Nonlinear Effects of Military Spending on Economic Growth in Sub-Saharan Africa

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Abstract

While the military spending-growth nexus has been widely researched, most of this work tends to assume a linear relationship between military expenditure and growth. This ignores the possibility that the relationship may be non linear, and the impact of military burden on growth may vary by its size. A few studies have considered such non-linearities, but they have been mainly been country specific case studies. This paper applies models that allow for changing regimes to a balanced panel of Sub Saharan African countries. It finds there to be a differential of military spending on growth for countries with high and low burdens, with military spending deterring growth in the low burden regime, while it promotes growth in the high burden regime.

Keywords: Military spending, Economic growth, Non-linear panel data models, Sub-Saharan Africa

JEL:C23, C24, H56, E62

Preliminary draft. Comments welcome. Please do not quote without asking.

1 Introduction

The effect of military expenditure on growth has been widely researched over the last 50 years, but did not seem to indicate any robust empirical regularity, positive or negative. Dunne and Tian (2013) in a recent comprehensive survey of the literature argue that the findings suggest that the effect is likely to be negative in studies that include post Cold War data, while Alptekin and Levine (2012) in meta-analysis of number of studies and suggest that there may be a positive effect. Yesilyurt and Yesilyurt (2019) in a more recent meta analysis find evidence consistent with their hypothesis of no effect. A recent study by Dunne and Smith (2019) further underlines the lack of any strong relationship, suggesting that there may be benefits in moving from large cross section studies to consider more localised groups.

Another issue of concern is that much of this literature has taken the relationship to be linear, implying it has the same impact regardless of the size of military spending. It is possible , however, that the effect of military spending may vary. Military spending provides security and this may benefit the economy, but it may become an economic burden once it increase beyond a certain amount, giving an inverted U-shaped relationship between military spending and growth. A few studies have considered this possibility, but have mostly provided country specific case studies, with Phiri (2017) as a recent example. There is limited cross country research available, with most recently Karadam et al. (2017) undertaking a panel analysis of countries in the Middle East.

This paper considers the possibility of a nonlinear relation between military spending and growth within the particular context of Sub Saharan Africa. It constructs a balanced panel and follows the approach taken in Karadam et al. (2017) by analysing countries in Sub Saharan Africa. It analyses the impact of defence spending on growth in the region using an exogenous growth model and allowing for nonlinearities. The results do indeed suggest that the impact of military spending on growth can vary across thresholds and so care should be taken in generalising. This also allows an "optimal" or threshold to be identified. The next section discusses literature on the military spending-growth nexus, section 3 outlines the model, with section 4 presenting the data and empirical results. Finally section 5 presents some conclusions.

2 Military Spending and Growth

Four theoretical approaches have been developed to consider the economic effects of military spending, the Neoclassical, Keynesian, Institutional and Marxist perspectives, allowing for the potential identification of a number of channels through which military spending impacts economic growth (Dunne and Coulomb, 2008). Recent empirical work has mainly been focused on some exogenous or endogenous form of the neoclassical growth model, but as there is no agreed theory of growth among economists, there is no standard framework to fit military spending into (Dunne et al., 2005).

Studies that find a positive impact of military spending upon economic growth include Fredericksen and Looney (1982); Murdoch et al. (1997); Aizenman and Glick (2006) and Yildirim et al. (2011). Conversely, other studies such as Smith (1980); Dunne et al. (2001) and Mylonidis (2008) find defence spending to exert a negative impact on growth. Additionally, other studies find that the relationship between military spending and economic growth may be mixed (e.g. Deger and Smith (1983); Chowdhury (1991) or non-existent (e.g. Landau (1986); Huang and Mintz (1990). Moreover, surveys of the existing literature by Ram (1995), Dunne (1996) and Smith (2000) did not point towards any robust empirical relationship, positive or negative, though Smith did indicate that there was the possibility of finding a small negative effect in the long-run, however, more sophisticated techniques would be required to uncover such a relationship.

More recent studies have begun to show more consistent support for a negative impact of military spending on economic growth. Dunne and Tian (2013) survey 168 studies on the economic effects of military expenditure and reveal that by splitting the studies into ones that used predominantly Cold War period data and those with more equal or predominantly post-Cold War data, almost 53% of post-Cold War cross-country studies find military expenditure to exert a negative impact, compared to 38 percent for the Cold-War data period.

The recent rise in the popularity of cross-country studies has also led to increasing concerns over group heterogeneity, endogeneity and non-linearity. These include Smaldone (2006) who suggested that differences in results for countries within Africa were due to the experience of conflict, Yakovlev (2007) who considered non-linearities, Looney and McNab (2008) who considered economic freedom and governance, Dunne and Tian (2015) and Dunne and Tian (2014) who allowed for non-linearity and group heterogeneity and D'Agostino et al. (2018) who account for endogeneity. Dunne and Smith (2019) consider the economic effects of military spending through the investment channel and find considerable heterogeneity.

The results of this literature do suggest that there may be benefits in moving from large cross section studies to consider more localised groups. It also suggests that there may be some benefit from considering the possibility of non-linearities in the relation between military spending and growth. A few studies have considered this possibility, but have mostly provided country specific case studies e.g. Cuaresma and Reitschuler (2004), Lee and Chen (2007), D'Agostino et al. (2011), Kollias and Paleologou (2013) and Phiri (2017). There is limited cross country research available. Aizenman and Glick (2006) provided a cross country analysis and more recently Karadam et al. (2017) undertook a panel analysis of countries in the Middle East and Turkey.

3 Model

To consider the impact of military spending on growth we take an extended version of a neoclassical exogenous growth model:

$$Y(t) = K(t)^{\alpha} H(t)^{\beta} [A(t)L(t)]^{1-\alpha-\beta}, 0 < \alpha + \beta < 1 \tag{1}$$

where α and β are the elasticities of output with respect to physical and human capital respectively. $Y(t)$ denotes output at time t, $K(t)$ is physical capital, $H(t)$ is stock of human capital and $A(t)$ is the technology parameter with output elasticity of $(1-\alpha-\beta)$. Labour is assumed to grow at an exogenous growth rate of n, technical progress will grow at the exogenous rate of g and both physical and human capital will depreciate at the identical rate δ.

Following Dunne and Tian (2013), a dynamic specification of the estimated model is:

$$\Delta \ln y_{i,t} = \gamma \ln y_{i,t-1} + \sum_{j=1}^{3} \beta_j \Delta \ln x_{j,i,t} + \sum_{k=1}^{3} \alpha_k \ln x_{k,i,t-1} + \mu_i + \nu_{i,t}$$
$$; i = 1, 2, ..., N; t = 1, 2, ..., T \tag{2}$$

where y is GDP per capita, x_1 is gross fixed capital formation as a share of GDP (proxy for investment or capital stock), x_2 is adult mean years of schooling, x_3 is the population growth rate plus 0.05 or $(n + g + d)$. The reparameterised general first-order dynamic model is then estimated and the results are presented in table **??**, where all variables are in logs (l), Δ represents the change in the variable, $(t-1)$ denotes a lag of one period, the dependent variable in all regressions is Δly and represents the change in per capita GDP.

Following the model specification by Karadam et al. (2017), and the method in Gonzalez et al. (2017) who use a Fixed Effect Panel Smooth Transition Regression (PSTR) model, we use a balanced panel of 19 countries in Sub-Saharan Africa and analyse the effect of military spending on economic growth as countries transition from a low spending extreme regime and a high spending extreme regime. The 2 regime PSTR model is specified in equation 3;

$$y_{it} = \mu_i + \beta_0^{'} X_{it} + \beta_1^{'} X_{it} g(q_{it}; \gamma, c) + \upsilon_{it} \tag{3}$$

where i denotes the cross section for i=1,.....,N and t denotes the time dimension for t=1,.....,T. q_{it} is the threshold variable. μ_i represents individual fixed effects, X_{it} is a vector of explanatory variables used in the model, and υ_{it} is the error term. $g(q_{it}; \gamma, c)$ is a continuous logistic transition function that determines the smooth transition of variables across regimes. This logistic function is specified as

$$g(q_{it}; \gamma, c) = \left(1 + exp\left(-\gamma \prod_{j=1}^{m} (q_{it} - c_j)\right)\right)^{-1} \tag{4}$$

where $\gamma > 0$ and $c_1 < c_2 < ... < c_m$. γ is the slope parameter and determines the smoothness of the transitions from one regime to another. c is an m-dimensional vector of location or threshold parameters. The transition function, $g(q_{it}; \gamma, c)$ is bound between zero and 1, with the zero bound corresponding to the first extreme regime, which coefficients β_0. The upper bound is associated the second extreme regime case with coefficients $\beta_0 + \beta_1$. When considering a model with a single threshold where m=1, the two extreme regimes are associated with low and high values of the transition variable, and a monotonic transformation of the coefficients from β_0 to $\beta_0 + \beta_1$ as the transition variable increases. The change in coefficients will be centred around the location parameter c_1. For a higher order threshold, for instance, when m=2, the model becomes a logistic quadratic PSTR model. In this case, the model reaches a mimimum at $(c_1 + c_2)/2$, while taking a value of 1 at both the low and high values of the transition variable. As the slope parameter $\gamma \to \infty$, the PSTR model converges to Hansen (1999)'s 2-regime panel threshold model with low spending and high spending regimes, and as $\gamma \to 0$, the model converges to a homogeneous linear panel regression model with fixed effects.

To determine the appropriateness of the PSTR model, we test for the presence of a threshold through a linearity test as the PSTR model is not identified in the absence of non-linearities. If we cannot reject the null hypothesis of linearity, the PSTR model is a appropriate and we proceed to determine the number of thresholds for the purpose of determining the appropriate model specification. We then implement the PSTR model in equation (3) by estimating the augmented Solow growth model using the panel smooth transition model specification. The specification of the estimated model is given in equation (5):

$$\begin{aligned} \triangle y_{it} = \mu_i + \beta_{01} lny_{it-1} + \beta_{02} lninv_{it} + \beta_{03} lninv_{it-1} + \beta_{04} ln(n_{it} + g + d) \\ + \beta_{05} lnm_{it} + \beta_{06} lnm_{it-1} + \Big\{ \beta_{11} lny_{it-1} + \beta_{12} lninv_{it} + \beta_{13} lninv_{it-1} + \beta_{14} ln(n_{it} + g + d) \\ + \beta_{15} lnm_{it} + \beta_{16} lnm_{it-1} \Big\} g(q_{it}; \gamma, c) + \upsilon_{it} \end{aligned} \tag{5}$$

where y is real GDP, inv is the investment share of GDP, and $n + g + d$ denotes the growth rate of labour force plus depreciation. We use population growth as a proxy for the growth rate of the labour force as data on the growth rate of the labour force is not available for all countries. m is the share of military spending to GDP. Our focus is in determining the effect of non-linearity in military spending on growth, so we use m as the transition variable.

4 Empirical Analysis

4.1 Data

A balanced panel of 19 Sub Saharan African countries was constructed for the empirical analysis. It consists of Botswana, Burundi, Cameroon, The Gambia, Ghana, Kenya, Lesotho, Malawi, Mali, Mauritius, Mozambique, Nigeria, Rwanda[1], Senegal, Sierra Leone, South Africa, eSwatini(Swaziland), Uganda and Zimbabwe. The time period spans from 1983-2014. Data for military expenditure as a percentage of GDP is obtained from the Stockholm International Peace Research Institute (SIPRI). Data for per capita GDP, population and investment as a share of GDP are all obtained from the World Bank's World Development Indicators.

[1]We restrict values of $ln(n + g + d)$ to zero for 1992 and 1993 in Rwanda. The data shows negative population growth for these years which seems implausible for the years in question.

Table 1: Descriptive Statistics

	Mean	Std Dev
Panel Wide		
GDP per capita	1573.19	1932.33
Investment (%) GDP	20.28	9.85
Military Spending (%) GDP	1.93	1.44
Categorised by Military Spending Burden		
GDP per capita : Low burden	1578.41	1892.76
GDP per capita: High burden	1564.19	1979.26
Investment (%) GDP: Low burden	19.45	7.20
Investment (%) GDP: High burden	21.73	13.12
Military Spending (%) GDP: Low burden	1.08	0.50
Military Spending (%) GDP: High burden	3.40	1.35

Notes: Panel wide descriptive statistics are for the panel from 1983-2014. Statistics recorded before the variables are transformed to logs.

The mean panel wide military spending is 1.93% of GDP for the 608 observations in the panel. Mean investment is 20.28% of GDP, while the mean per capita GDP for the panel is $1573.19. Dividing the panel into low and high spending burdens using mean military spending, with a low burden as a military spending burden below 1.93%, gives 385 low burden observations with 223 high burden observations. The two categories do seem to differ with low military spending countries tending to have a slightly higher average per capita GDP ($1578.41) compared to countries with a high spending burden ($1564.19). The mean investment also tends to be lower for countries with a high military spending burden, with a value of 19.45%, compared to 21.73% for countries with a low military spending burden. The mean military expenditure for the low burden countries in 1.08% of GDP, while it is 3.4% of GDP for the high spending countries.

Table 2 reports the summary statistics for the transformed model after logging the variables and shows the distribution of the data across percentiles.

Table 2: Summary Statistics: Transformed Model

	Mean	Std Dev	10%	25%	50%	75%	90%
lny_{it}	6.814	0.993	5.74	6.020	6.736	7.251	8.541
$lninv_{it}$	2.886	0.589	2.243	2.667	2.981	3.212	3.400
lnm_{it}	0.374	0.805	-0.693	-0.105	0.406	0.916	1.361
$ln(n_{it} + g + d)$	-2.653	0.411	-2.996	-2.996	-2.644	-2.380	-2.167

Notes: Panel wide descriptive statistics after transformation of the variables to logs.

To examine the non-linear effects of military spending on the growth of per capita income, we begin by testing for the presence of non linearity in the data.

4.2 Linearity Tests

To examine the asymmetry further we consider whether there is non-linearity in military spending that might explain it. An LM test was used, where the null hypothesis of linearity is equivalent to testing whether the coefficients are homogeneous in each regime in equation (5). Failure to reject the null implies the PSTR model is not identified. This null hypothesis is tested against the alternative of heterogeneity, and is equivalent to testing $H_0 : \gamma = 0$ or $H_0^{'} : \beta_0 = \beta_1$. The PSTR model contains nuisance parameters which make the linearity test non standard. However, Luukkonen et al. (1988) propose a solution by replacing the transition function $g(q_{it}; \gamma, c)$ with a first order Taylor expansion around $\gamma = 0$. The reparameterised model that follows the Taylor expansion results in the auxiliary regression in equation 6

$$y_{it} = \mu_i + \beta_0^{'*} X_{it} + \beta_1^{'*} X_{it} q_{it} + ... + \beta_m^{'*} X_{it} q_{it}^m + v_{it}^* \tag{6}$$

Hypothesis testing in the auxiliary regression becomes $H_0 : \beta_1^* = \beta_2^* = ... = \beta_m^*$ against the alternative $H_a : \beta_1^* \neq \beta_2^* \neq ... \neq \beta_m^*$. The chi-squared version of the LM test is asymptitically distributes as $\chi^2(mk)$ and the F-version approximates an $F(mk, TN - N - k - mk)$ distribution.

The results for the linearity tests are reported in Table 3 using contemporaneous military burden and its first and second lags as transition variables. For all three transition variables, the null hypothesis of linearity is rejected against the alternative of a PSTR model. The most significant results is obtained by contemporaneous military spending (lnm_{it})[2]. However, as all three variables reject linearity, we retain them all as transition variables and defer our selection to the post-analysis stage[3].

Table 3: Linearity Test Results

		Lags		
Transition Variable		0	1	2
Military Spending	LM_{χ^2} test statistic	78.26	72.78	70.49
	LM_{χ^2} p-value	8.105e-15	1.096e-13	3.246e-13
	LM_F test statistic	11.67	10.85	10.51
	LM_F p-value	2.863e-12	2.203e-11	5.194e-11

To estimate the growth model, we follow Karadam et al. (2017) and use an autoregressive specification for the model, with the dependent variable being the change in GDP per capita.

4.3 Estimation results

Having established the presence of a non-linearity, we proceed to estimate a fixed effect panel smooth transition regression (PSTR) model. Linearity is most rejected by contemporaneous military spending so we use this as the transition variable, and compare the findings with the results from the standard linear model. The results in Table 4 show the linear model to have the expected signs on coefficients, with lagged GDP per capita negatively related to the growth rate of income per capita as inferred by the convergence hypothesis. The coefficient on investment though insignificant, is positive which indicates a positive relationship between growth and capital accumulation. Contemporaneous military spending has a negative and significant coefficient, indicating that an increase in military spending reduces growth, while lagged military spending and population growth do not appear to have a significant effect on growth.

[2]The data shows that linearity is still rejected in the second threshold. However, as we do not have a theoretical foundation for believing that military spending could have more than one threshold, we proceed to estimate a single threshold model.

[3]Karadam et al. (2017) also use arms imports as a transition variable. However, data for arms imports is not sufficiently available for the countries in our panel.

Table 4: Linear Model Estimation Results
Dependent Variable: GDP per capita growth rate

	Estimate	SE
lny_{it-1}	-0.0729***	0.0224
$lninv_{it}$	0.0161	0.0198
$lninv_{it-1}$	-0.0019	0.0108
lnm_{it}	-0.0506*	0.0284
lnm_{it-1}	0.02583	0.0204
$ln(n_{it} + g + d)$	-0.0017	0.0133

Notes: ***Significance levels at 1%, **significance levels at 5%, *significance levels at 10 %.

Table 5: Non-Linear Estimation Results
Dependent Variable: GDP per capita growth rate
Threshold Variable: lnm_{it}

	Regime 1 (β_0)		Regime 2 ($\beta_0 + \beta_1$)	
	Estimate	SE	Estimate	SE
lny_{it-1}	0.0166	0.0127	-0.0563***	0.0143
$lninv_{it}$	0.0015	0.0307	0.0175	0.0143
$lninv_{it-1}$	0.0041	0.0113	0.0022	0.0084
lnm_{it}	0.0805*	0.0454	0.0299	0.0220
lnm_{it-1}	-0.0631**	0.0282	-0.0373*	0.0219
$ln(n_{it} + g + d)$	0.0577 ***	0.0202	0.0561***	0.0202
γ	19.69	13.43		
c_1	0.4020	0.4392		

Notes: ***Significance levels at 1%, **significance levels at 5%, *significance levels at 10 %.

The non-linear model shows two effects of military spending. The first effect is the direct effect of military spending as an explanatory variable of growth. The second effect is the indirect effect on military sending on growth as it governs the low and high spending regimes.

The estimated threshold is 1.5% (anti-log of 0.4020). This threshold lies within the 50th percentile (see table 2) and indicates the halfway of the shift between regimes. This classifies levels of military spending far below 1.5% as the low spending extreme regime associated with the coefficient β_0. These coefficients are obtained when the transition function $(g(q_{it}; \gamma, c) = 0$. Levels of military spending far above 1.5% are classified as the high spending extreme regime and are associated with the coefficient $(\beta_0 + \beta_1$. It is important to note that while we look at the two spending extremes, there exists a continuum of regimes between these two extremes that enable the smooth transition. coefficients in this continuum are the weighted average of β_0 and β_1.

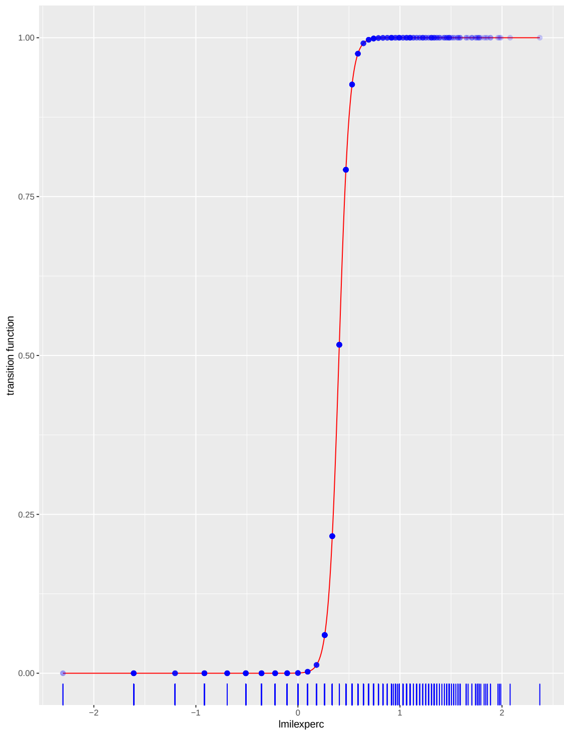
Results in the non linear model show the difference with the linear model, and the need to correctly specify the model by accounting for non-linearities. In table 5, contemporaneous military spending positively affects growth in the low spending regime (0.0805). the effect is also positive in the high spending regime where the coefficient is calculates as $(\beta_0 + \beta_1$. The lag of military spending has a negative effect on growth, with a coefficient of -0.0631 in the low spending regime. The negative impact of lagged military spending increases in the high spending regime with a coefficient of -0.1104 $((\beta_0 + \beta_1)$. This shows an asymmetric effect of military sending where the contemporaneous variable positively affects growth and the lagged value negatively affects growth. However, the positive effect declines as the level of military spending increases, from 0.0805 to zero, while lagged military spending has more of a negative effect as the level of spending grows (-0.0631 to -0.1004).

While the results show that the effect of lagged and contemporaneous military spending is asymmetric, we can make a conclusive statement about direction of change of growth in response to military spending using these short-run coefficients. To determine the direction of change, we consider the long run impact if military spending on growth. The long-run coefficients are obtained by summing the coefficients of contemporaneous and lagged military spending. These results indicate that while military spending in the low spending extreme regime has a positive impact on growth with a coefficient of 0.174 (0.0805-0.0631), the effect is negative in the high spending extreme regime with a coefficient of -0.0373. This implies the effect of military spending on growth is asymmetric and dependent on the level of spending, with low spending extremes contributing positively to growth and high spending extremes deterring growth.

These results provide evidence of the inverted U-shaped relationship between military spending and growth, and are similar to Karadam et al. (2017), Phiri (2017), Cuaresma and Reitschuler (2004) and Lee and Chen (2007) who all find that military spending enhances growth in the low spending regime and negatively affects growth in the high spending regime. This suggests that non-linearities should be considered in the military spending and growth relationship to avoid inferences from a misspecified linear model.

The value of γ, the smoothness parameter that governs the transition across regimes is 19.69. The corresponding shape of the transition function is shown in Figure 1 and show the gradual transition from the low spending extreme to the high spending extreme.

Figure 1: Transition function for military spending as the threshold variable



One concern with the model is the dynamic specification used. To establish whether this specification is appropriate, and the robustness of the results, we estimate the model using an error correction specification (ECM). We first determine the appropriateness of an ECM by undertaking panel unit root tests. Table 6 shows results for the Im-Pesaran-Shin panel unit root test, which is designed for heterogeneous panels, and the results show the null of non-stationarity to be strongly rejected for all variables, with the exception of GDP per capita, which is integrated or order 1. To consider what effect this might have on the results, the results for the error correction specification are reported in Tables 7 and 8. The linear ECM shows that military spending negatively affects growth in the short run, but has an insignificant effect in the long run.

With the error correction specification, our results continue to hold. In the linear model, military spending has a negative effect on growth in the short-run, and has no long-run effect. In the non-linear model, low military spending extremes contribute positively to growth, while the result becomes insignificant for higher spending extremes.

5 Conclusion

A considerable literature exists on the economic effects of military spending, without any consensus (Dunne and Tian (2016), Alptekin and Levine (2012) and Yesilyurt and Yesilyurt (2019)). A possible reason in the literature for the empirical irregularities is the manner in which military spending is modelled in the literature, assuming that the relationship between military expenditure and growth is linear. This paper has investigated the possibility of a non linear relationship between military spending and growth in Sub-Saharan Africa. Using a fixed effects panel threshold model, it identified a transition point for military spending where countries mover from the low spending extreme regime to the high spending extreme regime, and compared the results to those from a linear model.

Using the autoregressive specification, While the linear model showed contemporaneous military spending to have a negative impact on growth in a linear regressive model, taking into account non linearity revealed that military spending positively affects growth in the low spending extremes of military expenditure. This positive effect decreases as we transition to the higher spending extreme. Furthermore, analysing the long run coefficients shows that military spending and growth have an inverted U-shape relationship when we consider non-linearity in military spending. This finding supports the findings of Karadam et al. (2017), who find a positive for low burden and negative for high burden. Our results highlight the need to controlling for non linearity, and further more, the need for differentiating between the long run and short run effects of military spending on growth.

Overall, our results show that military spending has an asymmetric effect on economic growth, with the relationship depending on the size of the military spending burden and the time frame (short run or long run). We take these results with caution, as we have a relatively small sample size, and the countries in our panel are heterogeneous. Our results nonetheless suggest that there is need for further research on the non-linear effects of military spending on growth to adequately explain this relationship. Further research to determine the effect for specific countries given their heterogeneity is necessary, but for the moment we consider the importance and implications of non-linearity.

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6 Appendix

6.1 Unit Root Tests

Table 6: Unit Root Tests

	IPS test
ln(GDP per capita)	-0.0111
ln(GDP per capita (1st Difference))	-12.9298***
ln(Investment (%) GDP)	-3.4175***
ln(Military Spending (%) GDP)	-2.9235***

Notes: GDP per capita is tested with a trend. ***Significance levels at 1%, **significance levels at 5%, *significance levels at 10 %.

6.2 Error Correction Model

Table 7: ECM Specification: Linear Model
Error Correction Estimation results of Augmented Solow Growth Dependent Variable: GDP per capita growth rate

	Estimate	SE
$\triangle lninv_{it}$	0.0159	0.0229
$\triangle lnm_{it}$	-0.0507*	0.0276
lny_{it-1}	-0.0729***	0.0238
$lninv_{it}$	-0.0506*	0.0284
lnm_{it-1}	0.0258	0.0204
$ln(n_{it} + g + d)$	-0.0017	0.0133

Notes: ***Significance levels at 1%, **significance levels at 5%, *significance levels at 10 %.

Table 8: ECM Specification: Non-Linear Model
Panel Threshold Fixed Effects Estimation results of Augmented Solow Growth Model
Dependent Variable is GDP per capita Growth Rate
Threshold Variable is Military Expenditure lnm_{it}

	Regime 1 (β_0)	SE	Regime 2 (β_1)	SE
$\triangle lninv_{it}$	0.0017	0.0345	0.0176	0.0149
$\triangle lnm_{it}$	0.0631**	0.0293	0.0124	0.0282
lny_{it-1}	0.0165	0.0158	-0.0564***	0.0139
$lninv_{it}$	0.0057	0.0309	0.0198	0.0176
lnm_{it-1}	0.0176	0.0338	-	-
$ln(n_{it} + g + d)$	0.0577**	0.0270	0.0561***	0.0203
0.0202				
γ	19.73	13.58		
c_1	0.4054	0.4730		

Notes: ***Significance levels at 1%, **significance levels at 5%, *significance levels at 10 %.

6.3 Country Level Statistics

Table 9: Country Level Statistics for Military Spending

	Regime 1			Regime 2		
	Mean(ln)	Mean (%GDP)	No. of Obs	Mean(ln)	Mean (%GDP)	No. of Obs
Botswana	1.081	2.95%	26	1.543	4.68%	6
Burundi	1.112	3.04%	22	1.856	6.40%	10
Cameroon	0.32	1.38%	32	-	-	0
The Gambia	-0.547	0.58%	32	-	-	0
Ghana	-0.508	0.6%	32	-	-	0
Kenya	0.603	1.83%	32	-	-	0
Lesotho	1.085	2.96%	31	1.57	4.8%	1
Malawi	-0.009	0.99%	32	-	-	0
Mali	0.508	1.66%	32	-	-	0
Mauritius	-1.508	0.22%	32	-	-	0
Mozambique	0.209	1.23%	24	1.791	6%	8
Nigeria	-0.286	0.75%	32	-	-	0
Rwanda	0.016	1.02%	30	1.604	4.97%	2
Senegal	0.527	1.69%	32	-	-	0
Sierra Leone	0.409	1.51%	32	-	-	0
South Africa	0.597	1.82%	30	1.504	4.5%	2
eSwatini(Swaziland)	0.516	1.68%	32	-	-	0
Uganda	0.811	2.25%	32	-	-	0
Zimbabwe	0.965	2.62%	18	1.675	5.34%	14