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DETERMINANTS OF MILITARY EXPENDITURES IN SUB-SAHARAN AFRICA

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ABSTRACT: *This study surveys the models of the determinants of military expenditure and then specifies a model for the determinants of military expenditure in Africa and tests it by time series, cross section and pooled cross-section time series data for thirteen least-developed Sub-Sahara African countries. The result of the analysis shows that military spending, in this sample, is determined mainly by strategic considerations rather than by pure economic conditions.*

I. INTRODUCTION

African military spending constitutes a very small portion of the total world's military expenditure. It was only 0.32% of total world military spending in 1959, and it reached 2.09% in 1985. In the period between 1959 and 1977 the annual rate of growth of African military expenditure was very high, and exceeded the growth rate of total world military spending throughout the period. By 1978, however, total African military expenditure and the ratio of African military expenditure to total world military expenditure flattened out. Nevertheless, military expenditure in absolute terms is still high and its burden on individual countries is also high, but reductions in African military spending started before other LDCs regions.[1]

The trends of military expenditure in many Sub-Sahara African countries differed from the experience of LDCs as a whole. Within the Sub-Saharan region, however, there are also considerable variations between trends of military spending across countries. This study selects a sample of thirteen least-developed Sub-Sahara African countries: Benin, Central African Republic (CAR), Ethiopia, Kenya, Mali, Niger, Rwanda, Somalia, Sudan, Tanzania, Togo, Uganda, and Zaire. The aim of this selection is to overcome the problems of dealing with a wide variety of countries. The choice of the sample is motivated by the following considerations: First, following the World Bank regional classification, the

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selected group belongs to the Sub-Sahara African region, with some common geographical, ethnic, cultural and social characteristics. Second, the selected group falls under the 'low income oil-importing' (LYC/M) category in the World Bank income and relative resource endowment classification. Third, the military involvement in the economic and political affairs of these countries is very high, to the extent that a military government is the rule rather than the exception. This is accompanied by intense civil wars and political instability. Fourth, none of these countries has a domestic armament industry. Finally, these countries are characterized by low per capita income and sluggish economic growth. Agriculture dominates economic activity both in its contribution to the GDP (ranging between 27% in Zaire and 61% in Tanzania, in 1987) and its absorption of the economically active population (ranging from 66% in Benin and 90% in Tanzania in 1987). The industrial sector is very small and is concentrated on agricultural food processing and import substitution.

In the last decade, most of the countries in our sample experienced a decrease in their military burdens, size of the armed forces, and arms imports, with a considerable variation in the magnitude of military burdens [40]. The principal objective of this study is to identify the major determinants of Sub-Sahara African military spending, and to ascertain the causes of variance in the countries' military burden.

Understanding the determinants of military spending is important for the study of the economic effects of military expenditure as well as its relevance to government policies. It helps to rationalize amounts and allocations of defence budgets, and it is also crucial in arms control, disarmament, and military conversion policies. Moreover, if the defence spending proved to have detrimental economic effects, then its reduction becomes an economic and political priority and the knowledge of the determinants will help in the reduction of military expenditure levels.

The first part of this paper briefly surveys some of the earlier work done in the area of military spending determinants. Then, the lessons drawn from these studies will be summarized and incorporated in our research design. Data for thirteen Sub-Sahara African countries, for the period 1963-1985, are used to identify the major determinants of military

spending in these countries, by using time series, cross-sectional, and pooled time series and cross-sectional analyses.

II. PREVIOUS STUDIES

The quantity of studies on the determinants of military expenditure is fairly impressive. Therefore, this review will not pretend to be exhaustive; it will, however, attempt to classify these studies into broad categories and examine the characteristics and contributions of each category. The survey examines the relevance of the previous approaches to our study and points out directions for future research.

A significant number of military spending determinants studies are built upon arms race models, and so they are treated as a separate category.[2] The second category of studies of the determinants of military expenditure is concerned with the bureaucratic, economic and strategic factors, without an explicit recognition of the existence of the arms race.

2.1 Arms Race Models

The pioneering work of Richardson [48] remains the basis for an enormous number of arms race models. His theory envisages two hostile nations in armament competition and the theory, thus, interprets the arms increases on both sides in terms of an international action-reaction process. The simplest version of his theory is given by the following two equations:

$$\frac{dx}{dt} = k\,y - \alpha\,x + g\,, \tag{1}$$

$$\frac{dy}{dt} = l\,x - \beta\,y + h\,, \tag{2}$$

where x and y are the two nations' defences, k and l are positive defence coefficients, α and

β are positive constants representing the fatigue and expense of keeping defence, while g and h are constants representing grievances and ambitions.[3]

Following this seminal work, a large literature in the area of arms race modelling was produced, with different modifications to the basic model. These can be categorized into three broad types. The first includes models which change the expressions of the variables used. The second takes the form of increasing or decreasing the variables in the model. The third emphasizes the implications of an asymmetric model (e.g., Deger [8]).

In the first category some arms race models are concerned with the determinants of military expenditure [21], while others are concerned with the explanation of the variation in the stocks of weapons [38]. The models which deal with military expenditure vary in the way they measure this spending. Some studies assume that each country's military spending depends on the level of its rival's expenditure in the preceding period [44]. Others use the change in expenditure instead of the level of military expenditure [28], while most recent models employ the distributed lag formulation (e.g., [37]).

Arms race models have made a remarkable contribution to the study of the determinants of military spending. Their simple framework helps in organizing thought about military interactions, facilitating the testing of the models against historical data and the systematic discussion and comparison of the results, and raising many research questions [54: 113]. However, the arms race models are open to criticism on a number of theoretical and practical grounds.

The principal objection to Richardson's type models is their mechanical nature, where the feedback process with an opponent plays the decisive role in determining military spending, while other autonomous forces within each country are ignored.[4] In developing counties the need for military force to maintain ruling elites in power and to repress domestic opposition groups is crucial in deciding the level of military effort. Moreover, the system can have a variety of solutions depending on the parameters' values, and "to determine the parameters requires a theory of the nature of the state and the principles on

which it acts".[3] The relevance of arms race models to developing countries is also questionable, either because of the absence of explicit armament matching policies [11: 69], the existence of more than one potential external antagonist [51: 574]. Furthermore, on the practical side, most of the arms race studies suffer from problems of multicollinearity, measurement error, and model specification [49].

Despite the contribution of arms race models to the literature, and the continuous effort to address the above-mentioned limitations, the quantitative evidence on arms race models has not been compelling.[6] Their formulation was weak in explaining the variations in military expenditures between countries, particularly in the Third World. Deger [11], and Deger and Sen [13] provided many examples for the failure of the Richardson model in explaining changes in military expenditure even in cases where arm races were evident (for example Iran-Iraq, India-Pakistan and Turkey-Greece).[7] In fact, these models have not been successful in analyzing even the military allocations of the superpowers, where arms matching policies are clearly prominent.[8]

2.2 Non-Arms Race Models

Studies that analyze the determinants of military expenditure without explicit consideration of arms races have focused on economic, political and military aspects, at the national or the international levels, or both. They can be classified into three categories. The first category of these studies is concerned with the economic conditions which influence the level of military expenditure. The second emphasizes the dominance of political and military considerations. The third category is more comprehensive and incorporates economic, political, and strategic factors in the analysis.

In the first category there are a number of different approaches reflecting different schools of thought. The Marxist school was the pioneer of this kind of reasoning. For Marxists, military institutions are subordinate to class, and military expenditure has a necessary role in the maintenance of the capitalist system; within the school there are, however, a number of strands which differ in the extent to which military expenditure is

necessary for capital accumulation.[9] The underconsumption school is usually cited as the most explicit Marxist school in interpreting military spending. Following the tradition which concentrates on the purely economic function of defence spending, the underconsumption school considers the nature of the global economic system in the determination of military expenditure. Baran and Sweezy [4] argued that under monopoly capitalism there is a tendency for aggregate economic surplus to rise and the surplus will be absorbed mainly in the military sector of the economy. They asserted that military expenditure is used to stabilize capitalism by maintaining effective demand and moderating the downward pressure on the rate of profit. Military expenditure in capitalist countries also depends on their position in the international economic hierarchy.[10]

Lotz's [34] work is an earlier example of the studies which emphasized the influence of domestic economic conditions on levels of military expenditures. His purpose was to explain the factors which affect government decisions about expenditure, and variations in its composition and size, across 37 developing countries.[11] He fitted a cross-sectional equation with military burden as the dependent variable. The results showed a significant negative relationship with per capita income, and significant positive relationships with the total government expenditure as a percentage of GNP, percentage of population living in urban areas, and exports of minerals and oil as a percentage of total exports (the last three independent variables are proxies for the stage of development, social change and employment structure, and the size of the foreign-owned extractive sector, respectively). Nevertheless, although his results are statistically acceptable, the explanatory variables which were included in his equation are not related directly to the decision-making processes governing military allocations.

In the same vein, a considerable number of studies emphasized the overwhelming importance of domestic economic factors in determining the level of military spending (e.g.,[23]).[12]

The second category of studies have focused on strategic, political and military factors as major determinants of military outlays. One of the first studies that stressed the

political influence of the military on military spending was Nordlinger [42]. He found that, in 74 non-Western countries, the type of government (military or civilian) exerted a significant influence on defence spending in the period between 1957 and 1962. Similar conclusions were reached by Thompson [61], Kennedy [29] and Whynes [64].[13] However, the findings of Rothstein [50] suggest that it is perception of threat by the government that determines the defence allocations. Rothstein was interested in developing a conceptual framework to account for LDCs' security choices. He argued that threat perception by the ruling elite, and government legitimacy and effectiveness (both estimated by expert judgements) are the major determinants of Third World security expenditure (see also Deger and Sen's optimizing model [11]).[14]

These studies face many theoretical and practical objections, and their results are both conflicting and inconclusive. They cover only a limited number of potentially significant influences, and some of them tend to generalize their findings on the basis of very poor and insignificant results [23]. An example of the practical difficulties is found in studies which emphasized the predominance of the political factors. Creating relevant explanatory variables will be extremely difficult, requiring a high degree of subjective judgement. There are also problems in the estimation and operationalization of such concepts (see Rosh [49], and Rothstein [50]).

Needless to say, the limitations inherent in most of these studies are mainly associated with the exclusive use of cross-sectional or longitudinal research designs. Other causes of inconclusive results are differences in the samples chosen, study periods and the explanatory variables included in the studies. Nevertheless, it is clear that the decision-making process to determine the allocations of defence expenditure is complex. It involves the interaction of different economic, strategic, political and military factors, at the national, regional and international levels. The implications of this are that any serious attempt to analyze the determinants of military expenditures must follow a comprehensive approach that encompasses most of these factors. The third class of non-arms race models follows a comprehensive approach of combining all plausible economic, political and military influences in the analysis. This provides better results and insights, as the following survey

of the key studies of this approach will show. This category embraces the neoclassical school of thought and many other studies.

Neoclassical economic theory assumes that the state is a rational agent and a class-neutral actor, maximizing social welfare subject to its resource constraints. Military expenditure is, thus, determined by balancing its opportunity costs and the security benefits it provides. Smith's [55] study of U.K. military spending and Hewitt's [26] public choice model of demand for military expenditure are examples of the empirical application of this approach. However, the relevance of this approach to LDCs is suspect for a number of reasons. Deger [9] shows that domestic and international forces in the form of class structure, power relations and bureaucratic influence may upset the fine tuning of welfare maximization. Moreover, Smith [54: 64] argues that this account is misleading for three reasons:

> it transforms the concrete political analysis of military expenditure into a metaphysical subject confined to technicians. It diverts attention from the role of private interests in the process by which decisions are made, making effective opposition to them more difficult. And it obscures the political and economic functions of military expenditure in a class society.

Choucri and North [6] provided an earlier study of the causes of military expenditures in six European countries between 1871 and 1914. Their model included both domestic factors (military expenditure in the previous year, population, income and colonial area) as well as international factors (military expenditures of non-allies and the intensity of colonial conflicts), which tend to contribute to military expenditures (see also Hill [27], Hess [25]).[15]

Zuk and Thompson [67] studied the military spending of 66 LDCs in the period 1967-1976, focusing on the question of whether or not military coups or regimes have an impact on subsequent levels of military spending. However, their analysis adopted a wider framework. They pooled the data and regressed military outlays (with different measures) against several economic and political variables (such as regime type, coup occurrences, level of conflict, economic development and arms imports). They concluded that regime

of breaking down the Third World into smaller groups, or regions, of similar characteristics. Each region has a set of potential influences which are different from those of other regions. Thirdly, the studies which combine economic, political and military factors were successful in identifying the causes of variations in military expenditure than those which were concerned with a limited set of factors. Moreover, the incorporation of national, regional and global dimensions in the analyses proved to be of vital importance. Fourthly, most of the limitations of the longitudinal or the cross-sectional analyses can be surmounted by applying a pooled cross-sectional and time series analysis, which treats levels of military spending dynamically within and across nations. Lastly, much effort and emphasis is needed in data collection and analysis as well as the operationalization of the political and strategic influences.

III. THEORITICAL FRAMEWORK AND RESEARCH DESIGN

Defence expenditure is predominantly a public good, in the sense that almost all military spending comes out of government budgets. Governments choose the level of military expenditure as part of their optimal allocation of resources, and the choice reflects the preferences of the government in power. Third World governments decide on the level of military expenditure that provides appropriate 'security' against potential or actual 'threat' of domestic opposition, civil war or external threats. These strategic factors have both political and military dimensions. However, the determination of military expenditure is relatively independent of the economic situations in LDCs. Therefore, Third World military spending is generated mainly by its internal logic, unconfined by the calculus of marginal losses and gains implied by the rational optimization of the State of some well-defined social welfare function, as might be the case in developed countries. Deger [9:18] points to the examples of irrational military spending of some LDCs that are difficult to justify in terms of optimal strategic gains.

A more satisfactory approach to the analysis of the causes of military spending in developing countries must, therefore, conceive that military expenditure is principally determined by strategic considerations. It is influenced by the perception of threat that a

country faces and the needs of security. Moreover, the security and threat concepts have both political and military factors, and national, regional and global dimensions. These factors are extremely important in the determination of Third World military expenditures. However, the ability of governments (or the states they represent) to mobilize resources for defence is constrained by the overall economic conditions of the country. That is to say:

> irrespective of whether internal or external security objectives dominate, the level of security expenditure should, in theory, be determined by an assessment of the likely security threats confronting a country and the most effective means of meeting them, within the overall framework of resource availability (Ball [3: 32]).

The major determinants of military expenditure are therefore: (a) political and military situations (security and threat perceptions); and (b) overall economic conditions. These factors operate at domestic, regional and global levels. This is the general framework within which this study attempts to analyze the determinants of military spending in Sub-Saharan Africa. Our analysis will start by specifying general working hypotheses on the relationship between military burden and a number of explanatory variables. The rationale behind these hypotheses rests on a set of assumptions that will be illustrated.

The population of this study consists of thirteen Sub-Sahara African countries. The time frame for this study is the period 1963-1985. The analysis starts from 1963 because most of the countries included obtained independence in the early 1960s, and 1985 is the last year for which we can find complete and comprehensive data. The data are examined, first, across time for each country to ascertain the causes of the change in military burden in each separate country. Then, they are analyzed using cross-sectional analysis to scrutinise the long-term determinants; and lastly, pooled time series and cross-sectional techniques are used.

IV. DETERMINANTS OF MILITARY EXPENDITURE IN SUB-SAHARAN AFRICA

In this section many potential influences on the military burden are identified. The interaction of economic, political and military influences is central to the analysis, as

MacKenzie [35: 31] argues that " we should not explain militarism only economically, nor see it as having merely 'internal' logic. The state and the international system of states are centrally important in militarism". Therefore, the potential regional and international factors are also incorporated in the analysis.

The military burden as measured by the share of military spending in output is the most widely used indicator of a country's militarization level, because it avoids the difficulties of finding a relevant deflator for military spending to construct constant price data, and it also avoids the distortions caused by exchange rate conversions when making cross country comparisons. It is a good indicator of the diversion of national resources to the military sector, and it controls for the large variations in the resources of different countries (GDP levels). Moreover, some empirical studies show that the military burden measured in this form has the highest mean correlation with numerous indicators of militarization. [16] Using the ratio of military expenditure to the total government budget is less acceptable because of the great variance in the relative size of government budgets. Therefore, for these reasons , we follow the usual practise of focusing on the military burden (ME/GDP).

4.1 Economic Factors

A number of economic factors are likely to affect the overall levels of military expenditure in LDCs. First, the level of national income is argued to be relevant, with wealthier nations allocating higher military expenditure than poorer ones. Military expenditure (as with all other public expenditure) is determined by the availability of resources. As the national income increases (and consequently the taxable capacity increases) the ability to fund military activities also increases. Moreover, higher levels of income may result in structural changes, income inequalities and greater urbanization. These changes involve greater potential for conflict in the society, and consequently higher military spending [36: 1130]. GDP per capita is used as a measure for the level of income. The countries included in the sample fall under the "Poorest Countries" category in terms of their GDP per capita which ranged between 152 US$ in Rwanda in 1965 and 781 US$

Third, the role of global economic linkages in the determination of military expenditures is emphasized by the 'world system' school. The school claims that the country's incorporation into the world economy might affect its degree of militarization. However, the school does not specify the type and direction of this relation. Here we hypothesise that the greater the degree of incorporation in the world economy, the higher the military burden is likely to be. There are many reasons behind this hypothesis. High levels of military expenditure will be needed to suppress the internal groups who oppose the extraction of resources implied by higher levels of incorporation.[18] In addition government revenues, and consequently the resources available to defence spending, will be increased by duties and tariffs on an increasing volume of trade, and by government efforts to dampen the fluctuations resulting from the move to an open economy, as governments usually smooth out such fluctuations by increasing the scope of the public economy by tax systems. [19] The ratio of total exports and imports to GDP is used as a proxy for a country's degree of incorporation into the world economy. It is relatively high in Somalia, Togo and Zaire compared with other countries in the sample.

"Inertia" is considered as the fourth economic factor in determining military outlays. It is a salient feature of most economic time series. As there is a momentum built into military expenditure, we expect a positive relationship between current and past values of military spending. The current military expenditure may be rigid in the downward direction because it is likely that there will be some hangover from previous expenditures and commitments to military programmes, or simply a ratchet effect as in Peacock and Wiseman [45]. Previous military expenditure may also account for relatively consistent increases in military expenditure, and captures the effects of bureaucratic processes.[20] However, if pressures are exerted on such a level (e.g., revenue constraint) for a long time, inevitably expenditure has to be reduced.

Finally, many studies have emphasized the influence of the 'military-industrial complex'[21] as a major determinant for defence spending. This represents the alliance of domestic arms industry and bureaucratic interests which act to persuade decision makers to agree on additional military spending. However, this influence is likely to be weak in

LDCs because of the small size of the arms industry, and in our Sub-Sahara African sample it is even less important as there are no such industries. Table (1) ranks these countries according to their levels of the proposed economic variables, and it is obvious from the ranking that there is no systematic relationship between these variables.

4.2. Political Factors

The political framework is essential in determining government allocations of expenditures within a country. The type of the government (whether civilian or military) is likely to be an important factor in this process. While the direction of this relationship is not straightforward, we can hypothesize that a military government is expected to spend more on defence than its civilian counterpart. The proposed relationship is the result of the interaction of different mechanisms and motivations.

Military corporate interests are likely to be effective in increasing the military share of government expenditure. The military as an organization has many reasons to promote higher levels of defence spending, as the armed forces want to ensure that their members are well paid (compared with other societal groups) and well equipped (compared with national paramilitary forces and the armed forces of the neighbouring countries). " When we add the enormous political power enjoyed by the military to their corporate interests, it comes as no surprise to find that the armed forces have sometimes been characterized as the country's most powerful 'trade union'"[42: 1134].[22] The chance of promoting these interests increases when the army itself controls the government.

The promotion of the interest of the military was a strong motive behind many military coups. Indeed, "the great majority of coups are partly, primarily, or entirely motivated by the defence or enhancement of the military's corporate interests"[43: 78]. In the African context, the 1966 and 1972 coups in Ghana, the 1968 coup in Mali, and the 1980 Liberian coup are obvious examples. The pay rates of the armed forces increased immediately after these coups [3: 66-68].

Mutinies in many African armies also corroborate the military corporate interest argument. In Uganda, for example, the government was forced to increase the basic pay of soldiers following the 1964 mutiny. Military expenditure, consequently, expanded from 4.4 % of the government budget in 1964, to 12.3% in 1967. Furthermore, the armed forces are likely to be well rewarded by military regimes to retain support, and higher wages and new equipment will often be used to minimize the threat to the military regimes from disgruntled officers. Other motivations for military intervention are the deterrence of foreign threat, and the consolidation of national unity against rebellious or secessionist movements.[23] This will necessitate an increase in defence spending immediately after the success of the military coup.

The distinction between civilian and military governments has been criticized on many grounds. Some researchers have argued that it is the military influence on civilian governments rather than the existence of military governments which is the most important factor in determining military outlays. However, in the African context such influences usually take the form of direct military intervention. It is also evident that military governments face more domestic opposition than their civilian counterparts, and as Maizels and Nissanke [36] argue, the frequent use of violence against the public to maintain the ruling elite in power might lead to higher defence allocations. Moreover, high levels of repression may eventually increase domestic opposition which may express itself in either a civil war or a military coup.

Finding a way of distinguishing between civilian and military governments is a challenging task. Some civilian governments are composed of military officers, technocrats and politicians, while many military regimes allocate some ministerial portfolios to civilians to reduce the opposition to military rule. To avoid these categorization problems we focus on the origin of the government. "If a government came to power as a result of a military coup, we regard it as a military regime".[24] It is considered a military regime until power is returned to a civilian administration [see Table (2) below for the nature of the governments in the region].

Of the thirteen countries included in our sub-Sahara African sample, two were former Belgian colonies (Rwanda and Zaire), five were British (Kenya, Somalia, Sudan, Tanzania and Uganda), five French (Benin, C.A.R., Mali, Niger and Togo) and two were Italian colonies (Ethiopia and part of Somalia). General elections were carried out to form the first national parliaments and governments immediately after independence, with the exception of Ethiopia. A few years after independence the civilian governments were overthrown by military coups in most countries, with the exception of Kenya and Tanzania.[25]

Successive military coups became a general phenomenon in the region. Williams [65: 26] argues "almost the only generalization one can safely advance is that there is no country in Africa where power is beyond the reach of soldiers; and no military government beyond the reach of counter-coups. The military coup has become, along with death or retirement of the earlier generation of African leaders, the main mechanism for political change".

4.3. Military Factors

At the national level, civil wars are the most pivotal determinants of LDCs' militarization levels. They usually develop out of domestic conflict over the distribution of wealth or political power, or as a result of internal repression. In the post-War period civil wars constituted a significant proportion of the total number of wars in the world.[26] They are likely to increase the nation's commitment of resources to the defence sector, and to threaten the country's political stability, as well as national security and unity. Goyernments, therefore, tend to devote considerable resources and effort to end such wars by political or military means.

At the regional level, external conflicts (foreign wars, armed invasion or tension between neighbouring countries) have momentous effects on the military effort, and this is reflected in higher levels of military expenditure. In our region, for example, the war between Ethiopia and Somalia in 1977-1978 escalated military expenditure in the two

TABLE (2): THE NATURE OF THE GOVERNMENTS IN THE REGION.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13
1959	*	*		*	*	*	*	*		*	*	*	*
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1 = Benin; 2 = CAR; 3 = Ethiopia; 4 = Kenya; 5 = Mali, 6 = Niger, 7 = Rwanda;
8 = Somalia; 9 = Sudan; 10 = Tanzania; 11 = Togo; 12 = Uganda; 13 = Zaire.
* : not independent.
Shaded areas: military governments.
Non-shaded areas: civilian governments.
SOURCES: See the Data Appendix.

countries. It increased the Ethiopian military burden from 4% in 1977 to 7.1% in 1978, and the Somalian military burden from 2.9% in 1977 to 6.2% in 1978.

To make a simple distinction between civil and inter-state wars is, however, not very useful as "a substantial proportion of civil wars in developing countries have been connected with regional inter-state conflict, so that it seemed impracticable to draw a rigid line between the two" [36: 1132]. In Sub-Saharan Africa, for example, the war between Uganda and Tanzania, in the period 1978 to 1979, was a result of civil conflict in Uganda and Tanzanian support for Ugandan rebels. Similarly the 1977-1978 war between Ethiopia and Somalia over the Ogaden region was the product of the continuous Somalian support to the Western Somali Liberation Front (WSLF), operating inside Ethiopia. Moreover, Ethiopia maintained its support to the rebels of the Sudan People's Liberation Army (SPLA), formed in 1983. SPLA was allowed to use Ethiopian bases, had access over the border and was given artillery and air support by the Ethiopian army. At the same time, Sudan had maintained its support of the Eritrean guerrillas by giving them similar facilities.[27]

To quantify the influence of wars and instability in determining levels of military expenditures, taking into account the above considerations, a war dummy is constructed. It encompasses both internal and external conflicts. Internal conflicts include civil war, mass executions, massacres and political violence (leading to at least 1,000 deaths a year). External violence includes involvement in a foreign war, intervention or invasion. The dummy variable takes a value of one if a country was involved in a civil or regional war, or both, and zero if it does not experience such conflicts [the sources of data for the construction of this dummy are listed in Table (3)]. Finally, given the nature and the composition of military expenditure in Africa, with a very high percentage of operating costs in total security expenditure (particularly personnel-related outlays),[28] the size of the armed forces plays a crucial role in the determination of military expenditures.

TABLE (3): MAJOR CONFLICTS IN THE REGION, 1959 - 1993.

PERIOD	AREA OF CONFLICT
1955-1972	Civil war in Southern Sudan.
1959-1965	Tutsi versus Hutu Government in Rwanda (massacres).
1960-1967	Violence and disorder in Zaire (Katanga crisis, Kasai and Stanleyville revolts, UN involvement, rebels in Albertville and Bukavu).
1961-1965	Endemic unrest and violence in Niger.
1963-1964	Frontier war between Ethiopia and Somalia.
1964.	Unrest in Kenya (Communist-inspired violence and British intervention).
1966.	Baganda revolt for secession (Uganda).
1971.	Border clashes and skirmishes between Uganda and Tanzania.
1971-1977	Civil war and massacres in Uganda, (Idi Amin).
1974-1991	Eritrean revolt and civil war in Ethiopia.
1976-1979	Uganda claims part of Kenya and reprisals against Kenyans in Uganda, and massing of troops along their borders.
1978-1979	Uganda attack on Tanzania which responded by invading Uganda.
1978-1979	Ogaden war in Ethiopia (Somali intervention).
1983-1991	Civil war in Southern Sudan.

SOURCES: Knede [31: 282-3]; Dupuy, Hayes & Andrews [18]; Hartman & Mitchell [24: 30-50]; Sivard [53: 10-11]; Dupuy & Dupuy [19 :1316-26]; and Williams [65: 19-30].

V. REGRESSION ANALYSIS

To test the previously mentioned hypotheses, and to quantify the role of the identified factors in the determination of the military burden, a simple one-equation model is constructed. The military burden is assumed to be a function of the military burden in the previous year, GDP per capita, ratio of government expenditure to GDP, ratio of total exports and imports to GDP, size of the armed forces, war dummy and the nature of the government dummy. This relationship is analyzed by techniques of time series, cross-section and pooled cross-sectional time series estimation.

5.1 Time Series Estimation

The time series technique permits comparison within countries over time but not across countries. The advantage of this technique is that it allows the examination of the major determinants of the military burden for each individual country which might differ in their weight among other countries. The equation to be estimated by time series data is written as: [29]

$$M_t = \alpha_0 + \alpha_1 GDPc_t + \alpha_2 GX_t + \alpha_3 XM_t + \alpha_4 ARM_t + \alpha_5 M_{t-1} + \alpha_6 WAR_t + \alpha_7 MRD_t \quad (3)$$

where

M_t :(ME/GDP) at time t - log transformed.
M_{t-1} :(ME/GDP) at time t-1 - log transformed.
$GDPc_t$: GDP per capita at time t - log transformed.
GX_t : Share of government expenditure in GDP at time t - log transformed.
XM_t : (Exports + imports)/GDP at time t - log transformed.
ARM_t : The size of the armed forces at time t - log transformed.
WAR_t : Dummy variable for war at year t (= 1 during wars, and = 0 otherwise).
MRD_t : Dummy variable for the nature of the government at year t (=1 for military governments, and = 0 for civilian governments).

The results are presented in Table (4) together with several diagnostic tests produced by Micro-Fit econometric package;[30] the Lagrange multiplier test of residual serial correlation; Durbin-Watson statistics; and the F test for heteroscedasticity. The normality and functional form (Ramsey's RESET) tests were also carried out. In terms of the goodness of the fit, the results are fairly satisfactory, and the dependent variables capture most of the variation in the countries' military burdens (R^2 ranging between 0.64 and 0.98). Most important is that the specification test (for serial correlation, normality and homoscedasticity) shows that the equations are well-specified.

TABLE 4: **TIME-SERIES REGRESSION RESULTS, 1963-1985.**

	BENIN	CAR	ETHIOPIA	KENYA	MALI	NIGER
CONS.	-0.219 (-0.07)	-0.3975 (-0.10)	4.2146 (0.58)	-14.89 (-4.9) ***	-13.4505 (-1.98) **	-8.9823 (-1.25)
$GDPc_t$	-0.1552 (-0.33)	-0.3486 (-0.58)	-0.023 (-0.02)	0.5210 (0.98)	-0.1000 (-0.11)	1.6359 (2.12) **
GX_t	-0.2013 (-0.79)	1.3417 (2.57) **	-0.793 (-1.60) *	2.6370 (4.62) ***	0.5877 (1.10)	-0.7347 (-0.64)
XM_t	-0.1261 (-1.22)	0.2888 (0.54)	1.654 (2.76) ***	-0.105 (-0.47)	0.0685 (0.33)	-0.0083 (-0.02)
ARM_t	0.2798 (2.05) **	-0.2076 (-1.95) **	0.0958 (1.05)	0.3820 (6.13) ***	1.3622 (4.10) ***	0.0814 (0.25)
M_{t-1}	0.3151 (1.63) *	0.5868 (3.57) ***	0.3737 (2.27) **	0.1955 (3.44) ***	0.8558 (4.80) ***	-0.0331 (-0.17)
WAR_t	-----	-----	0.0934 (0.69)	0.3501 (4.80) ***	-----	1.318 (4.67) ***
MRD_t	-0.193 (-2.47) **	0.2094 (0.91)	0.3643 (1.92) **	-----	0.1018 (0.66)	0.031 (0.14)
R^2	0.73	0.81	0.97	0.99	0.87	0.77
F	(6,16) 7.27	(6,16) 11.05	(7,15) 71.7	(6,15) 189.60	(6,11) 11.88	(7,15) 6.97
HET. test	(1,21) 0.78	(1,21) 0.33	(1,21) 1.60	(1,20) 0.06	(1,16) 0.06	(1,21) 2.10
SER. test	(1,15) 3.80	(1,15) 0.93	(1,14) 0.29	(1,14) 1.48	(1,16) 0.29	(1,14) 0.07

(CONT.) TABLE (2.4)

	RWANDA	SOMALA.	SUDAN	TANZAN.	TOGO	UGANDA	ZAIRE
CONS.	-5.8684 (-2.13) **	0.7006 (0.12)	2.1469 (0.47)	-5.8591 (-3.39) ***	-0.596 (-0.20)	-8.2832 (-1.94) **	-5.9667 (-1.83) **
$GDPc_t$	0.7458 (4.27)	-0.1341 (-0.17)	-0.2439 (-0.42)	0.6442 (1.50) *	-0.331 (-0.87)	0.8129 (1.30)	2.9200 (6.52) ***
GX_t	0.086 (0.24)	0.8674 (1.66) *	0.0162 (0.05)	-0.1320 (-0.65)	0.4983 (2.09) *	1.3716 (1.92) **	-0.0876 (-0.33)
XM_t	0.3292 (1.22)	-0.0341 (-0.18)	-0.0068 (-0.03)	0.1513 (1.46) *	-0.006 (-0.02)	0.4243 (2.03) **	0.2173 (1.18)
ARM_t	0.2811 (0.96)	-0.1865 (-0.67)	-0.0404 (-0.41)	0.4007 (2.95) ***	0.2051 (1.16)	0.0346 (0.23)	-1.0512 (-4.51) ***
M_{t-1}	0.5285 (4.03) ***	0.2062 (1.06)	0.5907 (3.62) ***	-0.0892 (-0.60)	0.3155 (2.17) **	0.5653 (7.02) ***	-0.7801 (-4.45) ***
WAR_t	0.7503 (3.38) ***	0.4673 (3.71) ***	0.3052 (3.74) ***	0.4058 (5.09) ***	-----	-0.0785 (-0.58)	0.1404 (0.49)
MRD_t	-0.5201 (-2.81) ***	-0.0090 (-0.05)	0.1894 (2.14) **	-----	0.0346 (0.24)	0.2522 (1.58) *	2.0679 (7.62) ***
R^2	0.84	0.64	0.86	0.94	0.90	0.91	0.89
F	(7,14) 10.70	(7,15) 3.82	(7,15) 12.91	(6,16) 42.80	(6,16) 24.51	(7,15) 21.60	(7,15) 17.23
HET. test	(1,20) 0.003	(1,21) 0.02	(1,21) 2.60	(1,21) 2.65	(1,21) 2.00	(1,21) 0.18	(1,21) 1.70
SER. test	(1,13) 1.86 *	(1,14) 1.61	(1,14) 1.18	(1,15) 0.30	(1,15) 1.76	(1,14) 0.04	(1,14) 0.02

The dependent variable is ME / GDP.
Figures between brackets are t-ratios. F : F Statistic.
(----) : The dummy does not apply in this country.
*, **, *** : Significant at 10%, 5% and 1% level of significance respectively.
HET. test : Heteroscedasticity test based on the regression of squared residuals on squared fitted values (F version).
SER. test : Lagrange Multiplier test of residual serial correlation (F version).

GDP per capita exerted a significant positive influence on military expenditure in three countries only while its effect in other countries was insignificant. This could be explained partially by the existence of a certain absolute technical minimum size of a modern military establishment [34]. Our initial experimentation with the relationship between military burden and economic growth did not support the existence of such a relationship in all countries and we will return to this issue in the next chapter. However, the results showed a significant positive relationship between military burden and total government expenditure as a percentage of GDP in five countries (CAR, Kenya, Somalia, Togo and Uganda); insignificant positive relationship in three countries (Mali, Rwanda, and Sudan); significant negative relationship in Ethiopia; and insignificant negative relationship in the rest of the sample. In CAR, Kenya and Uganda the elasticity of military burden to government expenditure share in output is greater than unity, implying a crowding-out effect on other government activities. However, in the remaining countries, the military burden adjusts less than proportionally to total government expenditure changes.[31]

One noticeable result is the weak effect of the total trade as a proportion of GDP (as a proxy for the degree of incorporation into the world economy). Indeed, in some countries which became less incorporated into the world economy over time, a corresponding increase in their military burden was evident (e.g Sudan). For Ethiopia, Tanzania and Uganda, however, this factor proved to be a significant determinant of their military burdens. Moreover, the influence of previous military spending was significant and positive for nine countries. The effect was also positive for Somalia, but not statistically significant. However, a negative insignificant relationship was noticed in Niger and Tanzania, and a significant negative relationship in Zaire.

As expected, the size of the armed forces proved to be a crucial factor in the determination of military burden. In four countries it had a significant positive relationship, with elasticities less than unity, while its influence was negative in CAR, Somalia, Sudan and Zaire; a positive insignificant influence was noticed in the rest of the sample [see Table (4)].

Security considerations (whether internal or external wars and conflicts) were the predominant factors for military burden determination in Sub-Saharan Africa. Eventually, in countries where wars were evident, a corresponding escalation in their military burden was noticed.[32] The war dummy is positive and significant in Kenya, Niger, Rwanda, Somalia, Sudan and Tanzania, and an insignificant positive relationship is noticed in Ethiopia and Zaire. This might be attributed to the long periods of wars and conflicts in these two countries. However, Benin, CAR, Mali and Togo did not witness any major conflict in the period investigated.

The time series results showed that the growth in the defence burden of military regimes in some countries is distinctive compared with that of civilian governments. The dummy variable for military governments is significant and positive in Ethiopia, Sudan, Uganda, and Zaire. The positive effect is not statistically significant in CAR, Mali, Niger, and Togo. Surprisingly, the dummy was significantly negative for Benin and Rwanda. For Benin, this might be attributed to the 50% increase in the size of the army by the civilian government in 1972.

5.2 Cross-Sectional Estimation

Cross-sectional analysis facilitates comparison across countries and clarifies the long-run properties of military burden patterns. Therefore, a cross-sectional model is estimated in this section although it might not be the most appropriate technique for the dynamic nature of our analysis. However, the analysis is modified to encompass longitudinal data, and the focus here is mainly on the economic variables. In the cross-sectional model, we modify equation (3) using the average values of the variables for the period 1967-1985.[33] The military burden in the previous year and the dummy variables were omitted and the percentage of population serving in the armed forces (ARP) is used rather than the absolute size of the forces, to control for differences in countries' total population. This percentage ranged between 0.03 % in Rwanda in 1963 to 1.22 % in Somalia in 1977. For the entire sample the mean value was 0.22 % for the period 1964-1985. The OLS estimation result is as follows:

$$M_i = \underset{(-0.76)}{-2.7868} + \underset{(0.15)}{0.0677}\ GDPc_i + \underset{(1.99)}{1.0561}\ GX_i - \underset{(-1.48)}{0.6656}\ XM_i + \underset{(1.51)}{0.3017}\ ARP_i \quad (4)$$

$R^2 = 0.61$ F (4,8) = 3.11
F [Functional Form] (1,7) = 1.02 F [Heteroscedasticity] (1,11) = 0.64
F [Serial correlation] (1,7) = 0.64
Figures between brackets are *t* ratios.
ARP_i: average percentage of population serving in the armed forces in country i.

Although the estimated coefficients of the cross-sectional equation have different interpretations, the results show some consistency with the time series estimates. There is a significant positive relationship between the military burden and the ratio of the government expenditure to GDP across countries. The percentage of population serving in the armed forces exerted a positive effect on the military burden (although it is significant only at the 10% level). Gyimah-Brempong (1989: 84) confirms this by arguing that "countries with large force ratios are likely to have high defence expenditures, especially in the African context, where military establishments are not mechanized". However, the positive influence of GDP per capita on the military burden is very small and insignificant and the sign of the trade to GDP ratio (the proxy for the incorporation into the world economy) is contrary to our expectations. One plausible explanation for the seemingly bizarre result is that the countries with relatively high ratio of trade to GDP (Benin, CAR, Mali, Niger and Togo) actually had a relatively low military burden and a low percentage of the population serving in the army,[34] because of their relations with France. The Francophone Zone has many economic, cultural and military links. Indeed, upon independence France signed mutual defence and military assistance agreements with them. These agreements included maintaining internal security, base rights, and transit and overflight privileges.[35] Another plausible explanation was suggested by Rosh (1988), who claims that as countries become more involved in the world economy their policy makers begin to perceive greater benefits to be derived from competition in this arena than through military conflict in the interstate system.

5.3 Pooled Cross-Sectional and Time Series Design

The pooled cross-sectional and time series analysis permits examination of the dynamic year-to-year fluctuations in the military burden of individual countries as it treats levels of military spending dynamically within and across countries. In our analysis a Generalized Least Squares procedure is used, in which the explanatory variables and the regression disturbance are presumed to satisfy the assumptions of the generalized linear regression model:[26]

$$M_{it} = \alpha_0 + \alpha_1 GDPc_{it} + \alpha_2 GX_{it} + \alpha_3 XM_{it} + \alpha_4 M_{i,t-1} + \alpha_5 ARPOP_{it} + \alpha_6 WAR_{it} + \alpha_7 MRD_{it} \qquad (5)$$

The results are as follows: (13 Countries, 19 years 1967-1985):

$$\begin{aligned} M_{it} = {} & -0.2203 - \underset{(0.63)}{0.0195}\, GDPc_{it} + \underset{(2.35)}{0.1346}\, GX_{it} + \underset{(1.09)}{0.0424}\, XM_{it} + \underset{(19.04)}{0.7816}\, M_{i,t-1} \\ & + \underset{(2.05)}{0.0505}\, ARPOP_{it} - \underset{(-0.95)}{0.0337}\, MRD_{it} - \underset{(4.99)}{0.2366}\, WAR_{it} \end{aligned} \qquad (6)$$

$R^2 = 0.97$ Figures between brackets are t ratios.

These results are consistent with both the cross-sectional model result and most of the time-series estimates for the individual countries. GDP per capita has a weak positive effect on the military burden but with an insignificant coefficient. Nevertheless, the relative size of government expenditure has a positive and highly significant effect. It is positively related to the military burden, with an elasticity of 0.13 . This implies that in these countries the military burden adjusts less than proportionally to total government expenditure changes, and this result corroborates the revenue constraint argument in the least developed countries. Moreover, previous levels of military burden have a large and highly significant influence on current levels of military burden.

Contrary to the cross-sectional results, the ratio of total trade to GDP is positively related to the military burden, but it is also statistically insignificant. From the regression results, it is also evident that the percentage of the population serving in the armed forces has a significant positive effect on military burden (with an elasticity of 0.05). Similarly, the war dummy is also statistically significant and has a positive effect. However the effect of the nature of the government (MRD) dummy is not significant and its sign is contrary to our a priori expectations. One reason behind this might be that while the dummy variable is coded zero for Kenya and Tanzania throughout the period investigated because no significant change took place in the government and there was no direct intervention from the army into the political sphere, these countries also had a relatively high military burden. Some civilian governments also increased the size of the army, and consequently military outlays (e.g., Benin). Another explanation might be that military governments, which usually come to power by military coups, raise the banner of eradicating corruption, and reducing conspicuous government spending, and therefore make a temporary reduction in military spending. Moreover, some of these ruling juntas tend to expel disloyal officers and soldiers,[37] and consequently reduce defence outlays.

Equation (5) is estimated with country dummies to allow the intercept of each country to differ; also some variables are deleted or added to the initial equation. Table (5) gives the results of these modifications.[38] The results show that some of the coefficients became significant when the lagged M was deleted from the equation.

Ethiopia and Niger have the highest and lowest levels of military burden in our

sample, respectively. When we control for them by specifying a dummy for each, the results are still similar and the Ethiopian dummy is positive and significant, while the dummy for Niger is also significant but negative. The dummies for other countries are, however, insignificant. Equation (5) was also estimated with and without the lagged military burden. The signs and the significance of most variables were similar. However, when the lagged military burden was added it was highly significant. This implies the importance of inertia in determining military allocations in Sub-Saharan Africa.[19]

TABLE 5: **DETERMINANTS OF ME (POOLED DATA ESTIMATION).**

NO.	CONS	GDP	GX	XM	M_{-1}	ARP	MRD	WAR	DUMMIES	R^2
(1)	0.5978	-0.1801	0.5065	-0.1909	-----	0.2104	-0.0184	0.4977	NONE	0.55
	(0.73)	(-2.57)	(4.89)	(-2.83)		(5.04)	(-1.32)	(6.95)		
(2)	0.0001	-0.0042	0.1112	0.0694	0.8142	0.0548	-0.0306	0.2247	NONE @@	0.92
	(0.001)	(-0.09)	(2.08)	(1.88)	(22.63)	(2.25)	(-0.93)	(5.10)		
(3)	-0.4072	0.0176	0.2156	0.0298	0.6936	0.0486	-0.0221	0.2473	D3 , D6	0.91
	(-0.98)	(0.39)	(3.04)	(0.69)	(13.43)	(1.82)	(-0.56)	(4.76)		
(4)	-0.6162	0.1491	0.1313	0.0149	0.6133	0.1063	0.0273	0.3134	Dummies for	0.92
	(-0.63)	(0.75)	(1.75)	(0.12)	(5.45)	(1.87)	(0.27)	(2.89)	all countries	

D3 : Ethiopia D6 : Niger

@@ Here numbers of the armed forces (ARM) are used instead of ARP.

Overall, the results clearly demonstrate the importance of the relative size of government expenditure, relative size of the armed forces, inertia and prevalence of wars in influencing these countries' levels of military burden even if we allow for country-specific effects. Moreover, the pooled regressions coincide with the cross-sectional and time series estimation results as all of them demonstrate the importance of the relative size of

the government expenditure as the main economic determinants and also emphasize the dominant role of the political and military factors in determining the military burden; most importantly, are the size of the armed forces, nature of the government (in some countries) and foremost the security web (wars and conflicts) of the country.

VI. SUMMARY AND CONCLUSIONS

The main objective of this study has been the clarification and quantification of the major determinants of military expenditure in Sub-Saharan Africa. We introduced the study by presenting a survey of the relevant literature and the findings of some earlier studies. It is clear from our evaluation of these studies that the models which incorporate bureaucratic, political, economic and strategic factors are better at explaining the determinants of Third World military spending than the arms race models. In addition to that, incorporation of the regional and global dimensions proves to be of vital importance.

We propose in this study that the strategic considerations of security and threat are the major determinants of defence spending. However, the variation in military expenditure is delineated by the boundaries of economic conditions, and particularly the governments' revenue constraint. Then the major determinants of military burden in Africa are identified, and a simple one-equation model is formulated and subjected to econometric analysis. The data are derived from thirteen Sub-Sahara African countries for the period between 1963 and 1985. Time series analyses for the individual countries is undertaken initially, and then a cross-sectional model is set for the averages of 1967-1985 variables. To address simultaneously the twin parameters of time and space, pooled time series and cross-sectional data are employed. The results are quite encouraging and consistent, and the model is able to explain most of the variations in the military burden of these countries.

The differences in the military burdens of the Sub-Sahara African countries appear to reflect a complex of economic, political and strategic factors, both at the national and the international levels. While the relative importance of the different factors varied from country to country, the need to maintain security and stability, and to counteract threats (to

the state or the government) is found to be the most important factor in most of the countries. The breakout of wars and internal conflicts was a key factor in the process of the escalation of military expenditures. In some countries, military governments have spent more on defence than their civilian counterparts, but across countries this argument is not supported by the pooled regression results.

While the income level (as measured by GDP per capita) was not binding for most countries, the military burden proved to be sensitive to the economic circumstances. The most important single economic factor is found to be the share of the central government in GDP. Adherence to a global power bloc is also found to be more important than the incorporation of the country into the world economy.

Studies of this type provide a consistent basis for comparison, pick out common features of countries, and suggest the relative importance of factors. But they can not be comprehensive because of problems of data quality and of operationalizing the relevant measures. Our study suggests that there are still unexplained factors accounting for the variation in the military burden. These may reflect historical, cultural and sociological features specific to each country. Such features can only really be analyzed by detailed individual country studies. The results do, however, have one very important policy implication. Since the strategic considerations of security and threat are the main determinants of defence outlays, then levels of military expenditures can be reduced by the conscious efforts of politicians and the military establishments to achieve political stability and the settlement of conflicts by peaceful means and negotiation. Regional organizations (such as, the Organization of African Unity - OAU) could also play a beneficial role in this respect. Border disputes, and the support of opposition groups of neighbouring countries were the main reasons for regional conflicts and, therefore, non-interference in the internal concerns of neighbouring countries will reduce regional conflicts. Moreover, democratic governments and institutions can solve most of these disputes at the national and regional levels.

7. Data Appendix

(1). Military Expenditure and the military burden (ME/GDP) figures from SIPRI Yearbook **World Armament and Disarmament** (various issues).

(2). Percentage of population serving in the armed forces = (armed forces / total population)X 100. The armed forces figures from USACDA **World Military Expenditure and Armed Transfers**, (Various issues). The armed forces refer to active-duty military personnel, including paramilitary forces if they resemble regular units. Reserve forces are not included; and population figures are taken from Summers and Heston (1988).[40]

(3). GDP per capita: Real gross domestic product per capita, 1980 intentional prices, from Summers and Heston (1988).

(4). The total trade to GDP (XM/GDP): World Bank **World Tables.**

(5). The ratio of government expenditure to GDP (GX/GDP): Summers and Heston (1988) and World Bank **World Tables.**

(6). The nature of government dummy is bases on the extended articles on the recent political and military history of these countries in the Regional Survey of the World: **Africa South of the Sahara 1991.**

(7) The war dummy is formulated from the sources given in Table (3).

NOTES

1. See Mohammed [40] for a survey on African military spending.

2. For detailed surveys and critical evaluation of the literature on arms races models, see Russett [51], and Rosh [49].

3. In this context, defences can refer to military spending while the fatigue of keeping defences refers to the cost of having a specific level of military spending; while the grievances and ambitions term is specific for the political intensions of the regime in its regional setting.

4. For more discussion on this issue, see Smith [56], and McGuire [38: 330-4].

5. Smith [54: 63]. Moreover, the Richardson theory of arms race has been criticized for being deterministic, and because it implies a static base-line [31].

6. See Ostrom [44], Majeski & Jones [37], Leidy & Staiger [32], and Smith [56].

7. However, Deger [8] modifies the traditional models by incorporating asymmetric relationships between the antagonist countries and the results of the empirical analysis were consistent with her theoretical predictions.

8.See Cusack & Ward [7], and Rosh [49], for the evaluation of the models in the superpowers context.

9. For a fuller evaluation of the Marxist school, see Smith [54], and Dunne [16].

10. Empirical evidence conflicting with the Underconsumption School was provided by Smith [54]. Also, the school was criticized for its surplus concept which is different from the Marxian concept of surplus value. The tendency of the surplus to rise under monopoly capitalism is also questioned by MacKenzie [35].

11. The countries included in his sample were those with a *per capita* gross national product of US$ 800 or less. They include six countries from our Sub-Sahara African sample (Ethiopia, Kenya, Mali, Sudan, Tanzania, and Uganda). See Lotz [34], pp. 119-25.

12. See Looney [33] for an evaluation of the approach, a literature survey, and a recent empirical study.

13. Other studies on the military's political influence on military spending suggest different conclusions. Zuk and Thompson [67: 61] summarized eleven of these studies. They justify the disparity of the empirical results by the differences in the research designs, as well as the differences in the countries included, periods of time, with the use of different independent and explanatory variables. Moreover, some studies did not confirm any significant relationship between regime type and resource allocations to the military (e.g., see Tannahill [59]).

14. Rothstein used military expenditure figures for 1983, while the judgements of the experts are based on evaluations for 1984 and 1985 political situations. This may affect the significance of his findings.

15. Similarly, Albercht, et al. [2] emphasized fear of neighbours, conflicting interests within the army, the needs of industrialization, and the costs of arms imports as the major factors behind militarisation in LDCs. Hewitt [26] also confirmed the importance of economic and financial indicators, political variables and demographic and geographic features of nations in explaining cross-country differences in levels of military spending.

16. Examples of these studies are given in Rosh [49: 677].

17.This factor was first emphasized by Lotz. He analyzed the different means of finance available to the governments of LDCs, and concluded that the revenue constraint is more binding to the LDCs. See Lotz [34: 130-1].

18. See Rosh [49: 682-5], for more discussion on the issue. Moreover, he argues that certain factions will benefit from this incorporation, and they will seek to maintain the existing economic order by applying force internally.

19. This argument is given by Cameron [5: 1250].

20. The last point was emphasized by Choucri and North [6]. However, Deger [10: 20] argues that the relationship between current and past values of military expenditure is negative in most LDCs because of their poor and limited resources.

21. See MacKenzie [35: 41-3] for an evaluation of the 'military-industrial complex' influence.

22. Moreover, Nordlinger's empirical findings from the analysis of 74 countries in the period between 1959 and 1962 corroborate his military corporate self-interest argument. See also Ball [3: 59-68] and McKinlay [39: 69-71] for the same argument.

23. For example, the June 1989 coup in Sudan was motivated mainly by the desire to end the armed conflict in southern Sudan. See Williams [65: 32] and Abdel-Rahim [1: 974].

24. Zuk and Thompson [67: 64]. Note that the Ethiopian monarchy (1941-1974) is not classified as military in our categorization.

25. In Kenya and Tanzania, the multi-party systems were abolished. They changed to single-party states. Moreover there was no return to civilian governments except in Benin, Sudan and Uganda for very short periods.

26. Knede [31: 270].

27. See Regional Surveys of the World [47: 459; 1050-2].

28. See Mohammed [40;41].

29. Initially, I started from an error correction model, but equation (3) below seems to give the appropriate formulation. Moreover, Dunne & Mohammed [17] estimated equation (3) for aggregate time series data of the whole sample using tests of restrictions. Their result shows that levels of income and changes in the GX and XM were the major determinants of the sample's military burden. See Dunne & Mohammed [17: 7-8] for the estimation procedures, restrictions and the coefficients of these determinants.

30. Micro-Fit Vax version 1.1, by Pesaran M.H. and Pesaran B., (C) 1989 Camfit Data Limited.

31. Some economists argue that for many LDCs, GDP and ratio of government expenditure to GDP tend to move upward with economic development (a variant of Wagner's law), and hence their inclusion in one equation might produce multicollinearity and possible mis-specification (see Deger & Sen [13]. However, we examined the pair-wise correlations among the two regressors for all countries and it is very low. It is above 0.5 for Benin, Kenya, Niger and Rwanda. Nevertheless, when we delete one of the variables the t ratios, R^2 and other statistics do not change.

32. This factor was emphasized heavily by two UNECA African economists: Dr. Bahri and Dr. El-Egaily, in my interviews with them (Addis Ababa, May 1991).

33. This is known as "between" regression in panel analysis [57].

34. The absolute size of the armed forces in these countries in 1987 was as follows: Benin 4,000; CAR & Rwanda 5,000 each; Mali, Niger & Togo with an army of 8,000 each; Kenya 21,000; and Uganda 15,000. This is compared to 300,000 in Ethiopia; 50,000 in Somalia; 59,000 in Sudan; 40,000 in Tanzania; and 53,000 in Zaire in 1987.

35. For the dates and type of these agreements and the scope of the military cooperation with France, see Dupuy, Hayes and Andrew [18; 70-1, 94-5, 250-1, 318-9]. A dummy variable for Francophone countries was constructed to see the effect of the French alliance on military burden. The coefficient was negative but not statistically significant and the result is expected because of multicollinearity (high correlation between this dummy and XM_i).

36. For the model description and the estimation procedure, see Kmenta [30: 616-22] and White & Horsman [63: 133-5].

37. See Mohammed [41] for the Sudanese case.

38. Dunne & Mohammed [17] estimated the above equation with pooled data using OLS with country-specific dummies. The results were similar to those of equation (6) in signs and coefficients.

39. The lagged military burden was deleted because estimating dynamic models with pooled data can lead to inconsistent estimates [57].

40. See USACDA **World Military Expenditure and Arms Transfers** (1988: 132), for an extended definitition and its sources of data.

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