Determinants of Zimbabwe's Military Expenditure (1980-2003)[#]

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Abstract

A number of articles have been written on the determinants of military expenditure in developing countries, which is important given the negative effect of military expenditure on economic development. There has been no such study for Zimbabwe. This paper tries to fill this gap, by empirically testing the effects of economic factors, external factors, and geo-political factors on Zimbabwe's military expenditure. The empirical work is preceded by a survey of the trends in military expenditure since 1980. The paper applies a log-linear model specification based on the standard neoclassical theory (Smith, 1989; 1990; 1995) to estimate the determinants of military expenditure. It utilises OLS estimations on co-integrated variables and comes up with long run and short run (ECM) models. The empirical findings suggest that Zimbabwean military expenditure has been influenced by both external and internal factors. The significant factors include the regional wars, the military expenditure of neighbouring countries, income, the government's domestic borrowing ability and the trade balance. The model using milex as shares of GDP data performed better than the one real milex, both in the short run and long run.

Keywords: Milex, Determinants, Zimbabwe

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1. Introduction

Defence has been a major item of national expenditure in Zimbabwe, but it has received little attention from economists. Military spending, however, is fundamentally a resource allocation question and deserves empirical economic analysis. The present economic crisis makes Zimbabwe's defence expenditures of concern to many. The economic crisis, though most often attributed to the fast track land reform programme, is also a function of fiscal deficit exacerbated by excessive military outlays in the late 1990s. The defence budget is one of the largest central government expenditures ranging between 13 and 19 per cent between 182 and 1997 (see Table 2). The government has been forced to rely on local sources of budget deficit financing which are inflationary. Failure by the state to control its budget deficit since the mid-1990s has been blamed on its refusal to lower expenditure in non-productive areas like defence (Golden, 2000).

The end of liberation wars and civil wars in southern Africa and the demise of apartheid in South Africa, it might be thought makes relatively high levels of military burden in Zimbabwe unnecessary. Zimbabwe's military burden (milex as a proportion of GDP) since 1990 has been higher than the average for sub-Saharan Africa and, indeed, has exceeded the average of all world regional groupings except the Middle East and North Africa. Furthermore, the economic recession in Zimbabwe has seen the poverty level rising to disturbing levels in association with negative economic growth (-13.2% in 2004). According to Hartnack (2005), about 70% of Zimbabweans live in absolute poverty.

This situation makes Zimbabwe an important case for empirical investigation. Empirical evidence in other countries has shown that defence expenditure has a negative impact on economic growth [Maizels and Nissanke (1986); Ram (1995); Heo (1999); Yildirim and Sezgin (2003); Kelly and Rishi (2003) and Klein (2004)]. Understanding the determinants of milex in Zimbabwe is crucial for policymakers so that they make informed decisions on its levels. Lack of longitudinal studies in Africa in general and Zimbabwe in particular on milex

determinants makes this research important. This paper therefore investigates the political, economic, demographic and strategic determinants of military expenditure in Zimbabwe.

The next section describes Zimbabwe's military sector and explain the trends of military expenditure since 1980. The third section will discuss relevant theoretical and empirical literature. The fourth section will discuss the methodology and results and will be followed by some concluding remarks.

2. Zimbabwe's military sector and milex trends

After independence in 1980, the various belligerent forces in Zimbabwe were integrated into a defence force, the Zimbabwe Defence Force (ZDF). The total number of military personnel has been declining since 1980. In 2000, the ZDF consisted of 40 000 personnel, 35 000 in the Zimbabwe National Army (ZNA) and 5000 in the Zimbabwe Air Force (ZAF), down from 94 000 in 1980. According to IISS (2004) the current figure is 29 000 soldiers and airmen. The ZDF has four main functions, the protection and security of Zimbabwe, provision of military aid to civil ministries, maintaining a peaceful political environment and maintenance of regional and international, peace and security. The defence sector has a small arms production industry run by the Zimbabwe Defence Industries (ZDI).

The ZDF has been involved in a number of internal and external operations since independence in 1980. The armed forces' first task was to deal with a low profile civil war in Matabeleland and the Midlands provinces between 1983 and 1987. External operations were conducted in Mozambique between 1983 and 1993, to protect the Beira Corridor trade route and the oil pipeline from sabotage by the South African-backed Mozambique National Resistance (RENAMO) rebels. Zimbabwe intervened militarily in the Democratic Republic of Congo (DRC) between 1998 and 2002 to prop up the government of Laurent Kabila.

Zimbabwe's milex since 1980 is shown by figures 1 and 2. Fig.1 shows that expenditure on military affairs in real terms has been above US$250 million since 1980. Fig.2 shows that milex as a proportion of GDP showed a downward trend since 1980, although it rose after 1998. The period 1980 to 1983 was characterised by a decline in burden ratio, from 7.1 in 1980 to 5.7 in 1983, because of the end of the guerrilla war against the Smith regime. The decline in military burden was short lived and the military burden rose from 5.7% in 1983 to 7.0% in 1987. At the same time defence-CGE ratio increased from 15.5% (1985) to 17.1% (1987) as a result the insurgency in Matebeleland and the Midlands provinces, and the civil war in Mozambique.

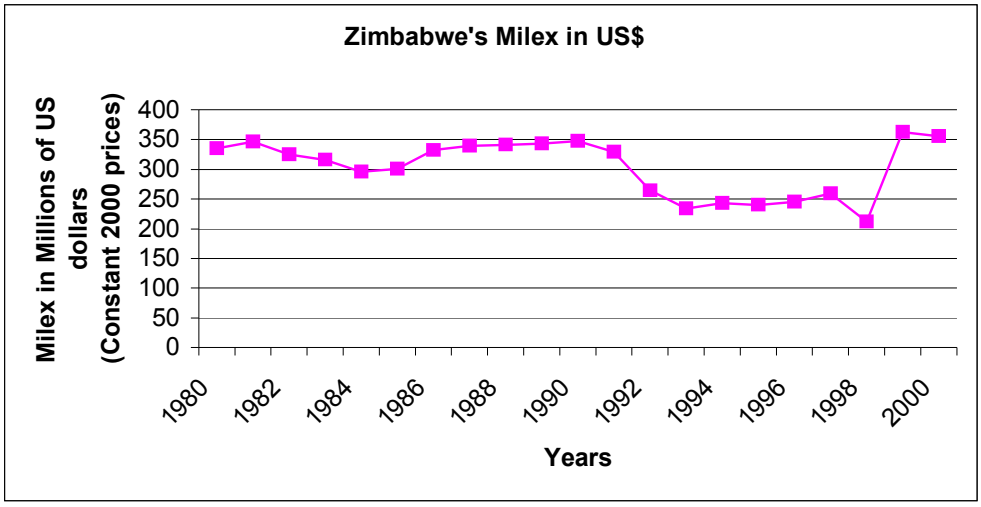


Fig.1 ***Data sources: SIPRI yearbooks***

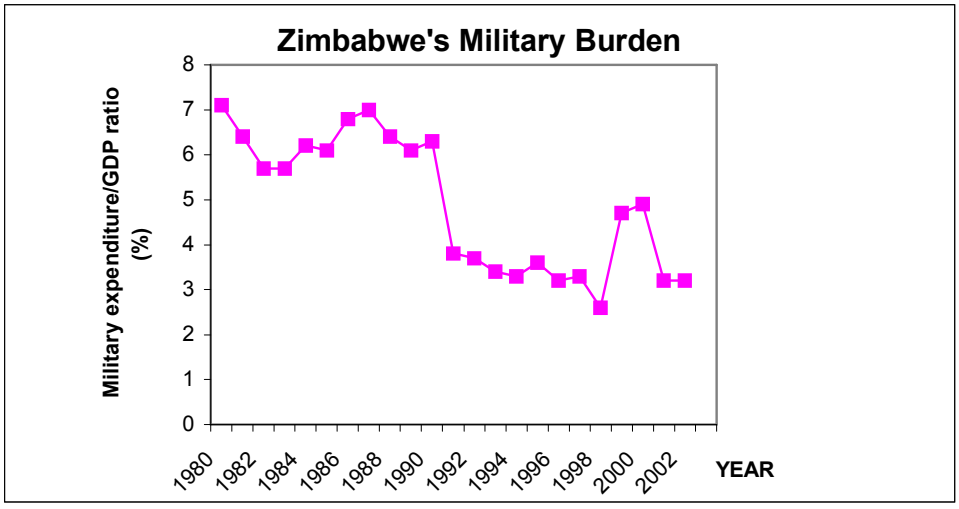


Fig.2 ***Data sources: SIPRI yearbooks***

Table 1. Zimbabwe's Military Expenditure

Year	Milex as % of GDP	in US$m (Constant 2000)	As a % of CGE	in Z$m (Current Prices)
1991	3.8	269	13.7	1116
1992	3.7	215	11.3	1269
1993	3.4	191	11.6	1439
1994	3.3	243	12.6	1826
1995	3.6	240	10.1	2214
1996	3.2	245	9.2	2742
1997	3.3	259	9.4	3441
1998	2.6	212	Na	3710
1999	4.7	363	Na	10068
2000	4.9	355	Na	15361
2001	3.2	212	Na	16208
2002	3.2	188	Na	34403
2003	Na	129	Na	123100

Source: SIPRI Yearbooks 2001 to 2004, IMF Government Finance Statistics

Domestic peace and security saw the military burden decrease from 7.0% in 1987 to 3.3% in 1994. Even so, the proportion of CGE allocated to defence was still high (see Table 2).

Table 2. Central Government Expenditure by Function

(As % of total CGE)

Year	Defence	Social Security	Education	Health	Housing & Amenities	Economic Affairs*
1982	17.26	5.13	21.87	6.43	1.56	24.19
1983	18.34	6.37	21.49	6.15	1.45	20.85
1984	16.23	4.3	20.38	6.17	0.46	26.01
1985	15.54	4.03	21.02	6.47	0.31	26.71
1986	16.49	3.56	22.21	6.67	0.31	25.49
1987	17.12	3.26	21.04	6.82	0.36	24
1988	16.31	3.37	21.96	7.55	0.46	23.09
1989	16.49	3.41	23.45	7.63	0.47	22.4
1993	18.41	6.78	13.88	7.34	11.97	16.02
1994	19.08	7.24	17.18	8.6	11.09	9.66
1995	15.4	5.78	18.52	6.68	8.72	11.7
1996	14.9	10.51	21.57	6.61	5.8	6.6
1997	13.26	18.23	24.2	8.11	4.36	6.75

Source: Government Finance Statistics Yearbooks, IMF (1989 to 2003)

****Includes: Fuel & Energy; Agriculture & Forestry; Mining, Manufacturing & Construction;Transport & Communication; and other economic affairs***

Between 1993 and 1997 the average burden of 3.5%, showed a significant reduction in resources committed to defence (see fig.1). The share of defence in CGE in the 1980s and 1990s was higher than all other areas of public expenditure (see Table 2). The slight increase in military expenditure for 1994-97 could have been triggered by the food riots of 1993-94 and general strikes organised by the Zimbabwe congress of Trade Unions (ZCTU), caused by removal of subsidies and the deregulation of price controls.

The military burden rose sharply from 2.6% in 1998 to 4.9% in 2000, which can be attributed to Zimbabwe's participation in the war in the DRC and a huge unbudgeted for salary increase for civil servants and the army. In 1999, Zimbabwe's milex was the highest in real terms since 1980. The period between 2000 and 2002 was characterised by violent protests and strikes and political violence in the run-up to the parliamentary and presidential polls. The Movement for Democratic Change (MDC) won a record 57 seats against 62 for ZANU (PF) in 2000. This was the first time in its history that ZANU (PF) had faced stiff political competition. The fast-track land reform programme was also gathering momentum in the midst of growing criticism domestically and from the international community. Such political tension might have contributed to an upsurge in military expenditure. The relatively lower levels of military expenditure in 2003 could be a function of the poor economic performance and the prevailing peaceful external environment. New acquisitions of military equipment occurred between 2003 and July 2005. In 2004, the government ordered 12 new fighter jets and 100 military vehicles from China (International Institute for Strategic Studies, 2005; Hartnack, 2005). These have been attributed to sanctions imposed by the Western powers on military spare parts and equipment, as well as the desire to catch–up with new technology.

Looking at milex from a regional perspective, South Africa is currently the largest military spender in the SADC region, followed by Angola, Zimbabwe, Botswana and the DRC respectively (see Table 3 in Appendix C). South Africa's expenditure of US$ 2353 million in 2003 was almost twice that of all the other SADC countries combined. South Africa's milex decreased from

US$3727 million (1990) to US$1621 in 1999. The subsequent increases are a result of a major arms deal signed in 1999. Zimbabwe had the highest milex-CGE ratio in the region between 1988 and 1997, reaching a peak of 21.8% in 1981. Between 1987 and 1996 the average estimate for the Zimbabwean milex –CGE ratio was 13.2%. For most of the SADC countries, the general trend of milex-CGE ratio after 1990 was downward. The war in the DRC in 1998 explains the increase in burden for the SADC countries sucked into it between 1998 and 2000 (Angola, Zimbabwe and Namibia).

3. Determinants of Military Expenditure

Many previous researchers have studied the determinants of military expenditure in developing countries (Maizels and Nissanke, 1986; Dommen and Maizels, 1988; Rosh, 1988; Looney, 1989; Hewitt, 1991; West, 1992; Dunne and Mohammed, 1995; Rahman, 2000; Batchelor et al, 2002; Dunne and Perlo-Freeman, 2003a; Dunne and Perlo-Freeman, 2003). Almost all these are based on cross-country regression models.

A number of studies have classified the factors that explain milex in developing countries (see Maizels and Nissanke, 1986; Ball, 1988; West, 1992; Deger and Sen, 1995; Harris, 2002a & 2002b and Goldsmith 2003). Broadly the determinants are grouped into the following categories, the political environment, military activities, economic and geo-strategic factors. Harris (2002) emphasises the importance of the underlying motives for milex. These can be summarized under two major categories i.e. external factors (influences independent of the country), and internal factors (domestic economic constraints and politics). The focus here will be on country-specific studies but, given the scarcity of longitudinal studies in Africa, cross-country studies will be included. Table 4 gives a summary of the determinants of milex from studies reviewed in this research.

3.1 External Considerations

Under external considerations, the focus is on the government's perception of threats. This may be based on objective data like the military expenditure

levels of hostile countries or can be based on subjective thinking including what Sun and Yu (1999) call the "general philosophy embodied in the leadership's attitude". Geo-strategic issues show a link between 'national security and threat perceptions'. Researchers concur that inter-state clashes result in increased defence expenditure (Maizels and Nissanke, 1986; Ball, 1988; Hewitt, 1991; West, 1992; Hartley and Sandler, 1995; Dunne et al, 1995; Batchelor et al, 2002; Harris, 2002a & 2002b; Yu 2002). Investigations on the effect of potential conflict, and neighbours military spending have shown that countries, which lie close to unfriendly neighbours, will allocate more to defence (Batchelor et al, 2002; Dunne and Perlo Freeman, 2003a & 2003b)

Milex also depends on the actions of external weapons suppliers and donors of military aid (West 1992). Arms production is a positive determinant of military expenditure and superpowers influence non-arms producing countries in terms of their purchases. Arms suppliers can influence governments to purchase military weapons well in excess of need. Dommen and Maizels (1988) found that arms suppliers exert a positive effect on milex.

Looney (1989) found that openness and external threats are important milex determinants for non-producers of armaments. Arms producing nations were influenced more by economic variables. Maizels and Nissanke (1986) and Dommen and Maizels (1988) found the growth of foreign exchange (positively) and the foreign investor concentration (negatively) to be very significant for the Asian region. Among the many economic constraints to milex, the growth of foreign exchange availability is important especially for arms non-producers. Rosh (1988) and Dunne et al (2003b) find a positive and significant trade variable in developing countries. The unavailability of foreign exchange will scuttle the ability to spend on imported military hardware.

A less common threat variable in the literature is the one introduced by Rosh (1988), called the 'security web' which has been used in recent studies by Dunne and Perlo-Freeman (2003a) and (2003b). This variable defines the militarisation of neighbouring and other countries that can affect the security of

a country. Rosh calculates the militarisation of a security web by averaging the military burdens of the countries in the web. This variable exerts a significant and positive effect on milex.

Table 4 Determinants of Milex in developing countries

AUTHORS	Nissanke [1986]	Maizels and Nissanke [1988]	Dommen and Maizels [1988]	Rosh [1988]	Looney [1989]	Hewitt [1991]	Dunne and Mohammed [1995]	Dunne and Perlo Freeman [2003a]	Batchelor Dunne and Perlo [2002]	Yu [2002]	Collier and I [2002]	Perlo Freeman [2003b	Dunne Perlo Goldsmith [2003]
DETERMINANTS ECONOMIC													
Per capita income	N						(0.29)s				0.93s		0.027
GDP or Growth rate	N					0.27s		(0.02)n					
CGE/GDP ratio	0.21s	0.17s			0.23s	0.8s	0.11n						
GDP or Growth rate	N				0.55s				1.07s	0.003s		(0.12)n	(0.258)s
Growth of forex	2.79s	2.40s											
Trade balance				0.002s	(0.07)n		0.06n					0.107s	
External debt					0.02n								
POLITICAL/MILITARY													
lag milex							0.60s		0.71s			0.68s	0.928s
Security web								0.005s			0.60s	(0.051)s	
Inter-state war	2.43s	1.74s				1.73s	0.30s	0.83n	0.17n		2.5s	(0.55)s	0.127s
Civil war						1.26s		0.26s		500.1s	1.85s	0.003n	0.036s
Regime type	0.65s	0.66s		(0.007)s		0.78s		(0.04)s	(0.24)s		(0.20)s	0.000n	(0.002)s
Potential enemies				0.47s				0.54s		1.46s	0.46s	0.026	
Internal threat											3.95s		0.022n
Arms supplier	0.63s	0.64s											
STRUCTURAL													
Total Population		n				0.03n		(0.13)s			(0.32)s	(0.18)n	
FDI/capital ratio	(1.15)s	(0.8)s				1.69s				93.1s			
R 2	0.65	0.67		0.6	0.7&0.6		0.91	0.57	0.79	0.91	0.62		0.92

s= significant, n =not significant, ( ) = negative sign

3.2 Internal considerations

Ball (1988) argues threats to internal security outweigh external security considerations for developing countries. The main task of defence forces is to protect the regime in power against its citizens. Both civilian and military governments in order to placate the armed forces make use of milex budgets. Collier and Hoeffler (2002) measure internal threat by estimating the probability of a civil war breaking out. The variable had a more significant

effect on milex than international war in developing countries between 1960 and 1999.

West (1992) has argued that 'the most important influences on the military are domestic bureaucratic and political interactions'. Along similar lines, Harris (2002a, 2002b) argues that the relative strength and ability of the military pressure groups will affect on milex allocations. The military is an important domestic political player in many developing countries. Ball (1988), argues that annual disparity in defence–linked expenditures is determined by bureaucratic needs like salaries and pension increases, equipment replacement and inflation. Bureaucrats wield a lot of power in the budgetary process and act in their self-interest to maximize the size of their budgets and put pressure on politicians to approve them (Brown and Jackson, 1990).

The type of regime in power (democracy, dictatorship, military rule, etc) may influence milex. A military regime is might be expected to allocate more resources to the military. Studies have tested various theoretical relationships between regime type and military spending (Maizels and Nissanke 1986, Rosh 1988, Hewitt 1991, Collier and Hoeffler 2002, and Dunne and Perlo-Freeman 2003). The main hypothesis is that 'systematic differences exist in spending patterns attributable to regime type' (West, 1992).

Dunne et al, 2003a & 2003b and Rosh, 1988 found a significant effect of military regimes on milex in developing countries. Dunne and Mohammed (1995) and Hewitt (1991) found military governments to have a positive but non-significant effect on milex. These findings indicate that military governments have a tendency to increase milex.

Ball (1988) and Harris (2002) note the effect of inertia in defence budgets, where choices made by the ruling elite relating to the army size, composition and weapon procurement will have considerable long run consequences on the levels of milex. Last year's milex is one of the best pointers of current milex expenditure. To capture the concept of inertia, econometric studies have included a lagged milex variable among the explanatory variables [Georgiou

et al (1996); Sun and Yu, (1999);Yu, (2002); Sezgin and Yildirim (2002); Dunne et al (2003a, 2003b),),

Resource availability-what a country can afford-is viewed as the most important determinant of the level of military expenditure. Researchers have included a variable to capture wealth or income constraint to milex. Most of the studies have used the growth rate of GDP or GNP, per capita income and real income/ GDP or GNP [Looney, 1989; Hewitt, 1991; Dunne and Mohammed, 1995; Collier and Hoeffler, 2002; Batchelor et al, 2002; Yu, 2002;Dunne and Perlo-Freeman, (2003a & 2003b)]. Other economic constraints to milex include public debt, central government expenditure, inflation, and government revenue. Some countries receive foreign security assistance to supplement domestic sources.

4. Empirical Model

In most previous studies researchers have used the neoclassical model of the state as a rational actor. The models employed by Hewitt (1991), Smith (1989; 1990; 1995) and Batchelor et al (2002) assume a state which maximizes welfare (W) as a function of security (S), economic variables such as consumption (C), population (N), and other variables [e.g. the politics of the ruling party, and strategic] (Z). Thus, the welfare function is,

$$W = W(S, C, N, Z) \quad \ldots\ldots(1)$$

The welfare function is optimised subject to the budget constraint and a security function. The budget function is given by,

$$Y = P_c C + P_m M, \quad \ldots\ldots(2)$$

Where Y *is nominal aggregate income and,* P_m *and* P_c *are the prices of real military spending* M *and consumption* C *respectively.*

Security is determined by a country's milex (M), that of other countries ($M_1 \ldots M_n$) and other strategic variables T, which affect the security situation (Smith, 1995).

$$S = S(M, M_1 \ldots M_n, T) \quad \ldots\ldots(3)$$

For allies there is a spillin from their expenditure, which raises security while milex by enemies cause insecurity. The maximisation problem is then solved to find a derived demand for the level of military spending.

$$M = M (P_m/P_c, Y, N, M_1 \ldots M_n, Z, T) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

For estimation purposes equation (4) is often written as shares of output or income Y instead of levels. The demand equation had to be modified to suit the country's characteristics and data availability. Dunne and Mohammed (1995) and Dunne et al (2003a) argue that when studying LDCs it is important to take the nature of the country into account. The dependent variable milex will be measured by the military burden (milex as a proportion of GDP, Mt) and real milex in US dollars, Mz. Mt_{t-1} and Mz_{t-1} will be included as independent variables to measure the impact of inertia in the respective models.

The income constraint (Y) will be measured by real GDP (1990 constant prices). As GDP rises, a country has more resources for production and greater means and need for protection. The government's ability to borrow for milex will be measured by the Treasury bill rate (TB). This variable is included because for a part of this period Zimbabwe had difficulties in accessing multilateral aid and along with limited borrowing options, led to reliance on domestic sources of finance. Given a war or political instability the greater will be the crowding out of other government expenditures by defence expenditure. To capture the effect of economic integration on milex we use the trade balance. Zimbabwe's trade balance (TR) is defined as the difference between exports and imports (X-M), 1990 constant prices. This is a sign of openness of the economy and the growth of foreign currency. Its impact on milex is ambiguous, but for Zimbabwe we expect a positive sign since it imports the greater part of its weaponry.

The "security web" (SW) militarisation is measured by the average military burden of countries able to affect the security of Zimbabwe and the relevant countries are Angola, Zambia, Mozambique, Botswana and Malawi. Namibia is excluded because some data before independence is not available. South Africa's defence burden (SAt) and real milex (SA) is taken separately because

of its military dominance and its apartheid past; it will have been during the greater part of the period.

Other variables included are civil conflict [war or political unrest] dummy (CD) and an external war dummy (ED). The CD dummy takes a value of 0 for no conflict, and 1 for civil war/ unrest. A positive coefficient is expected on this dummy variable. The dummy ED takes the value of 1 for the war periods [1983 to 1993 for Mozambican war and 1998 to 2002 for the DRC war] and 0 for other periods. A positive sign is expected. Fig.4 summarizes the theoretical expectations from the determinants of military expenditure.

4.1 Model specification

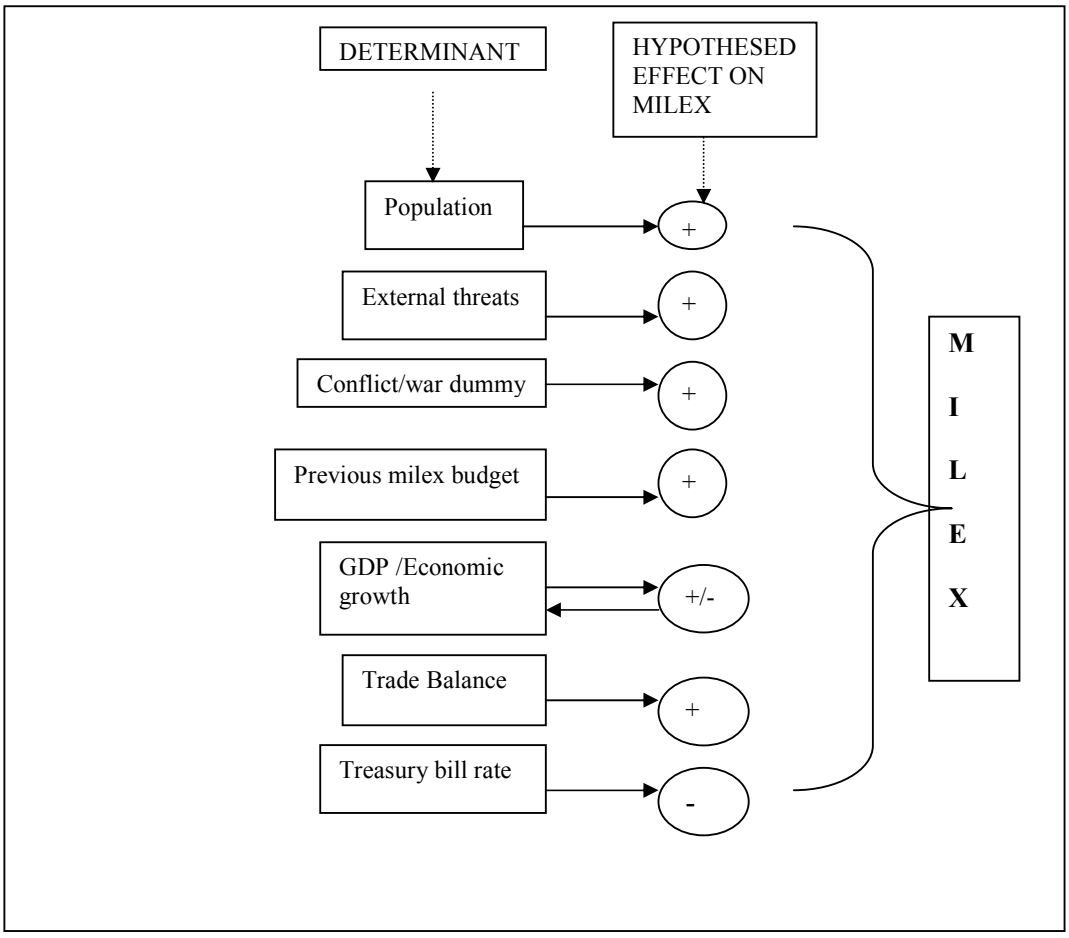
The general model takes into account the most important country conditions (geo-strategic, political and economic).

$$M_t = f [Y, M_{t-1}, N, SW, SAt, TR, TB, CD, ED] \ldots\ldots\ldots\ldots\ldots\ldots..(5)$$

The variables are logarithmically transformed to meet the assumptions of Ordinary Least Squares. At the same time the parameters are assumed to take the Cobb-Douglas functional form. An advantage of using logs is that the coefficients will represent elasticities. The study utilises the OLS estimation method after testing the data for stationarity using the Augmented Dickey Fuller (ADF) tests and co-integration using the approach by Engel and Granger (1987). The Error Correction and Co-integration approach involves the specification and estimation of a long-run model of I(1) [integrated of order one] variables. The residuals from the co-integration model are tested for stationarity. Normally if the variables are co-integrated then the residuals will be stationary [integrated of order 0, i.e. I(0)].

An Error Correction Model (ECM) is employed here to determine the short run relationship and the speed of adjustment from the short run to the long run. The error correction term captures the adjustment towards the long run equilibrium. If variables are regressed in their differenced state (Box-Jenkins approach), a valuable long run relationship between the variables is lost.

Fig. 3 Summary of the theoretical expectations



The specific models were derived using Hendry's general to specific modelling approach (see Thomas, 1993). The general form of the error correction model is given as,

$$DLogM_t = \alpha_0 + \alpha_1 DlogY + \alpha_2 DlogM_{t-1} + \alpha_3 DlogN + \alpha_4 DDlogSW_{t-1} + \alpha_5 DDlogSA_{t-1} + \alpha_6 logTB + \alpha_7 TR + \alpha_8 CD + \alpha_9 ED + RV_{t-1} + e \quad \ldots\ldots(6)$$

where D denotes first differences; DD denotes second differences; log denotes logarithms, α_is are constant parameters, RV_{t-1} represents the error correction term; e – is the residual term. The error correction term in equation 6 is calculated as follows'

$$RV_{t-1} = (LogM_t - @_0 - @_1 logY - @_2 DlogSW)_{t-1} \quad \ldots\ldots(7).$$

The Co-integration model after testing for stationatity of variables is

$$LogM_t = @_0 + @_1 logY + @_2 DlogSW + RV \quad \ldots\ldots(8)$$

Where RV is the residual term and @s are constant parameters.

If the dummy variables are taken into consideration the final long run model is given as,

$$LogM_t = @_0 + @_1 \log Y + @_2 \, DlogSW + @_3 \, CD + @_4 ED + RV \ldots\ldots.(8a)$$

4.2 Data Sources and Limitations

The literature on military expenditure identifies the problem reliability and consistency of data obtained from various sources [SIPRI, IMF, US Department of Defence (DOD) etc]. Availability of data on milex in Africa is low and characterized by conspicuous omissions (Omitoogun, 2003). Empirical researchers also differ on whether or not to use milex in levels or as a share of GDP or CGE. Brauer (2002) and Hartley and Sandler (1995) contend that the outcome of empirical research depends on whether level or share data is used and concluded that share data produce better results. The problem with levels data is that of conversion when more than one country's data is being compared.

This study intended to analyse data for the period 1980 to 2003 inclusive, but the data from 2001 to 2003 was missing for some variables, therefore the sample was reduced to 1980 to 2000 for estimation purposes. This research relied on data both in shares of GDP and in levels in order to test data form performance. SIPRI milex data was used because it had more complete data series for both ratios and levels. SIPRI data , it should be noted refers to actual expenditure.Real GDP, trade balance, population, Treasury bill rates and budget size data were obtained from various issues of the IFS *Yearbooks*, EIU *Country Profile*, the Reserve Bank of Zimbabwe *Quarterly and Monthly Reviews*, and the IMF *Government Finance Statistics Yearbooks*. The different sources used diverse base years and the data had to be converted to one base year (1990).

While Zimbabwe data are available, there are serious doubts on its consistency and soundness. Omitoogun (2003) argues that off-budget milex is widespread in Africa and Zimbabwe in particular. Most of the milex statistics exclude a significant portion of the actual milex. For instance, the cost of Zimbabwe's participation in the DRC war is still not clear. Omitoogun (2003) and International Institute for Strategic Studies (2001) argue that milex data

was inaccurate in Zimbabwe because the government wanted to "…provide 'politically correct' military spending figures" to the IMF. Zimbabwean officials had claimed that the government was spending US$3 million per month on the DRC war but the actual figure was US$25 million a month, in early 2000.

4.3 Empirical Results

The Eviews 3 package was used in carrying out the estimations. The first step was to test for data non-stationarity using the ADF test and results obtained are shown in Table 5 in Appendix, A which shows that the variables are integrated of different order. A test for co-integration used variables integrated of order one. The residuals for milex measured as share of GDP [log (Mt)] as the dependent variable, (RV11) were found to be stationary in level form at 10%. When milex was measured in levels [log (Mz)], the residuals (RV12) were also stationary in level form at 5%. The co-integration results are presented in Table 6a and 6b in Appendix A. The results show that milex in Zimbabwe is co-integrated with militarisation of its neighbours (logSW) and the income /real GDP [log (Y)]. The co-integrated variables and the dummies were combined in order to come up with a long run model. The long run models are presented in Tables 7a and 7b.

4.3.1 Long run model

Table 7a.

Dependent Variable: Milex as a proportion of GDP [LOG(Mt)]

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	10.85893	4.962143	2.188355	0.0461
Military burden (logMt-1)	0.185946	0.216577	0.858567	0.4050
SA Burden [dlog(SAt)]	0.379108	0.311712	1.216214	0.2440
Security web [logSW]	0.090968	0.129409	0.702950	0.4936
Income [logY(-1)]	-1.036374	0.482091	-2.149749	0.0495
External war [ED]	0.265029	0.080680	3.284961	0.0054
R-squared	0.854297	Mean dependent var		1.584416
Adjusted R-squared	0.802261	S.D. dependent var		0.299660
S.E. of regression	0.133253	Akaike info criterion(AIC)		-0.949815
Sum squared resid	0.248588	Schwarz criterion		-0.651095
Log likelihood	15.49815	F-statistic		16.41723
Durbin-Watson stat	1.819465	Prob(F-statistic)		0.000020
Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.253619	Probability		0.780044
Obs*R-squared	0.811112	Probability		0.666606
White Heteroskedasticity Test:				
F-statistic	4.693128	Probability		0.012014

Obs*R-squared	16.17138	Probability	0.063388

Jarque-Bera(coefficient)= 0.264459 p-value= 0.876140

Table 7b.

Dependent Variable: Real milex [LOG(Mz)]

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant (C)	8.284856	3.977081	2.083150	0.0575
Real milex [logMz(-1)]	0.303893	0.233766	1.299989	0.2162
SA Milex [log SA(-1)]	0.956536	0.498584	1.918504	0.0773
Security web[logSW-1	-0.379223	0.202039	-1.876982	0.0831
Income [log (Y)]	-0.385602	0.330987	-1.165004	0.2649
External war [ED]	0.141076	0.066117	2.133743	0.0525
R-squared	0.622330	Mean dependent var		5.687860
Adjusted R-squared	0.477073	S.D. dependent var		0.168958
S.E. of regression	0.122179	Akaike info criterion (AIC)		-1.114562
Sum squared resid	0.194062	Schwarz criterion		-0.816318
Log likelihood	16.58834	F-statistic		4.284321
Durbin-Watson stat	1.434126	Prob(F-statistic)		0.015973
Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.704012	Probability		0.515579
Obs*R-squared	2.156060	Probability		0.340265

Jarque-Bera(coefficient)= 0.995049 p-value= 0.608034

The Ordinary Least Squares method was used to estimate the long run models. It can be seen from Table 7a that milex in Zimbabwe is significantly determined by previous income levels and external war. The DRC and Mozambican wars variable was significant at the 1% level and exerted a positive effect on milex. The income variable, although significant at 5%, has a negative sign. The negative correlation between GDP and milex in Zimbabwe may be explained by the fact that the since the dependent variable is a ratio of GDP, so when income falls with milex constant the burden goes up. Another explanation could be that low GDP is associated with shortages and high seasonal and cyclical unemployment and milex increases inorder to maintain internal stability. This may be true for an agrarian economy like Zimbabwe where the risk of internal insecurity is high. Inertia, South Africa' military burden and the 'security web' militarisation have an non-significant long-term influences on Zimbabwe's milex. The model has a high goodness of fit, shown by an R^2 of 0.85 and adjusted R^2 of 0.80. Based on the Breusch-Godfrey LM Test there is no serial correlation.The model also passes the Jarque-Bera normality test.

An alternative model was tested using Log (Mz) as a dependent variable. The results in Table 7b show that milex is significantly and positively determined by external wars. This is in line with previous studies. The income variable is negative but not significant. The negative correlation between GDP and milex might imply that the income variable picks the effect of internal instability, which CD was supposed to capture. The CD dummy is not significant.

The South African burden and the security web variables are significant in the second model, albeit at the 10% level. The acceleration in South Africa's milex in past periods has had a positive effect on Zimbabwe's milex an expected result given that the apartheid regime posed a serious threat to the new ZANU PF government throughout the 1980s. After the demise of Apartheid relations improved but it seems there is competition between Zimbabwe and South Africa over regional supremacy. This has manifested itself in the SADC when the two countries disagreed on how the committee on defence and security should operate. Zimbabwe also led a SADC alliance, which excluded South Africa from dealing with the war in the DRC. However, the current regimes have cordial relations. The security web militarisation though only significant at 10%, has a negative sign, which implies that there is a form of 'alliance' amongst these neighbours. This dates back to the liberation period when the Frontline States (now SADC) were assisting each other to fight colonialism. The increase in milex by friendly neighbours is a contribution to the security of Zimbabwe. Comparing the two LR models, the model in shares performs better than the one using levels data. This supports the findings of Brauer (2002) and Hartley and Sandler (1995). The model in shares has a higher goodness of fit, with an adjusted R-squared of 0.80 compared to 0.48 for the model in levels.

4.3.2 Short Run or Error Correction Models

The results for the short run models are shown in Tables 8a and 8b. The models estimated are in the form presented in equation 6. The model in Table 8a was estimated using milex as a share of GDP.

Table 8a

Dependent Variable: Milex as a share of GDP [DLOG(Mt)]

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	-0.623879	0.155798	-4.004417	0.0015
Income [dlogY(-1)]	2.513043	0.659521	3.810406	0.0022
Treasury bill rate [logTB]	0.103737	0.044811	2.314975	0.0376
Trade balance [TR]	0.000302	0.000149	2.029965	0.0633
External war [ED]	0.338848	0.074307	4.560145	0.0005
ECMt-1 [$RV11_{t-1}$)]	-0.864639	0.173949	-4.970634	0.0003
R-squared	0.766650	Mean dependent var		-0.014056
Adjusted R-squared	0.676900	S.D. dependent var		0.180070
S.E. of regression	0.102355	Akaike info criterion (AIC)		-1.468643
Sum squared resid	0.136196	Schwarz criterion		-1.170399
Log likelihood	19.95211	F-statistic		8.542076
Durbin-Watson stat	1.958357	Prob(F-statistic)		0.000901

Table 8b

Dependent Variable: Real Miliex [DLOG(Mz)]

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	-0.188395	0.052641	-3.578891	0.0034
Milex [dlogMZ(-1)]	0.736630	0.226105	3.257906	0.0062
Security web [logSW(-1)]	-0.316471	0.111624	-2.835148	0.0141
Income [dlogY(-1)]	1.094778	0.522159	2.096639	0.0562
External war [ED]	0.242929	0.062489	3.887563	0.0019
ECMt-1 [$RV12_{t-1}$]	-1.227852	0.257729	-4.764120	0.0004
R-squared	0.728815	Mean dependent var		0.001352
Adjusted R-squared	0.624513	S.D. dependent var		0.152797
S.E. of regression	0.093629	Akaike info criterion (AIC)		-1.646854
Sum squared resid	0.113964	Schwarz criterion		-1.348610
Log likelihood	21.64511	F-statistic		6.987553
Durbin-Watson stat	2.233540	Prob(F-statistic)		0.002248

The initial all-inclusive model (Appendix B) shows that inertia is not significant at the 10% level. This is contrary to results from Batchelor, et al (2002), and Dunne, et al (1995, 2003a, 2003b) who found the variable significant. The military burden for South Africa has a positive impact but is insignificant at the 10% level. The security web and the civil conflict dummy are not significant. All these variables were dropped and this improved the explanatory power of the model from 58% to 69%(using adjusted R- squared) as presented in Table 7a. In addition the AIC and the Schwartz criterion both declined and the joint F-test p-value improved from 0.03 to 0.001.

The growth in income in previous periods strongly influences milex in Zimbabwe. The short run response is elastic and significant at 1%. This is in

line with previous studies. This may result from the fact that the Zimbabwean economy is driven by agriculture. When this sector performs well this provides the government with foreign currency for importing military equipment. Another explanation could be that persistent recessions will eventually exhaust resources available, even to the military. Even though a regime under fire would want to continue to prop up the military, a limit will eventually be reached, at which point milex will decline as GDP declines. The recent decline in real milex between 2001 and 2003 could be explained by this reasoning.

The trade balance has a positive and significant (10% level) impact on the growth in milex. In the short term, the immediate sources of finance are the available foreign currency reserves, which are therefore a driving force behind any military built up. However, the low coefficients show that the short run impact is very small. Rosh (1988) and Dunne et al (2003b) find a similar result for developing countries, while Looney (1989) and Dunne etal (1995) found it non-significant. Maizels and Nissanke (1986) and Dommen and Maizels (1988) also find a related variable-growth in foreign currency-to have a positively significant effect on milex in developing countries.

The Treasury bill rate indicates the relationship between borrowing and government expenditure, with TB rate signifying the government's desire for more funds for defence. A positive link shows that government has been borrowing on the local financial market to accelerate milex in the short term when foreign sources are not available. Although the coefficient is small it is very significant at 5%. The external war dummy is significant at 1% and has a positive sign as expected. This result is in line with earlier studies. Apart from the cost of maintaining troops in foreign countries, there is a need to replenish equipment. The error correction term ($RV11_{t-1}$) is very significant at 1% and has a negative sign as expected. This means that 86% of the discrepancy between the actual and long run equilibrium level of milex is corrected for annually.

The second ECM model in Table 8b is a nested model of an original model in Appendix B. The latter shows again that the previous year milex has a positive

but non-significant impact at the 10% level. The South African milex also has a positive but non-significant coefficient. The Treasury bill rate, trade balance and the civil conflict dummy are non-significant. As these variables were being eliminated one by one, the model's explanatory power improved from 52% to 62 %. The AIC and the Schwartz criterion coefficients also decreased while the F statistic p-value declined from 0.05 to 0.002. The ECM shows that milex in Zimbabwe is explained by an autoregressive process. The inertia variable has a positive impact and is significant at 1% level. The short run impact of previous milex is therefore high. This result agrees with that of Batchelor et al (2002) and Dunne et al (1995; 2003a; 2003b). The security web militarisation, though significant at the 1% level in the short run, has a negative sign as in other models. The external war dummy is significant at 1% level and had the expected positive sign. The error correction term ($RV12_{t-1}$) is very significant at 1% and has a negative sign as expected but the magnitude of size of -1.23 is greater than –1.0, which is not expected. This implies there are continuous disequilibria in the adjustment process. The feedback adjustment process overshoots. Comparing the two short run models, the model using milex as a share of GDP performs better than that using real milex. The model in shares has a higher goodness of fit, adjusted R-squared of 0.68 compared to 0.62 for the model in levels. The p-values for the F-statistic were 0.001 and 0.002 respectively.

5. Conclusion

This paper's main objective was to test for the main determinants of military expenditure in Zimbabwe between 1980 and 2003. The data sample for estimation was reduced to 1980-2000 due to missing figures for later years. In order to examine fully the factors the study used two dependent variables. The model using milex as shares of GDP performed better than the one using real milex in levels.

Looking at both lines of investigation, the Zimbabwean milex seems to have been influenced more by the external war interventions than internal conditions. The external war dummy was significant in all the models both

long run and short run. The use of shares or levels data did not change its positive and significant impact. Another strategic variable that features strongly in the models is South African milex. This variable has a long-term positive impact on Zimbabwe's milex. Another crucial factor is the income variable, which in the long run has a negative effect on milex. Inertia or previous milex has had a positive impact on current milex changes in the short run. In the long run, it maintains a positive but insignificant impact. The security web militarisation had a significant dampening effect on milex both in the short and long run. The Treasury bill rate and the trade balance have a strong show in the short run as expected.

The results reveal that policymakers, if they are interested in arresting the ballooning budget deficit, the spiralling inflation and the worsening recession, they should focus their attention to domestic priorities rather than pursue external agendas or regional peacekeeping that increase the demand for milex. Foreign military interventions have definitely worsened the economic and political crisis in the country. Concerted effort should be made by government to use non-military methods of attaining peace, which are more cost effective in restoring peace and order within and outside the country.

References

Ball, N. (1988) Security and Economy in the Third World, Adamantine Press Limited, London.

Batchelor, P., Dunne P., and Lamb, G. (2002) "The Demand for Military Spending in South Africa", Journal of Peace Research, Vol. 39, No. 3, 339-354.

Bonn International Center for Conversion [BICC] (2004) "Conversion Survey 2004 – Global Disarmament, Demilitarisation and Demobilisation", Nomos Verlargsgesellschaft, Baden-Baden.

Brauer, J. (2002) " Survey and review of defence economics literature on Greece and Turkey: what have we learned? *Defence and Peace Economics, Vol.13,No.2, 85-107.*

Brown, C.V. and Jackson, P.M. (1990) Public Sector Economics, Basil

Blackwell, Oxford, UK.

Brzoska, M. (1995) " World Military Expenditures", *In Handbook of Defense Economics, Vol.1, by K. Hartley and T. Sandler, Armsterdam, Elsevier*.

Collier,P. and Hoeffler,A.(2002) "Military Expenditure: Threats, Aid and Arms Races". *World Bank Policy Research Working Paper 2927.*

Deger,S. and Sen,S. (1995) "Military Expenditure and Developing Countries" *In Handbook of Defence Economics Vol.1, by K. Hartley and T. Sandler, Armsterdam, Elsevier.*

Dommen, E. and Maizels, A. (1988) "The Military Burden in Developing Countries". *The Journal of Modern African Studies, Vol.26, No.3, 377-401*.

Dunne, J. P., and Mohammed N.A.L., (1995) "Military Spending in Sub-Saharan Africa". *Journal of Peace Research, Vol.32, No.3, 331-343*

Dunne, J.P. and Perlo Freeman, S. (2003a) "The Demand for Military Spending in Developing Countries". *International Review of Applied Economics*

Dunne, J.P. and Perlo Freeman, S. (2003b) "The Demand for Military Spending in Developing Countries: A Dynamic Panel Analysis*". Defence and Peace Economics, Vol.14, No.6, 461-474.*

Dunne, J. P. and Smith, R. (2005) "The Econometrics of Military Arms Races", *Paper presented to the ninth Economics and Security Conference, 23-25 June University of the West of England/University of Bristol, Bristol.*

Economist Intelligence Unit (1999-2004), "Country Report, Zimbabwe" (Various Issues).

Engle, R.F., and Granger, C.W.J. (1987) (Co-integration and Error Correction: Representation, Estimation and Testing", *Econometrica, Vol.55, 251-276.*

Georgiou, G.M., Kapopoulos, P.T. and Lazaretou, S. (1996) " Modelling Greek -Turkish Rivalry: An Empirical Investigation of Defence Spending Dynamics", *Journal of Peace Research, Vol.33, No.2.*

Golden, R. (2000) "Hollow Arguments…", *Business News, Official Journal of the Zimbabwe National Chamber of Commerce, Vol.1, No.5,p3.*

Goldsmith, B. E. (2003) "Bearing the Defence Burden: theories and Correlates of Military Expenditures, 1886-1989". *Paper presented at International Studies Association Annual Convention, Portland Oregon, US*

Gujarati, D.N., (1995) Basic Econometrics. 3rd Edition, McGraw-Hill, Int. Ed.

Harris, G. T. (2002a) “Military expenditure and economic development in Asia”, in J. Brauer and J. P. Dunne, eds., *Arming the South The Economics of Military Expenditures, Arms Production and Trade in Developing Countries*, Ashgate, Avebury,p71-98

Harris, G. T. (2002b) “The irrationality of South Africa’s military expenditure”, *African Security Review Vol.11, No.2, 75-86.*

Hartley,K. and Sandler,T. eds.(1995) *Handbook of Defence Economics*. Armsterdam, North-Holland.

Hartnack, M. (2005) “ Mugabe sinks US$ 120 million on Chinese jets” Newzimbabwe.com, <www.newzimbabwe.com.pages/f7.125.html>

Heo, U. (1999) “ Defense Spending and economic Growth in South Korea: The Indirect Link”, *Journal of Peace Research, Vol.36, No.6, 699 –708.*

Hewitt, D. (1991) “Military Expenditure: Econometric Testing of Economic and Political influences”, *IMF Working Papers WP/91/53, IMF, Washington DC.*

International Monetary Fund (IMF), (Various years) *Government Finance Statistics Yearbook. Washington DC, USA.*

International Monetary Fund (IMF), (Various years) *International Financial Statistics.Publication Services, Washington DC, USA.*

International Institute for Security Studies (2001, 2004),”*The Military Balance”* , IISS, London.

Kelly, T. and Rishi, M. (2003) ” An empirical study of the spin-off effects of military spending”, *Defence and Peace Economics, Vol.14, No.1, 1-17.*

Klein, T. (2004) “Military expenditure and economic growth: Peru 1970-1996”, *Defence and Peace Economics, Vol.15, No.3, 275-288.*

Looney, R. E. (1989) “ Internal and External Factors in Effecting Third World Military Expenditures”. *Journal of Peace Research, Vol.26, No.1, 33-46.*

MacLean, S. J. (2002) “Mugabe at war: the political economy of conflict in Zimbabwe”, *Third World Quarterly, Vol.23, No.3, 513-528.*

Maizels, A. and Nissanke, M. (1986), “The determinants of military expenditure in developing countries”, *World Development Vol.14,*

No.9,1125-1140.

Mlambo, N. (nd), "The Zimbabwe defence industry, 1980-1995", *SADCI Defence Digest, Working Paper No.2*. < www.ccrweb.ccr.uct.ac.za/>

Nkiwane, C. (1999) 'Small arms flow in Zimbabwe' Monograph No.34, *Weapons flow in Zimbabwe, Mozambique and Swaziland.* <www.africa-talk.com/forums/lofiversion/index.php/t192.html>

Nyambuya, M. (1996) "National Defence: The Experience of the Zimbabwe Defence Force", *African Security review Vol.5 No.3.*

Omitoogun, W. (2003) Military Expenditure Data in Africa: A survey of Cameroon, Ethiopia, Ghana, Kenya, Nigeria and Uganda. *SIPRI Research Report No.17, Oxford University Press*.

Ram, R. (1995) "Defence expenditure and Economic growth", *In Handbook of Defense Economics*, *Vol.1, by K. Hartley and T. Sandler Armsterdam, ElsevierScience B.V.*

Reserve Bank of Zimbabwe(RBZ) (2002 Various Issues) *Monthly and Quarterly Reviews*, Harare

Skons,E.,Omitoogun, W., Perdomo, C. and Stalenheim, P.,(2005) "Military Expenditure" *SIPRI Yearbook*, Oxford University Press, Oxford.

Smith, R. (1995) "The demand for military expenditure", *In Handbook of Defence Economics Vol.1, by K. Hartley and T. Sandler, Armsterdam, Elsevier Science B.V, 69-88.*

Stockholm International Peace Research Institute, (various years), *SIPRI Yearbook*, Oxford University Press, Oxford.

Thomas, R.L. (1993) Introductory Econometrics. Second edition, Longman, New York.

West, R. L. (1992) "Determinants of military expenditure in developing countries: Review of Academic Research", *World Bank Discussion Papers, No.185, pp 113-145.* World Bank, Washington DC.

Yildirim, J. and Sezgin, S. (2003) " Military Expenditure and employment in Turkey", *Defence and Peace Economics, Vol.14 (2), pp 129-139.*

Yu, M.T. (2002) "The Impact of US-China Relations on Taiwan's Military Spending: An analytical Model of error Correction Mechanism (1966 -1992)". *Paper presented at CGOTS, APSA's annual meeting in Boston.*

APPENDICES

APPENDIX A

Table 5: Stationarity results

VARIABLE	ORDER OF INTEGRATION	LEVEL OF SIGNIFICANCE
Militaryburden [log(Mt)] / Real Milex [log(MZ)]	I(1)	10%
Population [logN]	I(2)	5%
SA Burden[logSAt] / SA Milex [logSA)]	I(2)	5%
Security web [logSW]	I(1)	1%
Income [logY]	I(1)	5%
Trade balance [TR]	I(0)	10%
Treasury bill rate [logTB]	I(0)	5%

Table 6a Co-integration Results

Dependent Variable: Milex as a share of GDP **LOG(Mt)**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	16.56927	3.657565	4.530136	0.0003
Security web [logSW]	0.125171	0.174308	0.718103	0.4819
Income [logY]	-1.593409	0.366918	-4.342685	0.0004
R-squared	0.617368	Mean dependent var		1.602305
Adjusted R-squared	0.574853	S.D. dependent var		0.303360
S.E. of regression	0.197801	Akaike info criterion		-0.271550
Sum squared resid	0.704252	Schwarz criterion		-0.122333
Log likelihood	5.851280	F-statistic		14.52128
Durbin-Watson stat	0.667146	Prob(F-statistic)		0.000176
ADF Test Statistic	-1.855728	1% Critical Value*		-2.6889
For residuals RV11		5% Critical Value		-1.9592
		10% Critical Value		-1.6246
ECMt-1 [RV11(-1)]	-0.332204	0.179015	-1.855728	0.0791
Log likelihood	10.79793	Durbin-Watson stat		1.647196

Table 6b

Dependent Variable: Real Milex LOG(MZ)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	11.54316	2.840835	4.063297	0.0007
Security web [logSW]	-0.031198	0.135385	-0.230441	0.8203
Income [logY]	-0.606933	0.284986	-2.129697	0.0473
R-squared	0.229041	Mean dependent var		5.701424
Adjusted R-squared	0.143379	S.D. dependent var		0.165992
S.E. of regression	0.153632	Akaike info criterion		-0.776950
Sum squared resid	0.424850	Schwarz criterion		-0.627732
Log likelihood	11.15797	F-statistic		2.673780
Durbin-Watson stat	1.063111	Prob(F-statistic)		0.096223
ADF Test Statistic	-1.968050	1% Critical Value*		-2.6968
For residual (RV12)		5% Critical Value		-1.9602
		10% Critical Value		-1.6251
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RV12(-1)	-0.568519	0.288874	-1.968050	0.0656
D(RV12(-1))	0.059752	0.267835	0.223094	0.8261
Durbin-Watson stat	1.990388	Prob(F-statistic)		0.032101

APPENDIX B

ECM Original Model

Appendix 8a

Dependent Variable: Military burden [DLOG(MT)]

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	-0.594644	0.192277	-3.092646	0.0129
Military burden [dlogMT(-1)]	0.134001	0.260660	0.514082	0.6196
Security web [dlog(SW(-1)]	-0.033487	0.158551	-0.211209	0.8374
Income [dlogY(-1)]	2.630520	0.826060	3.184417	0.0111
SA Burden [ddlogSAT]	0.167533	0.257282	0.651166	0.5312
Treasury bill rate [logTB]	0.090694	0.057640	1.573469	0.1501
Trade balance [TR]	0.000285	0.000225	1.269616	0.2361
Civil conflict [CD]	-0.031450	0.072739	-0.432371	0.6756
External war [ED]	0.371670	0.096143	3.865798	0.0038
ECMt-1 [RV11(-1)]	-0.998580	0.266845	-3.742170	0.0046
R-squared	0.789267	Mean dependent var		-0.014056
Adjusted R-squared	0.578534	S.D. dependent var		0.180070
S.E. of regression	0.116902	Akaike info criterion		-1.149537
Sum squared resid	0.122996	Schwarz criterion		-0.652464
Log likelihood	20.92060	F-statistic		3.745344
Durbin-Watson stat	2.407138	Prob(F-statistic)		0.031119

Appendix 8b

Dependent Variable: Real Milex DLOG(MZ)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant C	-0.378993	0.239503	-1.582415	0.1522
Milex [dlogMZ(-1)]	0.409486	0.533599	0.767403	0.4649
Population [ddlogN]	-0.351498	1.570989	-0.223743	0.8286
SA Milex [ddlogSA])	0.127966	0.423857	0.301909	0.7704
Security web [dlogSW(-1)]	-0.218648	0.225708	-0.968725	0.3611
Income [dlogY(-1)]	1.673947	1.029816	1.625482	0.1427
Treasury bill rate [logTB]	0.063890	0.073509	0.869141	0.4101
Trade balance [TR]	0.000224	0.000265	0.844071	0.4231
Civil conflict [CD]	-0.005167	0.069066	-0.074808	0.9422
External war [ED]	0.195701	0.102330	1.912447	0.0922
ECMt-1 [RV12(-1)]	-0.914439	0.494827	-1.847996	0.1018
R-squared	0.766404	Mean dependent var		0.001352
Adjusted R-squared	0.474409	S.D. dependent var		0.152797
S.E. of regression	0.110774	Akaike info criterion		-1.269745
Sum squared resid	0.098168	Schwarz criterion		-0.722965
Log likelihood	23.06258	F-statistic		2.624715
Durbin-Watson stat	2.319453	Prob(F-statistic)		0.092358

APPENDIX C

Table 3. SADC MILITARY EXPENDITURE

Year	Angola	Botswana	Lesotho	Malawi	Mauritius	Mozambique	Namibia	Seychelles	SA	Swaziland	Tanzania	Zambia	Zimbabwe	DRC
1988	6071	113	21.9	16.8	5.9	101		15.1	3835	9.8		118	341	
1989	7745	123	29.5	18.2	8	126		16.7	3783	10.5		170	343	
1990	6727	154	27.8	17.2	9.9	114		17.3	3727	15.3		149	347	
1991	7280	165	23.6	15.2	11.2	113	132	18.8	3148	16	127	102	329	
1992	7781	154	19.4	16.9	11.5	113	100	21.8	2771	21.3	125	114	264	

1993	4212	161	17.8	17.2	11.2	122	59.5	13.8	2523	24.1	82.4	51.9	234	
1994	1491	148	21.2	16.8	11.6	143	47.4	12.1	2671	24.6	77.4	59.9	243	
1995	1022	135	26.3	10.4	12.1	63.4	52.7	11.1	2376	25.6	100	74.9	240	
1996	1589	124	23.5	13.8	11.3	57.6	56.3	10.7	2065	26	98.7	45.3	245	173
1997	1195	143	23.5	17.8	9.4	64	69.4	11.6	1899	25.4	98.6	58	259	154
1998	424	185	25.3	14.2	8.6	76	74.4	11	1711	28		58.5	212	46.3
1999	1553	182	31.8	13.8	9	91.2	104	11	1621	29.2		29.9	363	169
2000	438	191	30.6	15.4	9.4	90.6	113	10.3	1878	26.9	121	18.6	355	133
SUM	47528	1978	322.2	203.7	129.1	1274.8	808.7	181.3	34008	282.7	830.1	1050	3775	675.3
Average	3656	152.2	24.8	15.7	9.9	98.1	80.9	13.9	2616	21.7	103.8	80.8	290.4	135.1
% change	-92.8	69.0	39.7	-8.3	59.3	-10.3		-31.8	-51.0	174.5		-84.2	4.1	

Source: SIPRI 2004, (Measured in US $m, at constant 2000 prices)

Table 6 SADC Milex-Central Government Expenditure Ratio

YEAR	Angola	Botswana	Lesotho	DRC	Malawi	Mauritius	Mozambique	Seychelles	SA	Swaziland	Tanzania	Zambia	Zimbabwe
1980		10.3		8.6	11.9	1.8	27.8		17.8	9.3	14	9.3	20.3
1981		9.4		4	8.9	1.6	29.7		15.5	7.6	16.2	12.1	21.8
1982		6.8		8.2	7.6	0.9	29.1		14.1	8.8	13.2	10.5	15.7
1983	28.8	7		6.5	5.9	1			12.8	8.4	13.7	12	17
1984		6.6		2	5.3	1			12.9	7.7	14.9	10.3	15.6
1985		6.5			4.7	0.9	38		11.9	6.1	18.4	6.7	16.7
1986		7.1			6.2	0.8			11.9	5.5		8.9	18
1987		10.6	7.1		5.7	0.8	34.6			5.6		9.3	17.5
1988		11.6	6	5.9	5.1	1	40.7			6.1		8.4	16.9
1989		11.2	7.7	9.5	5.4	1.1		7.6		5.5		7.4	16.2
1990		12.3	7.6	3.5	5.1	1.5						8.3	16.2
1991		12.9	6.4	2.9		1.6		8.3				18.2	13.7
1992		11.1	9.4	10.8		1.6		6.2	8				11.3
1993		9.3	8.8	3.9		1.5		4.7	6.5			4.8	11.6
1994		11.4	6.8	6.9		1.5		4.5	8.6			7.9	12.6
1995		9.7	7.5			1.5		4.3	7.1			9	10.1
1996		8.1	6			1.3		3.5	5.7			6.8	9.2
1997			5.7			1		3.4	5.4			6.9	9.4
1998			6.3	3.9		0.9		3	4.5				
1999				9.9		0.9		3.1		6.4			
2000				10.6		0.9		3		6.4			
2001						0.9							
2002						0.9							

Sources: SIPRI YEARBOOKS(various issues); IMF Government Finance Statistics, ACDA 1990,1992.