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Defense Expenditures, External Public Debt and Growth in Developing Countries*

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This study reexamines the relationship between growth and defense spending in developing countries. It differs from previous studies as it recognizes differences in the borrowing capacity of each country. We hypothesize that a negative relationship will exist between defense and economic growth in countries which are financially resource constrained, and a positive relationship will exist in countries which are relatively resource unconstrained. A factor and discriminate analysis are used to group countries. The variables chosen for the factor analysis depict a country's external debt, structural condition, growth, and balance of payments position. Regression equations were estimated for the total sample and each group, with the growth in Gross Domestic Product as the dependent variable. The results confirm the hypothesized positive relationship between defense and growth in the unconstrained group, but was not confirmed for the constrained group. The results suggest the importance of variables such as foreign exchange, net inflows of capital, external debt, and the growth of the public sector in general, on economic growth.

1. *Introduction*

Common sense tells us that military preparations are an economic burden. The more resources devoted to military preparations the less are available for such things as investment in technology and education — activities which produce economic growth and which are the underpinnings of economic and social development in a wider sense (Huisken 1983, p. 3). Since the modern defense establishment is a heavy consumer of technical and managerial manpower and foreign exchange especially in non-arms producing countries, one would expect the negative effect to be especially strong in these developing countries where precisely these resources are particularly scarce (Huisken 1983, p. 13).

While military spending has risen dramatically in the last ten years, Nawaz recently concluded that '...no clear agreement has emerged about the nature and extent of their economic impact' (Nawaz 1983, p. 34). Several studies have indicated positive net benefits of defense expenditures while others have concluded that the overall net effect is negative[1]. The main objective of this study is to reexamine the defense/growth issue by taking into account the great differences in an individual country's international borrowing capacity. As will be shown, the group of countries with high international borrowing capacity can often avoid many of the negative tradeoffs imposed by defense expenditures. On the other hand, those countries possessing limited borrowing capacity have experienced most of the negative impacts on growth associated with defense.

1.1 *General considerations of the defense/growth relationship*

One can argue that defense expenditures can either promote or hinder economic growth. Proponents of military expenditures justify them not only on grounds of national security and stability, but also on economic terms. As Benoit noted (1978, p. 277), expenditures may contribute to growth by:

> (1) feeding, clothing, and housing a number of people who would otherwise have to be fed, housed and clothed by the civilian economy ... (2) providing education and medical care as well as vocational and technical training ... (3) engaging in a variety of public works — roads, dams, river improvements, air-

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> ports, communications networks, etc. — that may in part serve civilian uses; and (4) engaging in scientific and technical specialties ... which would otherwise have to be performed by civilian personnel.

In addition, the military sector is often the first to come in contact with modern technology and can train its personnel in handling sophisticated equipment. This experience can then be transmitted to other sectors of the economy.

The basic criticism against defense expenditures is that they represent a significant opportunity cost (see Leontief & Duchin 1983, and United Nations 1982). Chan (1985) has summarized the four main negative effects. First is the modernization effect which was also noted by Benoit (1972). The result may be an income shift (as civilian GDP is reduced), a productivity effect as government expenditures exhibit 'negligible rates of measurable productivity increases' (Benoit 1972, p. 3), or a 'crowding-out' of civilian consumption and investment. Second Chan suggests a balance-of-payments effect if growth is export-led: military expenditures could lead to a '...chronic and serious displacement of capital and talent from the most dynamic sectors of civilian production to military production' (Chan 1985, p. 417). Third, Chan notes the use of R & D resources in defense may hurt the country's technological and productivity base. A final criticism is that defense expenditures are often import-intensive (see Looney & Frederiksen 1986). If imports are financed by external loans, the external debt rises. If imports are financed through export earnings, resources are absorbed which might have better alternative uses. Thus one can readily see why no consistent relationship has emerged between growth and defense.

2. *Review of the literature*

The impact of military expenditures on economic growth in developing countries has been studied by a number of scholars (for an extensive review, see Chan 1985. For an excellent survey and contribution to the empirical work on the effect of defense in advanced countries, see Cappelen et al. 1984). Rothschild (1973) ranked correlated growth, exports and military spending for 14 OECD countries between 1956 and 1969 and concluded that increased defense spending tended to reduce exports and growth. Benoit (1973, 1978) used 1950-65 data for 44 developing countries and estimated a model which included investment, defense, and foreign aid. He concluded that 'Contrary to my opinion, countries with a heavy defense burden generally had the most rapid rate of growth, and those with the lowest defense burdens tended to show the lowest growth rates' (Benoit 1978, p. 271; see also the comment by Ball 1985, and the reply by Frederiksen & Looney 1985a).

Dabelko & McCormick (1977) assessed the impact of defense spending on education and public health expenditures and grouped countries by form of the government: personalist, centrist, and polyarchic. They found that significant opportunity costs existed for education and health in every country, the level of development had little impact on this cost, and personalist regimes tended to have the highest opportunity costs (the measurement of the opportunity cost of defense is particularly controversial; see Lyttkens & Vedovato 1984, and Dabelko & McCormick 1984).

Frederiksen & Looney (1982) used a growth equation which also included investment and defense as independent variables but separated the countries into financially resource constrained and unconstrained groups. Using data for 1960-78, they concluded that increased defense spending fostered economic growth in the unconstrained group, but had little discernible effect in resource constrained countries.

Lim (1983) estimated a Harrod-Domar type model and concluded that 'defense spending is detrimental to economic growth' in developing countries (Lim 1983, p. 379). He estimated regression equations for different regions of the world and concluded (Lim 1983, p. 379):

Our results also show marked interregional differences in the relationship between defense and growth. Economic growth in the African and Western Hemisphere LDCs in the sample seemed to be adversely affected by defense spending. On the other hand, there is no relationship between defense and growth in the other two groups of LDCs (Asia and Middle East and Southern Europe).

No theoretical explanation was offered to explain why the hemisphere would affect the role of defense on growth. Frederiksen & Looney (1985b) assumed an identical model specification and tested for a relationship between defense and growth in the context of their resource constrained/unconstrained hypothesis. Once again, they found that the coefficient for defense spending was positive (and statistically significant) in the richer group but insignificant in the poorer group.

Smith & Smith (1980) predicted that military expenditures may contribute to growth through the direct impact on resource mobilization, modernization of equipment and skills, the provision of necessary infrastructure, and an internal supply response to the military demand. Indirectly they hypothesized that military spending might hurt the savings to output ratio. They found that military expenditures led to a decline in savings relative to income which retarded growth. The effect on modernization and productivity was positive but weak, and they stressed the sensitivity of their results to model specification and estimation procedure. On the issue of causality, they recognized that military expenditures and savings could cause growth, but also that growth might prompt more defense and savings. They found that the small direct positive effect of defense was outweighed by the indirect effect of a lower savings rate.

In a similar study, Deger & Smith (1983) examined the interaction of military expenditures, savings and growth and found that military expenditures had a small positive effect on growth through modernization but a larger negative effect on savings. Taylor et al. (1980) estimated a regression equation which related the growth rate of output to changes in exports, population, the defense burden, capital inflows and capital stock. For all developing countries and for separate regional groupings, they found that increases in military expenditures had a significant negative impact on economic growth. Further, increases in the defense burden depressed the investment/GDP ratio which suggests that military expenditures are on balance competitive with investment.

The same general conclusion was reached by del Pando (1980). Focusing on just five South American countries, he found that if military expenditures were to be cut back, the reduction in demand could be more than compensated by spending the same resources in other sectors of the economy. The Faini study (Faini, Annez & Taylor 1984) indicated that the growth of military expenditures reduced the growth of investment and agricultural production. A 1% rise in the military's share of Gross Domestic Product (GDP) was associated with a 23% and 18% drop in the shares for investment and agriculture in GDP, respectively.

3. *A model of growth and defense spending*

This paper extends our previous work and differs from other studies in several ways. First we specifically include several relevant measures of international credit availability (such as external debt, inflow of funds, reserves, and the like) in the grouping procedure since capital flows have become a major element in the overall resource constraint makeup of developing countries. Second, we have used a factor and discriminant analysis to classify the countries into resource constrained and resource unconstrained groups. This reflects the multi-attribute nature of each country's resource position. Third we have included independent variables in the estimating equations to capture the effect of increased government borrowing and debt accumulation (as well as defense spending) on economic growth.

The hypothesis tested is that a negative relationship will exist between defense and growth in resource constrained countries.

Since government expenditures in general and defense expenditures in particular are often foreign exchange intensive, the negative relationship is hypothesized since the problem is zero-sum. With a high debt-service ratio, little or no access to external credit — indeed a general lack of resources — defense is maintained or increased using scarce foreign exchange and other resources taken from alternative productive investments. Negative growth will result. For the unconstrained countries on the other hand — with a low debt-service ratio, a relatively easy access to international credit or a heavy reliance on internal funding — an overall positive relationship between growth and defense is hypothesized. In other words, the game is not zero-sum. Defense can be maintained or increased without syphoning off resources from more productive uses as the 'safety valve' of external borrowing is tapped.

To test the hypothesis, the following model is estimated by means of least squares linear regression:

$$GDPGR = f(INV, DEBT, MILEXP)$$

where GDPGR is the 1970-82 real growth of Gross Domestic Product (GDP) and INV is the proportion of investment in GDP; the signs of the estimated coefficients are hypothesized to be positive. The debt variable is expressed in three different forms: external debt in 1970 and 1982 (EXTDEBT 70 and EXTDEBT 82, respectively) and government expenditures as a percentage of GDP for 1981 (GOVEXP). The estimated coefficients are hypothesized to be positive for the two external debt variables and negative for GOVEXP reflecting the government diverting resources away from productive alternatives (an argument made by Bauer 1984). MILEXP represents defense spending as a percent of GDP for 1981 and the sign is hypothesized to be negative for the constrained group and positive for the unconstrained group.

In past studies, causation has been an issue of some concern: does a positive sign of MILEXP infer that defense leads to growth or could it mean that economic growth allows countries 'to indulge themselves in the luxury of elaborate defense programs' (Benoit 1978, p. 275)? While Benoit assumed causation from defense to growth, one can easily argue the opposite. In an attempt to partially answer the causality question, military spending as a percent of the budget (MILBUDG) is included as an independent variable. A priori, there is little reason to expect any significant correlation or systematic bias between GDP growth and the defense share of the budget. If GDP were to increase one would not necessarily expect, for example, a reduction in the share for education to increase the share for defense. More likely, the various programs would increase (or decrease) in some proportional manner to income changes. If a positive correlation exists between the defense budget share and growth, we suspect it is partial verification of causation from military spending to growth. Data for this study were derived from the World Bank (1978, 1984), the International Monetary Fund (1983) and the *World Handbook of Political and Social Indicators* (Taylor & Jodice 1983). Military expenditures were taken from the US Arms Control and Disarmament Agency (1984).

4.0 *Factor and discriminant analyses*

Thirty-three independent variables were chosen for the factor analysis. The variables were selected to depict a country's external debt in 1970 and 1982, its structural condition (share of public and private consumption in GDP and the openness of the economy), its growth movements in the last decade (growth of exports, imports, private and public consumption), and its balance of payments position.[2]

Ninety-nine percent of the observed variance was accounted for by the following seven linear combinations or factors:[3]

1. Those facilitating public consumption such as gross inflow of public loans, ex-

ternal borrowing commitments and the resource balance.
2. Those contributing to the absolute level of external debt in 1982 such as the level of total public debt in 1982 past inflows of public loans, past external debt, and the current account deficit.
3. Those depicting the level of gross international reserves.
4. Public external debt as a percent of GDP, 1980.
5. The growth in imports, 1970-1982.
6. External debt service in 1982.
7. Public external debt as a percent of GDP, 1970.

As can be seen, four of the seven factors depict 'external debt' — the phenomenon of external capital flows to developing countries in the 1970s and early 1980s. Clearly, omitting this phenomenon would fail to capture a major influence on economic performance and decision making in both defense and non-defense sectors in many developing countries.

Following the procedure adopted by Jones (1980), a discriminant analysis was performed using the seven independent variables with the highest loading on each of the seven factors. With only minor exceptions, there was a high probability of correct placement of the sample countries (see Appendix I) and a distinct grouping based on the external debt situation resulted. Venezu-

Table I. Mean Values of Discriminant Analysis Variables and Other Selected Government and Financing Variables

	Total Sample	Constrained Group	Unconstrained Group
A. Discriminant Analysis Variables			
1. Gross Inflow of Public Loans/Exports 1982	0.70	0.94	0.26
2. External Public Debt 1982	5932.00	2629.30	11786.90
3. Gross International Reserves 1982	2587.20	583.80	6138.80
4. External Public Debt/GDP % 1982	35.3	44.3	19.2
5. Average Annual Growth Imports 1970-82	4.10	1.09	9.50
6. Debt Service/Exports % 1982	14.1	15.0	12.5
7. External Public Debt/GDP, 1970	17.3	21.2	10.4
B. Other Selected Variables			
Growth in Public Sector Consumption 1970-82	7.9	7.4	8.7
Public Consumption/GDP % 1982	17.2	18.1	15.7
Private Consumption/GDP % 1982	67.2	70.0	62.2
Government Expenditures/GDP % 1981	26.4	26.9	25.4
Government Expenditures/GDP % 1972	20.1	20.5	19.5
Gross Investment/GDP % 1982	21.6	18.0	26.3
Government Surplus (deficit)/GDP % 1981	-5.1	-6.2	-2.9
Total Current Government Revenue/GNP % 1981	20.9	19.9	22.9
Public Borrowing Commitments/Exports 1982	0.9	1.24	0.31
Public Borrowing Commitments/GDP % 1982	4.4	6.88	0.04
Debt Service Exports % 1982	14.1	15.0	12.5
Debt Service/GDP % 1982	3.7	4.1	2.9
Gross Inflows Public Loans/GDP 1982	3.65	5.74	0.04
Gross Inflows Public Loans/Exports 1982	0.70	0.94	0.26
Net Inflows Public Loans/Exports 1982	0.51	0.70	0.15
Total Government Current Revenue/GNP % 1972	17.7	16.8	19.4
Growth in Gross Domestic Product 1970-1982	4.4	5.6	3.7
Growth in Imports 1970-82	4.1	1.0	9.5
Increase in Public External Debt to GNP 1970-82	14.8	23.1	8.8
Growth in Investment/Growth in GDP 1970-82	1.55	1.16	2.27
Military Expenditures/GNP % 1981	4.2	3.6	5.1
Total Military Expenditures 1981	1318.1	389.1	2493.9
Military Expenditures per Capita 1981	117.9	57.7	223.3

ela and Argentina are classified into the constrained group as are several other major oil exporters and several of the newly industrializing nations such as Mexico, Greece, India, Korea, Spain, Algeria and Malaysia. The constrained group of countries seem to be poorer and less economically dynamic — typical of many African and poorer Latin American countries.

The mean values of the seven discriminating variables and the mean values of selected other variables for the two groups (Table I) confirm the distinct structural makeup of each group. For example, for the constrained countries external debt and external capital flows have played a major role in financing government expenditures. The debt-service ratio is higher, as is the inflow of external public loans relative to exports. In addition, the external public debt as a percent of GDP is significantly higher in both 1970 and 1982. On the other hand, the unconstrained group of countries has had easier access to external funds and has relied more heavily on internal sources of funding for government expenditures. For example, the external public debt is five times higher than for Group I countries but at the same time the level of international reserves is approximately ten times higher. The growth of imports is significantly higher, and this group of countries has relied less heavily on deficits to finance military expenditures, government consumption, or total government expenditures. While they have spent larger amounts for military purposes absolutely, the burden (as a percentage of the budget) has been smaller.

5. *Regression results*

As a first step, the regression equations were estimated for the total sample of countries (Table II, Eqs. 1 and 2).[4] The estimated coefficients for INV, EXTDEBT 82, and GOVEXP have the expected sign and are statistically significant.[5] The estimated coefficients of the two defense variables, MILEXP and MILBUDG, are positive and

Table II. Impact of Military Expenditures on Growth of Gross Domestic Product (Standardized Estimates).

EQUATION	Independent Variables										R^2	dof
	INV	EXDEBT70	EXDEBT82	GOVEXP	MILEXP	MILBUDG	NETCAP1	NETCAP2	PUBCONS	ICOR		
Total Sample												
1.	0.70**		0.26**	−0.36**	0.14						.55	48
2.	0.57**		0.23**			−0.04					.39	42
Constrained Group												
3.	0.45**		0.20			−0.32					.38	28
4.	0.77**			−0.32**			0.45**				.48	32
5.	0.66**					−0.26*		0.45**			.51	28
Unconstrained Group												
6.	0.43*	−0.49*	0.82**			0.52**					.70	13
7.	0.33*	−0.44*	0.82**			0.48**			0.36**		.81	13
8.		−0.23	0.61**		0.50**						.40	19
9.	0.29**	−0.42	0.68**			0.41**			0.55**	−0.41**	.93	13

See text for definition of variables; dof = degrees of freedom. *indicates statistical significance at the 90% level, and ** indicates statistical significance at the 95% or higher level.

negative, respectively, but are not statistically different from zero. In the aggregate, there appears to be little or no relationship between the level of defense spending and economic growth in developing countries.

The results for the constrained group of countries are similar to the total sample with respect to the positive effect of investment (Eqs. 3, 4, and 5) and the negative effect of government expenditures (Eq. 4). The coefficient of the defense variable (MILBUDG) is negative as hypothesized in equations 3 and 5, but only statistically significant in the latter at 90 percent. It would seem as if military spending in the constrained group of countries is more neutral than negative. This finding supports our earlier findings for this group of countries (see Frederiksen & Looney 1982, 1985). To examine the marginal contribution of foreign exchange in these countries, net and gross inflows of capital as a percent of exports (NETCAP 1 and NETCAP 2), were included as independent variables (Eqs. 4 and 5). The positive coefficients indicate a high marginal return on growth from available foreign exchange. This is not surprising given the existing relative deficiency of external resources experienced by this group.

The results for the relatively unconstrained countries indicate again the importance of investment. In addition, while the relationship between economic growth and the level of debt in 1970 (EXTDEBT 70) was negative in all equations, by 1982 the relationship was positive (EXDEBT 82), suggesting that the debt accumulated in the 1970s and 1980s had been used in high growth programs. Importantly, the coefficient of the defense expenditure variables (MILEXP in Eq. 8 and MILBUDG in Eqs. 6, 7 and 9) is positive and statistically significant. This result supports the hypothesis of the positive relationship between growth and defense in the richer countries. As noted above, since there is no a priori reason to suspect that growth and MILBUDG are correlated, the observed correlation lends supports to the thesis that military spending induces growth rather than the other way around.

It is possible that the relationship between all government programs (not only defense) and growth is positive and that the positive sign of the defense variables thus represented a spurious correlation. To control for the impact of increased public consumption on growth, we included the growth in public sector consumption between 1970 and 1982 (PUBCONS) as an independent variable in equations 7 and 9. The coefficient of the defense variable remained positive and significant, thus indicating the positive role of government in general and defense in particular for this group of countries. In addition, the coefficient for the incremental capital-output ratio (ICOR) was statistically significant (Eq. 9), indicating the more productive a capital investment, the higher the observed rate of growth.

By and large, the observed R^2 values and statistically significant variables indicate that the major determinants of economic growth vary considerably by sub-groups. The biggest source of growth appears to be investment for the constrained group. In the relatively unconstrained group, defense and debt in 1982 account for only 40 percent of the observed variation in growth. Given the shortages of capital and foreign exchange for countries in this group, one might expect increases in labor to provide a high proportion of the remaining sources of growth. As indicated in equation 9, well over 90 percent of the observed variation in growth can be explained by fluctuations in public sector consumption, external debt in 1982, and the incremental capital-output ratio (productivity of capital).

6. *Summary and conclusions*

The primary purpose of this paper has been to extend the discussion on the relationship between defense spending and economic growth in developing countries. Specifically the following hypothesis was tested: The relationship should be negative in relatively resource constrained countries and positive

in relatively resource unconstrained countries. This study differs from earlier works in that it includes variables to depict a country's international credit position (as well as other resource variables) in the grouping procedure. The latter was done by means of a factor analysis which reduced thirty-three variables to seven factors. The seven factors were incorporated into a discriminant analysis and two distinct groups were obtained. Regression equations were estimated for the total sample, and each group separately with the growth in Gross Domestic Product as the dependent variable. Independent variables included investment, external debt, military spending, external capital flows, and the growth in public sector consumption.

With respect to military expenditures, the relationship with growth was statistically insignificant for the total sample and the constrained group. However, for the unconstrained group, the results supported the hypothesis of a positive linkage between defense and growth. Investment was found to be an important determinant of growth especially in the total sample and the constrained group. The effect of foreign exchange inflows into the constrained group was found to be a significant determinant on growth.

In the unconstrained group, public sector consumption, the incremental capital-output ratio, and the accumulated external debt all contributed to growth in this group of countries. Apparently, for this group, adequate sources of financing in addition to capital inflows are available to accommodate increased government expenditures. For this group, military expenditures can be increased somewhat, with the net result of increasing growth. In other words, defense expenditures are not the burden to the foreign exchange abundant countries as they are to the constrained countries, since they can be financed out of augmented resources in the form of net capital inflows. However, given the external borrowing limits recently reached by a number of these countries, further military expenditures may, in contrast to the patterns identified here, be undertaken at the expense of economic growth. As a minimum, we would expect in the second half of the 1980s to find a smaller number of countries in the unconstrained group where increases in military expenditures make a net contribution to economic growth.

NOTES

1. The effect of defense spending is measured by the growth in Gross Domestic Product. We recognize the other effects such as the growth in inflation, employment, capacity and the like.
2. The list of variables and the orthogonally rotated factor pattern (to assure that the variables are relatively uncorrelated) can be obtained from the authors on request.
3. The extent of correlation between each factor and each variable is indicated by the coefficients of the linear combinations — the factor loadings. The program used specified that at least 99% of the variance in the independent variables be accounted for by the factors.
4. Table II presents a selection of many estimated equations. The full set of equations can be obtained from the authors upon request. Supplemental equations to the basic model have been included for the two groups to highlight the issue of causation, and the role of external capital flows and the growth in public sector consumption.
5. The t-statistics have been omitted from Table II.

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Appendix I. Discriminant Analysis Grouping

Constrained Group		Unconstrained Group	
Country	Probability of Correct Placement	Country	Probability of Correct Placement
Israel	69.34	Greece	57.78
Honduras	83.48	India	84.91
Cameroon	60.73	Nigeria	89.07
Sudan	66.47	Indonesia	90.67
Costa Rica	92.64	Egypt	68.20
Bolivia	86.27	Korea	89.95
Somalia	86.46	Rwanda	69.08
Tunisia	68.31	Turkey	66.95
Morocco	73.06	Spain	51.89
Guatemala	54.91	Venezuela	80.26
Malawi	91.40	Mexico	99.69
El Salvador	65.90	Brazil	99.02
Mali	97.12	Algeria	76.44
Pakistan	86.98	Philippines	55.78
Paraguay	60.02	Libya	75.69
Ecuador	56.61	Colombia	54.63
Dominican Republic	74.12	Thailand	60.95
Liberia	94.77	Malaysia	65.16
Ivory Coast	84.42	Argentina	66.09
Mauritania	96.04	Saudi Arabia	94.65
Sierra Leone	86.05	Kuwait	81.31
Panama	94.37	Syria	63.95
Chile	70.09	Jordan	50.81
Chad	87.18		
Uruguay	67.87	N = 23	
Tanzania	79.87		
Uganda	88.76		
Ethiopia	70.24		
Central African Repub.	76.89		
Ghana	78.72		
Burma	82.91		
Sri Lanka	75.39		
Trinidad	77.62		
Zambia	95.88		
Peru	71.67		
Zimbabwe	86.68		
Kenya	86.61		
N = 38			