeopardize the outlook of economic development, along with other deterrents for economic growth such as lack of foreign direct investment, shortage of domestic private investment, embedded inflation, economic mismanagement and crisis of governance.

On the other side of the equation, countries militarize because of external and internal circumstances. According to Chaitanya and Pathmalal (2008), internal unrest threatens political order of many developing countries and the government uses military forces to ensure stability and authority. In their work, they catalogue a number of scenarios: The Liberation of Tamil Tigers Eelam guerrilla warfare in Sri Lanka, al-Qaeda and Taliban forces in Pakistan, democratic movement in Myanmar, fundamentalist resurgence in Bangladesh and Maoists' uprising in Nepal, all of which pose serious challenges to the government. As a result, the political authorities resorted to military means to keep the country under control. As Haq (1997) points out, while South Asia remains among the poorest, yet it is the most militarized region. This duality is no coincidence.

In the developed world, Europe encounters a paradox in its recent economic crisis (Slijper 2013). Economic difficulties have been threatening the normal operation of a national government in some European countries since 2008; social infrastructure including pensions and wages is subject to curtailment. However, spending on weaponry remains almost intact, which may be one of the reasons for the protracted economic plight in Europe. The arms industry worldwide continues to profit from new streams of revenues as well as outstanding debts. In 2010, the EU military expenditures were estimated at €194 billion, equal to the annual deficits of Greece, Italy and Spain combined (Slijper 2013). Erstwhile studies revealed that investment in the military is among the least effective methods to generate jobs (Slijper 2013). According to Nicolas (2013), the arms industry has grown in the past decade in tandem with the increase in military budgets after the September 11 attack. His analysis shows that the top 100 companies in the sector traded arms to the value of around €318 billion in 2011, 51% higher in real terms than in 2002. Furthermore, Western companies have largely controlled the global arms industry, with 44

of the 100 largest companies from the US, representing 60% of the industrial sales, and 30 EU-based companies constituting 29% of the total; the five largest of these companies accounted for US\$ 74.8 billion in sales in 2011 (SIPRI 2013).

According to a report by the Stockholm International Peace Research Institute (SIPRI 2013), world military spending in 2012 was estimated at US\$ 1753 billion, almost 2.5% of world GDP. Though, with the fall in 2012 from its peak in 2010 and 2011 when the world's military spending remained at historically high levels, spending in 2012 was still higher in real terms than the peak near the end of the cold war. Currently, 15 top military spenders account for over 81% of the total spending in the world. Among these countries, the United States is responsible for 39% of the world total, followed by China (9.5%), Russia (5.2%), UK (3.5%) and Japan (3.4%). The SIPRI Fact Sheet (2013) further reports that military expenditures continued to grow in Asia in 2012, though the rate of growth declined compared to the previous years. China's military spending in real terms rose by 7.8% to US\$ 166 billion. Similarly, military spending has also increased in some other Asian countries from 2003 to 2012, including Vietnam (130%) and Indonesia (73%). Both countries are investing heavily in naval equipment. In contrast, India reduced her military spending in 2012, despite its border disputes with neighbouring countries (SIPRI 2013).

More recently, a SIPRI report (2014) finds that the volume of Indian imports of major weapons increased by 111% between 2004–2008 and 2009–2013. Thus, India's arms imports are now almost three times as high as those of the second and third biggest arms importers: China and Pakistan. Russia's major export in 2013 was of an aircraft carrier to India, where the main arms suppliers in 2009–2013 were Russia, accounting for 75% of arms imports, and the United States (7%). The latter became the second largest arms supplier to India for the first time. In Pakistan, the United States' arms imports accounted for 27% of the total for the same period. The five largest suppliers of major weapons during the period of 2009 through 2013 were the US, estimated at 29% of global arms exports, Russia (27%), Germany (7%), China (6%) and France (5%). The statistics demonstrates that in 2012, military expenditures in the Asian countries included in this study are in billions of US dollars: China (\$166), India (\$45), Indonesia (\$6.85), Pakistan (\$6.73), Thailand (\$5.4), Malaysia (\$4.7), the Philippines (\$2.98), Bangladesh (\$1.5), Sri Lanka (\$1.44) and Papua New Guinea (\$0.08) (*World Development Indicator* 2014). Figure 1 shows a trend analysis of the military spending to GDP ratio of ten Asian countries over the period of 1990–2011.

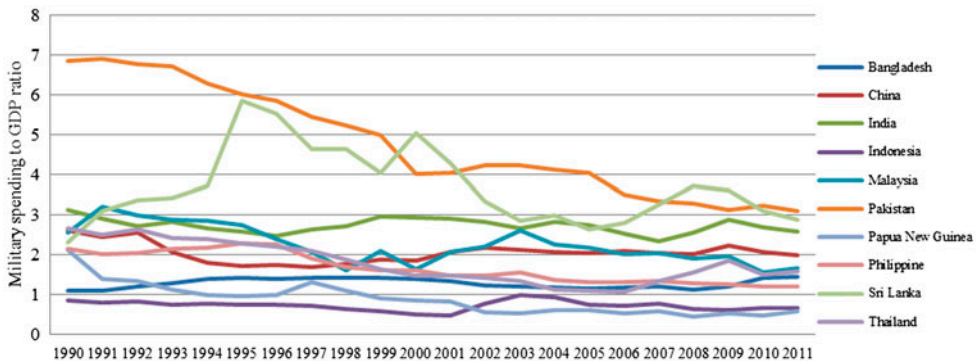


FIGURE 1 Military spending to GDP ratio: Ten Asian countries.

Data source: World Development Indicator (2014), the World Bank database.

With respect to external debt, a World Bank publication, *International Debt Statistics* (2013), reports that South Asia is the second major destination for International Development Association (IDA) resources, where IDA disbursements (loans and grants) increased 56% to US\$ 3.5 billion in 2011, largely because of a rapid rise in disbursements to India of US\$ 1.7 billion, an increase from US\$ 1.1 billion in 2010 and Pakistan, where IDA disbursements increased to US\$ 0.9 billion, relatively doubling her 2010 amounts. IDA disbursements in East Asia and the Pacific region experienced an upsurge by almost 9% in 2011. This is also due to primarily an increase in disbursements to Vietnam which is at present the only major IDA recipient in Southeast Asia. Similarly, the outstanding IDA loan portfolio at US\$ 122 billion at the end of 2011 is concentrated in five East Asia and South Asia countries: India, Pakistan, Bangladesh, Vietnam and China. The World Bank publication, *International Debt Statistics* (2013), adds that East Asia and the Pacific have ‘the lowest debt burden measured against both GNI and export earnings’, instead of a critical rise in debt outstanding since 2009. Figure 2 portrays the trend analysis of a comparison of the external debt to GDP ratio of ten Asian countries over the period of 1990 to 2011.

According to the World Bank (2014), South Asia documented an increase in IBRD commitments in 2011, due to an increase in new commitments to India of US\$ 3.7 billion compared to US\$ 2 billion in 2010. Because of this increase, India became the leading recipient of IBRD commitments during 2011. In terms of billions of US dollars, the data reveal external debt in the following ten Asian countries: China (\$754), India (\$379), Indonesia (\$254.9), Thailand (\$134), Malaysia (\$103), Pakistan (\$61.9), the Philippines (\$61.4), Bangladesh (\$26), Sri Lanka (\$25.4) and Papua New Guinea (\$23) (*World Development Indicator* 2014). Figure 3 shows data on average on both military spending and external debt in billion USD for these ten countries.

In this article, we explore the relationship between external debt and military spending across East, Southeast and South Asia. Some studies have found a positive effect of military expenditure on external debt, while others have not identified a significant empirical relationship. None of the existing literature on the topic of external debt and military spending has dealt with the Asian region extensively. The article aims at contributing to the studies of external debt and military spending in three aspects: First, this article focuses on ten countries in Asia, on which previous empirical studies are almost non-existent. Second, this

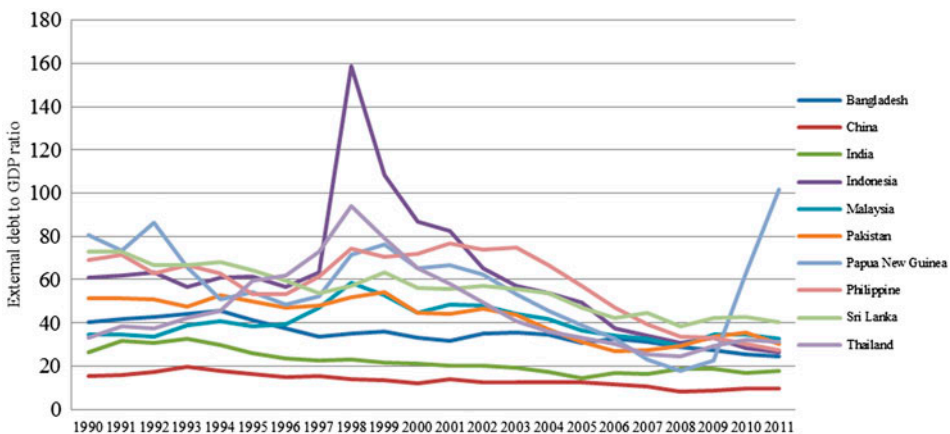


FIGURE 2 External debts to GDP ratio: Ten Asian countries.

Data source: World Development Indicator (2014), the World Bank database.

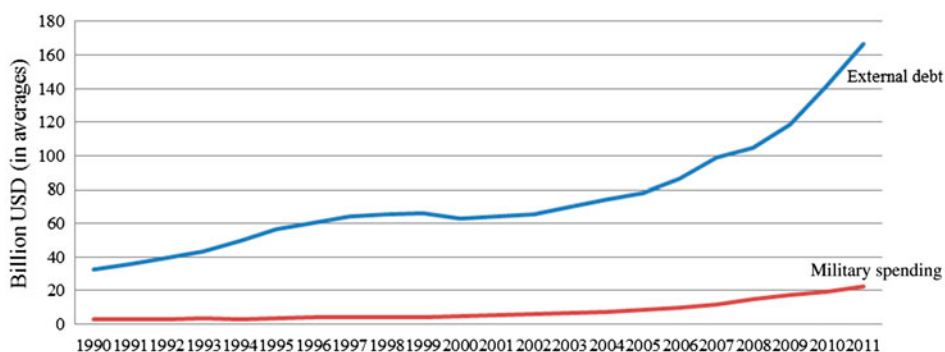


FIGURE 3 Averages of external debts and of military spending: Ten Asian countries.  
*Data source:* World Development Indicator (2014), the World Bank database.

article is distinguished from the rest in terms of the duration of time. Finally and more importantly, this article extends the studies in the current literature by jointly incorporating the alternative sources of government funding such as taxation, monetization, foreign exchange reserves and economic growth.

## LITERATURE REVIEW

Literature regarding the impact of military spending on external debt is scarce, yet growing. Given the importance of development and security in developing countries, further research on the relationship between debt and weapons is both worthwhile and warranted. Among past studies, Brzoska (1983) shows that military expenditure is a key variable in explaining the upsurge of external debt in many developing countries; further, he suggests that military spending causes sluggish economic growth. ‘The current financial problems of many Third World countries could look much less dim without arms imports on the scale we find today. Around one fourth of all credit inflows could be avoided if there was no militarization through imports of high technology. Equally, around one fourth of the debt accumulated is due to weapons imports’ (Brzoska 1983).

Looney and Frederiksen (1986) reinvestigate the linkage between economic growth and military expenditures in developing countries from 1970 to 1982. Their regression result validates the expected positive linkage between military expenditure and economic growth in the financially resource-unconstrained group, but fails to validate for the financially resource-constrained group. While, using a sample of 77 developing countries, Looney (1987) finds that military expenditures are mostly ‘unproductive’ as it seems that the resource-constrained countries will face serious problems in servicing their external liabilities. Explicitly, for most developing countries, a large part of the military equipment budget has to be spent on imported armaments (Danso 1990). The results in Looney (1987) indicate that in general, it is probable that a high percentage of the external public debt collected by 1982 was the consequence of increased military expenditures during the 1970s. Looney (1989) studies the influence of military expenditures and arms imports on debt and investigates the determinants of military expenditures, public external debt and arms imports. His sample includes both resource-constrained and resource-unconstrained countries, and the finding reveals arms imports to be a noteworthy contributory factor to indebtedness among developing countries. Similarly, Looney (1989) demonstrates that

weapons bought with limited foreign exchange reserves reduce the resources available for the import of intermediate and investment goods necessary for self-sustaining growth.

In the case of Greece, Kollias, Manolas, and Paleologou (2004) investigate by empirical estimation the impact of military expenditures on the country's fiscal situation during the period of 1960–2000; the study focuses on the effects of military spending on government debt and its two components: external and internal debt. Their empirical findings suggest that central government debt and especially, external debt, has been seriously affected by military expenditures. In a study, Gunluk-Senesen (2004a) opines that the recent sluggish growth performance of the Turkish economy is due to several structural problems. Nevertheless, the end consequence is dire economic insecurity, worsened by accumulation of external debt. A coexistent feature in the last decade is the enhanced level of military spending in general and spending on military machinery, including its imports, in particular. Günlük-Senesen (2004b) notes that debt overhang might be considered an impeding factor to economic growth rate, as an 'unproductive' use of external and internal resources would put in danger potentials and opportunities for future resources.

Dunne, Perlo-Freeman, and Soydan (2004a) conduct a study of eleven small industrialized countries during 1960–2000 in a fixed-effects GMM model. The empirical results suggest that military burden exerts positive impact on external debt. Sezgin (2004) empirically tests the relationships between defence expenditures and external debt, using the Engle–Granger methodology. The results indicate no conclusive evidence of the relationship between defence and debt in Turkey during 1979–2000. Exploring the relationship of financial and political variables in determining debt rescheduling in a probit model, Karagol and Sezgin (2004) find that financial variables are significant determinants of rescheduling probabilities; however, political variables are insignificant in the data of Turkey during 1955–2000.

In another study for the same sample and country, Karagol (2005) investigates the causal relationship between defence expenditures and external debt. The results suggest both long-haul and short-term unidirectional causality running from defence expenditures to external debt, but not *vice versa*. Moreover, Karagol (2006) evaluates the linkage among external debt, defence expenditures and GNP in Turkey during 1960–2002. After utilizing a time-series approach, the impulse response functions expose a positive effect on external debt stock of defence expenditures.

P. Narayan and S. Narayan (2008) examine whether military expenditures have contributed to Fiji's explosive and spiralling debt levels. After using the cointegration and vector error-correction estimation, the results suggest that military expenditures have a statistically significant and positive effect on external debt, while income has a statistically significant and negative effect on external debt. Chaitanya and Pathmalal (2008) indicate that an expansion in military spending considerably attenuates human rights and its performance in six South Asian economies for the period 1980–2006.<sup>1</sup> The study advocates that reduction in military spending might facilitate the reallocation of resources to the sectors, thus improving the opportunities for economic development.

In a similar vein, working on the data of Ethiopia during 1970–2005, Wolde-Rufael (2009) finds that expansion in defence spending leads to the accumulation of Ethiopia's external debt, while economic growth helps Ethiopia reduce its external debt. In a study using a sample of twenty-five sub-Saharan Africa countries during the period of 1988–2007, Ahmed (2012) observes that military expenditure has positive and significant impact on external debt.

<sup>1</sup>Countries included are Bangladesh, Burma (Myanmar), India, Nepal, Pakistan and Sri Lanka.

In a study, Shahbaz, Shabbir, and Butt (2013) analyse the effect of military expenditures on external debt in Pakistan over 1973–2009 in an ARDL bounds testing approach. The finding shows cointegration, verifying a long-run relationship between military expenditures, external debt, economic growth and investment. The results further indicate that an upsurge in military expenditures would raise the stock of Pakistan's external debt.

Table I presents a summary of some of the previous quantitative studies of military expenditures on external debt.

## MODEL SPECIFICATION AND DATA

The central purpose of this exercise is to conduct an empirical investigation of the impact of military spending on external debt in Asia. In previous works, researchers have studied the relationship between external debt and military spending in sub-Saharan Africa (Ahmed 2012; Anfofum, Andow, and Mohammed 2014), North Africa (Georgantopoulos and Tsamis 2011), South or Southeast Asia (Chaitanya and Pathmalal 2008; Zaman et al. 2013), the Middle East (Smyth and Narayan 2009), Latin America (Dunne, Perlo-Freeman, and Soydan 2004b), as well as single country studies such as Ethiopia (Wolde-Rufael 2009), Greece (Kollias, Manolas, and Paleologou 2004), Fiji (Narayan and Narayan 2008), Pakistan (Shahbaz, Shabbir, and Butt 2013) and Turkey (Günlük-Senesen 2004a; Karagol and Turhan 2008). Our study intends to focus on the developing countries in Asia across East, Southeast and South Asia.

In this panel study of external debt and military spending in Asian countries, our point of departure is to analyse this relationship in the context of multiple channels of government operation including tax revenue, monetization, foreign reserves and economic growth. In addition, we will use various statistical estimators of both random and fixed-effects models in our work. The operation of a national government is funded by various sources such as monetization, borrowing and taxes. Keeping the demand for military spending and the demands for all other public categories the same, an increase in government revenue through taxes or monetization reduces the pressure on borrowing to finance public projects including the military needs. Several scholars including Brzoska (1983) and Dunne, Perlo-Freeman, and Soydan (2004b) made it clear that military expenditure was a main source of external debt. Dunne, Perlo-Freeman, and Soydan (2004b) state that military spending particularly increases upward pressures on external debt, because the government's capacity to fund the military needs through other means than borrowing is limited. In developing countries, the 'potential to use tax resources to finance public expenditure is limited ... [Their] financial markets are relatively thin, and domestic possibilities are relatively limited' (Dunne, Perlo-Freeman, and Soydan 2004b). We agree with their assessment and in our article, we take one step further by explicitly including tax revenue and monetization in our model while testing the effect of military spending on external debt in order to verify the robustness of the relationship between external debt and military spending. In addition, government financing is also based on foreign exchange reserves and growth rates of the economy. Implicitly, these two variables will affect the level of borrowing. We will include both in our study of the relationship between external debt and military spending.

The following two equations are our basic models. Equation (1) gives the fixed-effects model and Equation (2) is a random-effects model.<sup>2</sup> In the random-effects model, the

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<sup>2</sup>A clear description of the random-effects model and fixed-effects model can be found in Clark and Linzer (2015). We adopted their notations in our formal presentations of the two models.

TABLE I Summary of Empirical Evidence on the Impact of Military Spending on External Debt

Author (s)	Sample periods	Methodology used	Dependent variable	Independent variables	Findings
Caruso and Domizio (2015)	1988–2013	Arellano–Bond approach, fixed effect, FMOLS	External debt	US Military spending, European countries Military spending and Unemployment	Positively related with US military spending, while and inversely related with average military spending of European countries
Anofum, Andow, and Mohammed (2014)	1986–2011	Vector auto-regression	External debt	Military expenditure, investment, GDP and debt service ratio	Military expenditure has positive impact on external debt
Zaman et al. (2013)	1988–2008 <sup>b</sup>	Panel cointegration, DOLS and FMOLS	External debt	Military expenditures and economic growth	Military expenditure has positive, while economic growth has negative impact on external debt
Shahbaz, Shabbir, and Butt (2013)	1973–2009	ARDL approach	External debt per capita	Real military spending per capita, GDP per capita, investment per capita	Increase in military expenditures would raise the stock of Pakistan's external debt
Ahmed (2012)	1988–2007 <sup>c</sup>	ARDL approach	External debt	Military expenditure, GDP, export, import and balance of trade	Military expenditure and debt has significantly positive relationship
Georgantopoulos and Tsamis (2011)	1988–2009 <sup>d</sup>	VAR, ECM	External debt	Military expenditures	Overall, military burden do not have any significant impact on all countries, except in the case of Egypt.
Smyth and Narayan (2009)	1988–2002 <sup>e</sup>	Panel cointegration, DFE, MOLS and DOLS	External debt	Military expenditures and GDP	Military expenditures have positive, and real GDP has negative impact on external debt
Wolde-Rufael (2009)	1970–2005	Granger causality tests	External debt	Military expenditure and GDP	Defence spending has a significantly positive impact on external debt
Karagol and Turhan (2008)	1960–2002	Cointegration test, impulse response functions	External debt	Defence spending, election dummy variable and political colour variable	Results show that rise in external debt continues before and after elections
Narayan and Narayan (2008)	1970–2005	Fiji ARDL, FMOLS, DOLS, OLS	Debt	Real GDP, real military expenditure	Military expenditures have a statistically significant positive effect on debt



Feridun (2005)	1971–2002 Argentina	Granger causality tests, VECM	External debt	Military expenditures	Military burden had no impact on the evolution of debt in Argentina
Dunne, Perlo-Freeman, and Soydan (2004a)	1960–2000 <sup>f</sup>	Fixed effects, GMM	External debt	Military burden, GDP, exports, net international reserves, interest payments, central government tax revenue, total debt service, arms imports	Military burden (expenditures) does indeed have a positive impact on external debt
Dunne, Perlo-Freeman, and Soydan (2004b)	1970–2000 Argentina, Brazil and Chile	ARDL approach	External debt	Military expenditure, GDP, exports, foreign exchange reserves, LIBOR <sup>g</sup>	No evidence found for Argentina or Brazil, while military spending tended to enlarge debt in Chile
Kollias, Manolas and Paleologou (2004)	1960–2001 Greece	OLS	External debt	Military expenditure, primary balance (deficit/surplus), GDP	Military expenditure has significantly positive added to the accumulation of Greek's public debt
Sezgin (2004)	1979–2000 Turkey	Engle-Granger test	External debt	Defence expenditures, GDP, balance of trade, arms imports, defence equipment expenditures	No clear evidence of defence-debt connections
Looney and Frederiksen (1986)	1970–1982 constrained group N = 23 unconstrained group = 38	Factor and discriminate analysis	Real growth of GDP	Defence Spending, external, debt and investment,	Positive link between military expenditure and economic growth in the unconstrained group, but failed to validate for the constrained group

*Note:* DOLS – dynamic ordinary least squares; GMM – generalized method of moment; ECM – error correction model; VECM – vector error correction model; OLS – ordinary least squares; FMOLS – fully modified ordinary least square ARDL – autoregressive distributed lag.

<sup>a</sup>Thirteen countries are Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Norway, Portugal, Spain, Sweden and United Kingdom.

<sup>b</sup>Five selected SAARC countries including Bangladesh, India, Nepal, Pakistan and Sri Lanka.

<sup>c</sup>Twenty-five countries from sub-Saharan Africa are Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo, Dem. Rep., Cote d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Uganda, Zambia and Zimbabwe.

<sup>d</sup>Northern Africa countries included are Egypt, Tunisia, Algeria and Morocco.

<sup>e</sup>Six Middle Eastern countries – Oman, Syria, Yemen, Bahrain, Iran and Jordan. Variables are in the log form.

<sup>f</sup>Eleven small industrializing economies are Argentina, Brazil, South Africa, Malaysia, the Philippines, India, Pakistan, S. Korea, Turkey and Venezuela. All variables are as percentage of GDP.

<sup>g</sup>London Interbank Offer Interest Rate, while all variables are as percentage of GDP.

country-specific error component information is utilized in the estimation of the parameters and in the fixed-effect model, country-specific effect is identified and differentiated for each unit. In our study, we intend to find general patterns of the relationship between external debt and military spending, rather than differentiating such a relationship by country. A random-effects model suits such an interest, though we will test the theoretical arguments using a fixed-effects model as well.<sup>3</sup>

Because of the characteristics of panel data, we emphasize the random-effects and fixed-effects models. However, as a matter of comparison, we also test the same specification of variables on the pooled data, between-country data and between-year data, all using OLS.

$$\ln D_{it} = \sum_{j=1}^J \alpha_j Z_{j|it} + \gamma_1 \ln M_{i,t-1} + \gamma_2 \ln Y_{i,t-1} + \gamma_3 \ln T_{i,t-1} + \gamma_4 \ln P_{i,t-1} + \gamma_5 \ln X_{i,t-1} + \gamma_6 \ln G_{i,t-1} + \varepsilon_{it} \quad \varepsilon_{it} \text{ follows } N(0, \sigma_y^2) \quad (1)$$

$$\ln D_{it} = \alpha_{j|it} + \beta_1 \ln M_{i,t-1} + \beta_2 \ln Y_{i,t-1} + \beta_3 \ln T_{i,t-1} + \beta_4 \ln P_{i,t-1} + \beta_5 \ln X_{i,t-1} + \beta_6 \ln G_{i,t-1} + \varepsilon_{it} \alpha_j \text{ follows } N(\mu_x, \sigma_x^2); \varepsilon_{it} \text{ follows } N(0, \sigma_y^2) \quad (2)$$

where  $i = 1, 2, \dots, N$ , indicates countries;  $t = 1, 2, \dots, T$ , indicates years.  $\ln$  stands for the log operator.  $D$  = External debt as a percentage of GDP,  $M$  = Military spending as a percentage of GDP,  $Y$  = Real GDP,  $T$  = Tax revenue as a percentage of GDP,  $P$  = Inflation,  $X$  = Foreign exchange reserves,  $G$  = Growth rate of real GDP per capita.

To alleviate the endogeneity problem, we use a one-year lag ( $t-1$ ) for the independent variables.

We expect a positive effect of military spending as a percentage of GDP on external debt as a percentage of GDP. This hypothesis is based on findings in several works (for instance, Brzoska 1983; Dunne, Perlo-Freeman, and Soydan 2004b; Jonakin and Stephens 2004; Kollias, Manolas, and Paleologou 2004; Smyth and Narayan 2009; Zaman et al. 2013). An increase in the need of military weapons, technology and personnel requires an increase in the budget, therefore, producing an upward pressure on borrowing money from international sources. The data for external debt and military spending are the World Bank's *World Development Indicators* (2014) and they are both as a percentage of GDP, which was typically used in the empirical work on external debt and military spending.

Keeping everything else constant, a larger economy should be able to borrow more; for instance, China and India did exhibit a capacity to borrow. In our essay, we use external debt as a percentage of GDP and therefore adjust for the size of the economy. A large economy has extensive domestic leverages in financing the government budget, therefore, reducing its dependence on foreign debt as a percentage of GDP. In the literature, some scholars find that income levels have a negative effect on external debt (Ahmed 2012; Kollias,

<sup>3</sup>The most visible advantage of the random-effects estimator is that they retain both the individual heterogeneity and n-degree of freedom, whereas the fixed-effect estimator, on the other hand, drops its heterogeneity along with losing n-degree of freedom (Dougherty 2011).

Manolas, and Paleologou (2004; Smyth and Narayan 2009).<sup>4</sup> In our study, we use real GDP to indicate the size of the economy and we expect that the sign of GDP on external debt as a percentage of GDP is negative. The source of this variable is Heston, Summers, and Aten (2012).

Our study includes other channels of government finance, in addition to borrowing. Particularly, we include variables such as tax revenue, inflation and foreign reserves. The variable  $T$  in our model is tax revenue as a percentage of GDP. Kugler and Organski (1980) and Kugler and Tammen (2013) find that countries with high taxation capacity tend to be associated with strong governments. In this context, high tax revenues under a strong government alleviate the needs for external borrowing. Alternatively, Snider (1988, 1990) finds a negative effect of government capacity on the probability of default on external debt. Stronger governments tend to have better potential for servicing debt. Therefore, they are able to borrow more than weaker governments are. In other words, a stronger government can increase borrowing if it chooses to do so. We term the two effects ‘the substitution effect’ and the ‘complement effect’. While under the former effect, tax levels have a negative effect on external debt, under the latter effect, tax levels have a positive effect on external debt. In our study, it would be of interest to find which effect of the two is dominant or if they cancel each other out in the aggregate. We take tax revenue as a percentage of GDP from Transnational Research Consortium (2014).

Instead of borrowing, a government may choose to print money to support itself. An increase in money supply, however, tends to lead to inflation. Therefore, there may be a negative correlation between external borrowing and inflation as the government chooses monetization over borrowing. In addition, countries with high levels of inflation may find it increasingly difficult to secure lenders from overseas when international confidence in the financial health of the borrower worsens as the result of its inflation. In our study, we hypothesize that previous levels of inflation have an adverse effect on external debt. We use the change rate in GDP price levels as a general indicator for inflation. The source of the data is Heston, Summers, and Aten (2012).

Aside from tax revenue and monetization, a country may utilize its foreign reserves to finance government operation. A country with large foreign reserves will have better abilities to purchase weapons and other defence-related products overseas than a country lacking in foreign exchange reserves. Rather than borrowing, the country rich in foreign exchange reserves simply deploys its foreign exchange reserves to pay the imported arms.<sup>5</sup> We expect the sign of the parameter estimate of foreign reserves on external debt to be negative. The data on foreign reserves are from the *World Development Indicators* (2014).

Finally, we add the growth rate of real GDP per capita as an independent variable. Countries that enjoy fast economic growth rates tend to pay off the debt and also reduce the future need to borrow externally.<sup>6</sup> Dunne, Perlo-Freeman, and Soydan (2004b) find a negative and statistically significant effect of GDP growth rates on external debt as a percentage of GDP. We expect a similar result on GDP growth rates in our article.

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<sup>4</sup>Ahmed (2012) finds that a one per cent increase in GDP will decrease external debt by 1.25% among sub-Saharan African countries.

<sup>5</sup>Brzoska (2010) discusses the implications of the funding of arms import and discerns a pattern over years. During the 1950s and 1960s, arms transfers were typically financed through military aid; during the 1970s and 1980s, countries took debt to acquire arms; during the 1990s, the exporters insisted on direct payment.

<sup>6</sup>We are grateful to an anonymous reviewer for this observation.

Table II lists the variables used in our article, their operationalization and sources of the data as well as the theoretical expectations of their impact on the external debt as a percentage of GDP.

As the result of matching availability of data in three data sets – *World Development Indicators* (2014), Heston, Summers, and Aten (2012) and Transnational Research Consortium's political capacity data set (2014) – our final data set forms a balanced panel data set with a cross section of ten Asian countries (Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Papua New Guinea, the Philippines, Sri Lanka and Thailand) over the years from 1990 to 2011. Tables III.A and III.B displays the descriptive statistics for both the original and log-transformed data.<sup>7</sup>

In the original data, external debt as a percentage of GDP is negatively correlated with GDP at  $-0.66$ . The larger the economy, the lower the external debt burden in GDP. External debt is also negatively correlated with foreign exchange reserves at  $-0.33$  and negatively correlated with economic growth at  $-0.40$ . In addition, GDP and foreign exchange reserves are correlated at  $0.86$ . This indicates that the resources of a large economy may give the country a solid leverage in financing arms imports and reducing the needs to borrow. Finally, the correlation between GDP and growth rate of GDP per capita is  $0.38$ . Table III.B provides information on the log-transformed data. It shows consistency with Table III.A with increases in certain correlations. For instance, the correlation between foreign reserves and external debt ratio is now  $-0.63$  and that between GDP and external debt ratio is  $-0.66$ .

## ESTIMATION AND ANALYSIS

The existing literature shows a variety of estimation methods. For example, Dunne, Perlo-Freeman, and Soydan (2004a) use a fixed effect and GMM method on a panel data set from 1960 to 2000 for eleven small industrializing economies – Argentina, Brazil, South Africa, Malaysia, the Philippines, India, Pakistan, South Korea, Turkey and Venezuela. Smyth and Narayan (2009) resort to panel cointegration, DOLS and FMOLS, for six Middle Eastern countries – Oman, Syria, Yemen, Bahrain, Iran and Jordan over the period of 1988–2002. Similarly, Zaman et al. (2013) conduct panel cointegration estimation, DOLS and FMOLS, on the panel data of five selected SAARC countries consisting of Bangladesh, India, Nepal, Pakistan and Sri Lanka over the period of 1988–2008. Shahbaz, Shabbir, and Butt (2013) employ time-series data of Pakistan over the period of 1973–2009 with the ARDL bounds testing approach. Our study uses traditional panel data techniques encompassing both fixed-effects and random-effects models to explore the impact of military spending on external debt in ten Asian countries during 1990 through 2011.

In order to estimate the regression model on the panel data of ten Asian countries, where external debt as a percentage of GDP is the response variable and the regressors include military spending as a percentage of GDP, real GDP, tax revenue as a percentage of GDP, inflation, foreign exchange reserves and growth rates of real GDP per capita, we follow the panel data estimation rule. The Hausman's test (Hausman 1978) is evoked to choose between the fixed-effects model and random-effects model for the estimation purpose (Greene 2008).

<sup>7</sup>Inflation and growth of GDP per capita have negative values in the original data. In order to perform log transformation, we apply the following formula to the original data before taking logarithm: original value minus the minimum of the value for the variable in the data plus one, resulting in the lowest value in the series being one.

TABLE II A Summary of the Dependent Variable: External Debt as a Percentage of GDP<sup>a</sup>

Variable	Definition and unit	Sign	Source
<i>M</i>	Military spending as a percentage of GDP: %	+	World Development Indicators, (2014)
<i>Y</i>	Real GDP: in millions of international dollars	–	Heston, Summers, Aten (2012)
<i>T</i>	Tax as a percentage of GDP: %	+/-	Transpacific Research Consortium (2014)
<i>P</i>	Inflation (GDP price level changes): %	–	Heston, Summers, Aten (2012)
<i>X</i>	Foreign exchange reserves: in hundreds of millions of US dollars	–	World Development Indicators, (2014)
<i>G</i>	Growth rates of real GDP per capita: %	–	Heston, Summers and Aten (2012)

<sup>a</sup>The data on external debt in our article are that for the variable total external debt in the World Development Indicators. It is defined by the World Bank as total debt owed to non-residents repayable in currency, goods or services. Total external debt is the sum of public, publicly guaranteed and private nonguaranteed long-term debt, use of IMF credit and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt.

TABLE III.A Descriptive Statistics and Correlation Matrix (Unlogged)

Statistics/variables	<i>M</i>	<i>D</i>	<i>X</i>	<i>P</i>	<i>T</i>	<i>Y</i>	<i>G</i>
Mean	2.225	43.078	85.742	0.508	14.760	812.642	3.780
Median	2.050	40.421	13.932	0.726	14.750	255.633	3.932
Maximum	6.904	158.694	2913.712	46.097	31.100	9483.322	21.336
Minimum	0.462	8.369	0.120	-54.575	4.5000	6.589	-14.631
Standard deviation	1.367	21.184	320.111	8.907	4.512	1490.721	4.352
Skewness	1.380	1.054	6.586	-0.682	0.458	3.288	-0.447
<i>M</i>	1.000						
<i>D</i>	-0.062	1.000					
<i>X</i>	-0.029	-0.332	1.000				
<i>P</i>	-0.053	-0.232	0.109	1.000			
<i>T</i>	-0.129	0.223	0.098	-0.041	1.000		
<i>Y</i>	-0.011	-0.527	0.855	0.101	-0.0009	1.000	
<i>G</i>	0.002	-0.402	0.273	0.326	-0.008	0.384	1.000
<i>N</i>	220	220	220	220	220	220	220

We test Equation (2) given in the previous section with all four available estimators in SAS: Fuller–Battese, Wansbeek–Kapteyn, Wallace–Hussain, and Nerlove. In our notation in Table IV, they are indicated, respectively, with FB, WK, WH and NL. In the table, the Wu–Hausman–Durbin test information is summarized by H. The corresponding number is the probability for the null hypothesis under the random effects. In Table IV, we also test Equation (1), the fixed-effects model.

All the four methods of random effects indicate that military spending as a percentage in GDP tends to increase the ratio of external debt in GDP. Based on the log–log model, a one per cent increase in the military ratio in GDP will lead to 0.13 of a percentage point increase in the external debt ratio in GDP. The magnitude of the parameter estimates for the military spending among the four estimators is very similar. The Wu–Hausman–Durbin test (given by H in Table IV) is in favour of the null hypothesis with *p*-values ranging from 0.512 to 0.995.

TABLE III.B Descriptive Statistics and Correlation Matrix (Log-transformed Data)

Statistics/variables	<i>M</i>	<i>D</i>	<i>X</i>	<i>P</i>	<i>T</i>	<i>Y</i>	<i>G</i>
Mean	0.622	3.633	2.434	4.002	2.642	5.537	2.929
Median	0.718	3.699	2.634	4.031	2.691	5.543	2.973
Maximum	1.932	5.067	7.977	4.622	3.437	9.157	3.610
Minimum	-0.771	2.125	-2.119	0.000	1.504	1.885	0.000
Standard deviation	0.610	0.537	1.993	0.309	0.325	1.624	0.324
Skewness	-0.155	-0.569	0.105	-9.986	-0.583	-0.156	-4.445
Kurtosis	2.626	3.009	2.812	129.191	3.396	2.843	35.822
<i>M</i>	1.000						
<i>D</i>	-0.121	1.000					
<i>X</i>	0.020	-0.626	1.000				
<i>P</i>	0.061	-0.193	0.092	1.000			
<i>T</i>	-0.106	0.212	-0.029	-0.027	1.000		
<i>Y</i>	0.166	-0.659	0.874	0.041	-0.285	1.000	
<i>G</i>	0.109	-0.386	0.216	0.660	-0.099	0.213	1.000
<i>N</i>	220	220	220	220	220	220	220

We also test our Equation (1) under the fixed-effects model. The result is given in the column with the heading FEM. The parameter estimate on military spending is a little higher than those under the random-effects model. Our interest in this article is to identify the general pattern of external debt and military spending, rather than investigating different levels of the effect of military spending on external debt among these Asian countries. However, we report the country-specific effects as the following: China (-0.121), India (0.016), Indonesia (0.951\*), Malaysia (0.417\*), Pakistan (0.091), Papua New Guinea (-0.006), the Philippines (0.657\*), Sri Lanka (0.177) and Thailand (0.607\*). The benchmark country is Bangladesh. The asterisk in the parenthesis indicates statistical significance at the 0.05 error level in a two-tail test.

Among other independent variables, two stand out. Both economic growth and foreign exchange reserves have a negative and statistically significant effect on external debt ratio. Those results are consistent across the random-effects and fixed-effects models. The magnitude of impact by foreign exchange reserves is slightly higher than that of military spending on external debt: around 0.14. Qualitatively, the positive effect of military spending on external debt and the negative effect of foreign exchange reserves on external debt cancel each other. It is possible for countries with sufficient foreign exchange reserves to increase its military spending without incurring external debt. The effect of economic growth on external debt exhibits the highest percentage change in the external debt ratio. A one percentage increase in economic growth rate in GDP per capita will reduce the external debt ratio in GDP by about 0.20 of a percentage point. Both GDP and inflation are negatively signed, confirming the hypothesis discussed earlier, but they are not statistically significant in the random and fixed-effects models. Tax revenue as a percentage of GDP is positively signed and is statistically insignificant.

We further test three estimators: they are OLS on the pooled data, the between-group data and between-time data. Among the three models – the random effects, fixed effects and OLS – the OLS is the least preferred if the random effects or fixed effects exist. Our statistics clearly indicate that the random effects are present; as the result, the OLS estimation should not be used. However, we provide the information here in the last three columns in Table IV.

TABLE IV Estimations: REM, FEM, Pooled, between Groups and between Years

Model Method	REM		REM		REM		FEM		Pooled		Between-group		Between-time	
	FB	WK	WH	NL	FEM	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	
Const.	5.079* (0.548)	5.080* (0.495)	5.081* (0.521)	5.081* (0.512)	5.387* (0.618)	5.106* (0.516)	17.882 (26.132)	-3.185 (2.846)						
<i>M</i>	0.136* (0.069)	0.123** (0.067)	0.131** (0.068)	0.129** (0.068)	0.148* (0.074)	-0.021 (0.045)	0.133 (0.377)	1.557* (0.355)						
<i>Y</i>	-0.083 (0.087)	-0.085 (0.073)	-0.084 (0.081)	-0.085 (0.078)	-0.078 (0.111)	-0.106* (0.041)	-0.259 (0.297)	1.977* (0.504)						
<i>T</i>	0.060 (0.089)	0.067 (0.089)	0.063 (0.089)	0.064 (0.089)	0.054 (0.092)	0.161** (0.094)	-0.230 (0.643)	-1.082* (0.426)						
<i>X</i>	-0.136* (0.035)	-0.135* (0.033)	-0.135* (0.034)	-0.135* (0.033)	-0.138* (0.039)	-0.077* (0.032)	0.167 (0.246)	-0.716* (0.161)						
<i>P</i>	-0.074 (0.069)	-0.074 (0.071)	-0.074 (0.070)	-0.074 (0.070)	-0.075 (0.070)	0.044 (0.113)	-0.691 (6.307)	0.065 (0.311)						
<i>G</i>	-0.204* (0.069)	-0.207* (0.069)	-0.205* (0.069)	-0.206* (0.069)	-0.202* (0.069)	-0.438* (0.109)	-3.391 (1.549)	-0.260 (0.288)						
<i>R</i> <sup>2</sup>	0.439	0.439	0.439	0.439	0.830	0.513	0.833	0.933						
$\sigma$	0.227	0.230	0.228	0.229	0.230	0.380	0.334	0.071						
<i>H</i>	0.995	0.512	0.948	0.852										
<i>N</i>	220	220	220	220	220	220	10	22						

Notes: FB = Fuller and Battese Variance Components, WK = Wansbeck and Kapteyn Variance Components, WH = Wallace and Hussain Variance Components, NL = Nerlove Variance Components, REM = Random-effects model, FEM = Fixed-effects model, OLS = Ordinary least squares.

\*Statistically significant at the 0.025 level in a one-tail test.

\*\*Statistically significant at the 0.05 error level in a one-tail test. The standard error values are in the brackets ( ).

Under the pooled data testing, the sign on military spending is negative, but statistically insignificant.<sup>8</sup> For the between-group model, we averaged the values for the variables from 1990 to 2011 for each of the ten countries, resulting in a sample of ten observations. Using the same variables under the random- and fixed-effects models, only three degrees of freedom remain. The sign on military spending is positive, but statistically insignificant. The  $R^2$  in the model reaches above 80%, but all the parameter estimates are statistically insignificant, probably reflecting the small sample. The standard error of the regression is high at 0.33, compared to 0.23 typically under the random- and fixed-effects model.

The last column in Table IV is the between-time regression. We averaged the values of the variables over all countries in a given year, resulting in 22 observations. Except GDP per capita growth, the parameter estimates are very different from the other models. This indicates that countries may experience certain changes in the pattern of external debt over years, suggesting the needs for future studies. One example is financial crisis in Asia in 1997 when Asian countries suffered from a severe financial crisis, particularly in Thailand, Indonesia, South Korea, the Philippines and Malaysia. Asian governments raised domestic interest rates to very high levels in order to put a brake on the flight of capital. The cost in domestic borrowing forced domestic investors to borrow overseas. As one of the reasons, domestic high interests caused an increase in external debt. For the same period of time, international loans and grants were also directed to help those Asian countries. We used a dummy variable for 1997 and 1998 in a random-effects model; the parameter estimate on military spending changed from  $-1.557$  to  $-1.115$ , remaining statistically significant at the 5% error level. The estimate on the Asian Financial Crisis dummy variable for 1997 and 1998 is 0.166 with a standard error of 0.053.

Another case is the financial crisis that swept the United States and Europe starting in 2008. Given the financial meltdown in the First World, it would be difficult for developing countries to borrow money internationally. We created a dummy variable to indicate the financial crisis for the years 2008–2011 and applied it to Equation (2). The dummy variable takes a negative sign, which is as expected, with the parameter estimate and standard error as  $-0.062$  and 0.056, respectively. The variable military spending remains stable, with the parameter estimate and standard error as 0.132 and 0.069.

## CONCLUDING REMARKS

In this article, we find evidence that military spending has a positive effect on external debt among the ten Asian countries for the period of time from 1990 to 2011. This result is consistent with previous works on other regions or countries (for instance, Ahmed 2012; Anfofum, Andow, and Mohammed 2014; Dunne, Perlo-Freeman, and Soydan 2004a; Looney and Frederiksen 1986; Kollias, Manolas, and Paleologou 2004; Shahbaz, Shabbir, and Butt 2013; Smyth and Narayan 2009; Zaman et al. 2013). In addition, we find that increases in foreign exchange reserves and in economic growth will reduce external debt. The reduction in external debt through the channels of tax revenue and monetization remains indecisive. The effect of GDP on external debt is not statistically significant, though its negative sign in the regression is consistent with some earlier works.

The analysis in this research demonstrates that the political authorities need to consider the possible negative impact of military spending on economic growth and development

<sup>8</sup>The change of the sign in the OLS estimation on the pooled data may result from the country-specific information unaccounted for in the OLS estimation. OLS regressions on individual countries yield very different results for military spending, reflecting the increasing sampling errors in small samples and/or potential specification errors.



through the channel of incurring external debt burden. Though central governments have on the top of the agenda the survival of a nation in a hostile international environment or governance in the face of domestic insurgence, a fundamental policy question remains whether military spending will effectively reduce the degree of hostilities and increase the opportunities for development. A trade-off or dilemma exists. On the one hand, military spending may worsen security for the country in a hostile domestic or international environment, raising further needs to militarize. On the other hand, increases in external debt without economic benefits will further set the country back in economic development, entailing more borrowing. The two processes jointly lock the nation in a self-contained double-trap: increasing internal and external military threats and instabilities, combined with ever worsening poverty and misery. When conflict exacerbates security environment, further militarization will cost the well-being of the nation even more dearly.

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## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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