Spring 1988
$10.50
Volume 14
Number 3
ISSN 0095-327-X

Armed Forces & Society

AN INTERDISCIPLINARY JOURNAL

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Official Journal of the Inter-University Seminar on Armed Forces and Society

Economic Determinants Of Latin American Defense Expenditures

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During the last two decades, there has been a growing interest concerning military expenditures in developing countries. Several research areas have included

- Examining whether military spending helps or hinders economic growth;
- Comparing economic performance under different regime types;
- Noting what factors cause developing countries to become either producers or nonproducers; and
- Studying the major determinants of defense spending in Third World countries.

Although the main purpose of this article is to extend the discussion on the determinants of military spending, the other three areas are integrated as well to test their impact on defense spending.

Up to now, many policy analysts and researchers have assumed that military expenditures are determined exogenously; external factors—such as the threat of aggression—cannot always be measured directly, and some form of proxy variable is often substituted. Hence the link

AUTHORS' NOTE: *The authors wish to thank David Segal and two reviewers for very helpful comments on earlier drafts of this paper.*

ARMED FORCES AND SOCIETY, Vol. 14 No. 3, Spring 1988 459-471

between the determinants of defense spending on the one hand and the level of military expenditures in developing countries on the other has not been subject to economic analysis.

Following up recent work by Harris and Maizels and Nissanke,[1] this paper hypothesizes that military expenditures can often be determined by economic (internal) factors. This hypothesis is tested on a case-by-case approach using time-series data from 10 Latin American countries (Argentina, Peru, Mexico, Venezuela, Chile, Paraguay, Uruguay, Colombia, Brazil, and Ecuador).

Review of the Literature

One of the earliest attempts to quantify the relationship between military spending and economic growth was completed by Emile Benoit,[2] who tentatively found that defense spending and economic performance were positively correlated. No clear agreement, however, has yet emerged: some authors suggest a positive role of defense budgets under certain conditions[3] and others point to an overall negative effect.[4] This topic has also begun to receive some attention in the literature.[5] Chan has recently summarized the major research efforts and remaining problems in this area.[6] For example, he noted little effort on the direction of causality—that is, does defense spending lead to growth or does economic growth allow nations to "indulge in" more military programs? Or does one factor influence the other? Chan concluded:

> We have probably reached a point of diminishing returns in relying on aggregate cross-national studies to inform us about the economic impact of defense spending. Instead, it appears that future research will profit more from discriminating diachronic studies of individual countries.[7]

Another area of interest has been to compare the economic performance under different political regimes (civilian versus military, for example). Remmer recently summarized this research and noted:

> The empirical studies of regime type, public policy, and policy outcomes conducted so far, whether focused on Latin America or including other areas as well, tend to support the conclusion that regime differences have little or no impact on public policy.[8]

She suggested that a country's relative performance was a function of endogenous economic factors, not regime type.[9]

Neuman's efforts to investigate why only certain developing countries produce weapons led her to conclude that there exists "a hierarchically shaped arms production system based largely on factors of scale." She suggested that "the existence of a large military to provide an adequate market, combined with a generous national income and sizable population to support the necessary infrastructure," will be important in determining whether a country becomes an arms producer.[10] Looney and Frederiksen suggested that while both population and size play an important role, an endogenous economic environment conducive to weapons production must also be present.[11] Their results pointed to additional factors that play an important role in the arms production process, such as contact with the world economy, the amount of public debt, and foreign trade.

Recent research on the determinants of military spending has spanned several disciplines. Hill noted that "the military spending level of any nation is likely to be a product of a number of separate forces," including arms races, military alliances, status and rank discrepancies in international systems, military aid, size and wealth of the country, the form of government, the extent of military involvement, internal social divisiveness, and internal political conflict.[12] While Hill was unable to find a single variable to account for the large differences in defense budgets in developing countries, he called attention to

> the salience of important international linkages as influences on military spending. To the extent that it is status in the system and ties to the central subsystem which influence military spending, reduction in the tension and competitiveness of that subsystem should have important impacts for slowing military spending increases.[13]

Westing, interested in the ways to reduce military outlays, examined 1975 data for 159 nations to "find the basis on which a nation determines its level of military expenditures."[14] Hypothesizing that countries would need to protect their land and wealth, Westing tested for the impact of population, land area (total and productive), and wealth (as measured by gross national product). He found a positive correlation between military spending levels and population size, the extent of productive land area, and GNP. He concluded that military expenditures in many developing countries will rise concomitant with increases in wealth.[15]

Two recent studies have examined the determinants of military expenditure levels in industrialized countries. Griffin, Wallace, and Devine examined defense spending levels in the United States from 1949 to 1976 and concluded that "military outlays [as a percentage of GNP] do appear to be employed as a counter-cyclical fiscal instrument by the state."[16] Treddenick tested for the impact of economic variables on the recent pattern of Canadian military expenditures. Specifically, he wished to see whether expenditures in Canada might be determined by "domestic economic imperatives . . . independent of any security considerations."[17] He determined that "recent large increases in Canadian defense expenditures have been influenced more by economic than by security considerations,"[18] and that the Canadian government has used changes in military budgets as a policy instrument.

In one of the earliest studies relating defense spending to economic variables, Ames and Goff examined defense and education expenditures in 16 Latin American countries for the period 1948–68.[19] They attempted to discover

- The relationship between changes in defense and in education spending;
- The effect of prior-year defense and education spending levels;
- Whether economic variables were significant determinants of spending levels; and
- Whether political variables significantly improved their model.

While noting it "would be premature to conclude that political factors are generally less important than economic factors in determining spending," they found that their political variables were not major determinants of education or defense spending levels,[20] that changes in education and defense spending were related to changes in available resources. They indicated that for Latin America, at least, there might not be a common allocative process and suggested that further research concentrate "on 8 to 10 carefully chosen cases."[21]

O'Leary and Coplin hypothesized seven factors that might bear on defense spending levels in Latin America:[22] the economic condition of the country, the role of the military in nonmilitary affairs, internal-security needs, arms races, military budgets in rival states, internal political support, and the age structure of existing equipment. While admitting the difficulty in quantifying many of these factors, they found little correlation between military spending and growth domestic product levels or any of the other factors except neighbors' arms purchases and budget levels of rival services in other countries, both of which acted as a sort of "reference point" in setting individual countries' budget levels.

In 1986 Maizels and Nissanke conducted a cross-section study of 83 countries with average data compiled in 1978 and 1980.[23] They hypothesized three potential determinants of military expenditures in any country: the political framework, military activity, and economic linkages. However, the relative importance of each factor will be determined by national, regional, or global conflicts or interactions in the individual country. For example, at the national level, economic factors such as the level of development (urbanization, inequalities in wealth and income, and opportunities for advancement), real-income growth, the size of the state budget, and the influence of the military–industrial complex are considered important determinants of military spending. At the global level, the growth of foreign exchange, the influence of foreign capital, and major aid donors are thought to be major determinants.

After estimating regression equations for the entire sample and for three regions (Africa, Asia, and Latin America), they noted not only the complexity of factors, but also that those factors would vary from country to country.

> Domestic factors, particularly the need perceived by ruling elites to repress internal opposition groups, and external factors, including relations with the global power blocs and the availability of foreign exchange to purchase arms from abroad, also appear to be major determinants of government decisions in regard to military expenditures.[24]

In the same year, Harris noted the scant attention paid to the economic determinants of military spending levels in developing countries.[25] In a time-series analysis to verify the findings of Ames and Goff, he examined the importance of endogenous economic variables on defense spending levels in five ASEAN (Association of South-East Nations) countries—Indonesia, Malaysia, the Philippines, Singapore, and Thailand. The independent variables were GNP levels, government revenues, inflation rates, and the balance of payments. The dependent variables included defense as a percentage of both GNP and central government expenditures, and the level of defense spending. In addition, Harris tested for the presence of some sort of lag structure by regressing the dependent variables against the previous year's value of the independent variables. He concluded that

> domestic economic conditions, especially government current revenue, appear to exert at least a moderate influence

> on annual changes in defense expenditure in ASEAN.... A nation's GNP sets a broad limit on its domestically financed defense expenditure, and that defense expenditure in the previous year is a good indicator of its level in the next year.[26]

Harris also noted that the balance of payments was an indirect effect through government revenues and that cutting defense expenditures might be relatively difficult given their high personnel component.

As noted, this paper attempts to extend the discussion of the impact that economic variables have on defense spending levels by means of individual studies over time (rather than by cross section) for 10 Latin American countries. Several reasons exist for the choice of these particular countries. First, we would like to replicate O'Leary and Coplin's findings that GDP and military spending levels are not correlated in Latin America. Second, this paper will verify the results obtained by Harris for the 5 ASEAN countries for another region of the world. In this context, the 10 countries that comprise this study appear to belong to a homogeneous group—limited conflicts and external threats. In addition, they account for more than 93 percent of the total GNP (9 of them have the largest GNP) and approximately 91 percent of total military expenditures in 1982 for Central and South America (excluding Cuba).[27]

This study will also confirm the finding of Ames and Goff that "Latin America may not have a common allocative process; instead, different models may explain different groups of countries or time periods."[28] While a positive correlation exists between economic variables and military spending levels, the relevant economic variable is likely to differ from one country to the next. Unfortunately, there is little that can be done a priori to predict which economic variable is relevant for each country.

The Model and Expected Results

Four different models are estimated for each country. Each model represents the possible linkage between the effect and timing of economic variables and the effect of previous military budgets on current defense budgets. The dependent variable is the level of military expenditures (ME).[29] Following previous studies cited above, GDP was included as an independent variable to represent a general resource constraint faced by each country. With respect to specific constraints, a government financing variable was also included in the model. This variable tests for any fiscal impact on the level of military expenditures.

Two variables were examined. On the one hand, government expenditures (GE) were tested for the presence of Wagner's law: military budgets will increase in pace with general governmental expenditure levels. Alternatively, as suggested by Harris, military outlays might only rise with increases in the overall funding ability of the government, measured here by government revenues. Finally a lagged value of military expenditures (ME_L) was incorporated to test for a "distributed lag effect."[30] In the case of Argentina, a dummy variable was included to account for the Falklands crisis. The dummy variable took the value of 0 for the period 1971–81 and a value of 1 for 1982 and 1983.

The four alternative models are

$$\text{I} \quad ME = f(GDP, GE)$$

$$\text{II} \quad ME = f(GDP_L, GE_L)$$

$$\text{III} \quad ME = f(GDP, ME_L, GE)$$

$$\text{IV} \quad ME = f(GDP_L, ME_L, GE_L)^{31}$$

Model I describes a situation in which military budgets simply depend on the current GDP and the government's current fiscal position. Model II, which hypothesizes that military spending depends on last year's GDP and fiscal position (GDP_L and ME_L), describes cases where a government—for whatever reason—reacts more slowly in altering defense budgets in response to changes in constraints. Model III mirrors model I except that the impact of changes in the government's fiscal position affect military budgets over time; that is, a country might commit itself to multiyear military programs. Model IV is similar to model II but also incorporates ME_L (as just described).

Some of the existing literature suggests a priori which of the four models is appropriate for each country. First, as suggested, countries relatively resource constrained might postpone military expenditures even during periods of rising government expenditures or revenues.[32] This suggests that either model II or IV describes the likely linkage between fiscal conditions and military budgets. Specifically, of the 10 countries considered, we identified Paraguay, Ecuador, Chile, Uruguay, and Peru as being resource constrained.

Type of regime is the second factor that might indicate which model is most appropriate for each country. In a recent study for Argentina, we found that military regimes are more inclined to reduce social ex-

penditures during periods of expanded budgets.[33] If this is a general pattern in Latin America, one would expect other countries with military regimes to be depicted by either model I or III. Civilian regimes, on the other hand, might delay military spending.

Third, it is possible that an indigenous arms industry may affect the linkage. If arms producers tend to experience positive spin-offs from weapons production, the model appropriate for these countries might be I or III: military expenditures are likely to be closely linked to current revenues and/or expenditures because of the need for continuous funding.

A fourth factor might be the geopolitical role of the nation. In this case, it is possible that the larger or more influential countries will strive for a stable proportion of military expenditures as a percentage of overall economic capability. If this interpretation is correct, we would expect to find the larger regional powers (Brazil, Argentina, and Venezuela) to exhibit patterns depicted by models III or IV: military spending adjustments are gradual over time.

Finally, it is possible that the major oil-exporting nations (Venezuela, Mexico, and Ecuador) might best be described by model III.[34] Under this scenario, governments might attempt to modernize their military with oil revenues. Quite likely, a large proportion of this expenditure will be spread out over time for large-scale weapons acquisition.

Empirical Results

The results of the regression analysis (see table 1)[35] reveal several interesting patterns and surprises in terms of the hypotheses suggested above. Most importantly, our results indicate the significance of fiscal variables in accounting for a large proportion of observed fluctuations in Latin American military expenditures. Levels of government expenditures (or, in two cases, revenues) were significant in determining levels of military expenditures in Chile, Venezuela, Brazil, Peru, Uruguay, and Ecuador. The more general constraint of individual nations' GDP was statistically significant for Chile, Ecuador, Mexico, Venezuela, and Argentina. These findings differ, however, to some degree with the results obtained by O'Leary and Coplin but agree with those of others, such as Harris. We support the findings of Ames and Goff, who posit that there is no one allocative process across the sample set. In some instances, current GDP or government expenditures are important; in others, a lagged value gives better results. For half the countries, the coefficient of the lagged value of military expenditures is significant,

Table 1

Partial Regressions Results (*t*-statistics) For 10 Latin American Countries

Country/ Period	Model I		Model II		Model III			Model IV				R^2
	GDP	GE	GDP_L	GE_L	GDP	ME_L	GE	GDP_L	ME_L	GE_L	DUM	
Ecuador 1955–82	6.81	2.25										.90
Chile 1973–83			4.49	18.3								.98
Mexico 1955–82			2.51	.63[b]								.91
Peru 1955–82			−1.04[b]	7.07								.88
Uruguay 1973–83			1.98[b]	2.98[a]								.88
Brazil 1963–83					−1.55[b]	6.83	2.20					.79
Venezuela 1955–82					5.87	5.02	2.72[a]					.98
Paraguay 1973–83					.48[b]	4.21	.94[b]					.81
Colombia 1955–82								1.52[b]	3.71	−.84[b]		.54
Argentina 1971–83								2.11[b]	5.35	−.84[b]	10.66	.99

Notes: [a]Government revenues.
[b]Statistically insignificant at the 95 percent level of confidence.

indicating that—for at least these states—the effect of changes in revenues or expenditures is felt in the military budget many years afterward. As hypothesized, the dummy variable is statistically significant for Argentina.

Specifically, in terms of our first hypothesis—that defense and expenditure linkages might be predicted by the degree of resource constraint—only Chile and Uruguay in the constrained group and Brazil and Venezuela in the other group followed a predicted pattern. With regard to the regime hypothesis, the results were just as inconclusive: Brazil, Paraguay, Colombia, and Mexico were the only countries to fall into their predicted group. Of the eight arms producers in our sample, only three fell into the predicted group (Venezuela, Brazil, and Ecuador). The remaining producers—Argentina, Peru, Mexico, Colombia, and Chile—fell into either model II or IV.

The best predicted results were obtained under the geopolitical hypothesis. Three regional powers (Venezuela, Brazil, and Argentina) all followed the anticipated pattern. On the other hand, Paraguay and Colombia followed a pattern not forecast by our hypothesis. Finally, of the three oil producers, only Venezuela followed the predicted pattern.

Summary and Conclusions

While there are many diverse reasons for developing countries to spend scarce resources on military equipment, this article has focused solely on economic determinants. We recognize, however, that there are many other reasons for defense spending.

Our results—estimated for 10 Latin American countries—indicate that a large proportion of variability in defense expenditures can be explained by economic variables: the overall constraint (GDP) and fiscal funding variables (primarily government expenditures but in two cases government revenues). While this information is insightful, it is of little help when forecasting military expenditures on a country-by-country basis, given that the four models we proposed are a priori equally valid. In other words, it is very difficult to predict which of the four models is valid for any particular country in Latin America. On the positive side, however, the results suggest that the large regional powers might have a somewhat different set of fiscal linkages than the smaller countries. This might enable some broad generalizations about future defense allocations to be made for this small set of countries.

Further, the results indicate that while cross-sectional studies may be useful in a general way, they cannot identify the short-run adjustment dynamics likely to play a fundamental role in affecting defense budgets in any given year.

This time-series analysis has confirmed in large part the findings of other scholars that economic variables should not be overlooked when trying to explain observed patterns of defense spending. Since we found no one model to be common to all 10 countries, our findings suggest that for these states—and possibly for a much larger set—the timing of the fiscal impact (immediate, short-, or a longer-run distributed effect) must also be considered.

We conclude that for these 10 countries any forecast of military expenditures that excludes economic factors is likely to be substantially inaccurate. The evidence indicates economic factors play a significant role in Latin America in determining military budgets; future research might also find this pattern in other Third World countries as well.

Notes

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2. Emile Benoit, "Growth and Change in Developing Countries," *Economic Development and Cultural Change* 26 (1978): pp. 271-280.
3. See, for example, Peter C. Frederiksen and Robert Looney, "Another Look at the Defense Spending and Development Hypothesis," *Defense Analysis* 1 (1985): pp. 205-210.
4. For example, Maizels and Nissanke, "Military Expenditures."
5. See Wayne Joerding, "Economic Growth and Defense Spending: Granger Causality," *Journal of Development Economics* 21 (1986): pp. 35-40; for a one-country study, see Peter C. Frederiksen and Charles J. LaCivita, "Defense Spending and Economic Growth: Time Series Evidence on Causality for the Philippines: 1956–82," *Journal of Philippine Development* (in press).
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8. Karen L. Remmer, "Evaluating the Policy Impact of Military Regimes in Latin America," *Latin American Research Review* 13 (1978): pp. 41-42.
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10. Stephanie Neuman, "International Stratification and Third World Military Industries," *International Organization* 38 (1984): pp. 167-197.
11. Robert E. Looney and Peter C. Frederiksen, "Profiles of Current Latin American Arms Producers," *International Organization* 40 (1986): pp. 745-752.
12. Kim Hill, "Domestic Politics, International Linkages, and Military Expenditures," *Studies in Comparative International Development* 13 (1978): p. 53; this article provides an excellent summary of the literature prior to 1978.
13. Ibid.
14. Arthur H. Westing, "Military Expenditures and Their Reduction," *Bulletin of Peace Proposals* 9 (1978): pp. 24-29.
15. Ibid., p. 26.
16. L.J. Griffin, M. Wallace, and J. Devine, "The Political Economy of Military Spending: Evidence from the United States," *Cambridge Journal of Economics* 6 (1982): pp. 1-14.
17. John M. Treddenick, "The Arms Race and Military Keynesianism," *Canadian Public Policy* 11 (1985): p. 78.
18. Ibid., p. 77.
19. Barry Ames and Ed Goff, "Education and Defense Expenditures in Latin America: 1948–1968," in *Comparative Public Policy: Issues, Theories and Methods*, ed. Craig Liske, William Loehr, and John McCamant (New York: John Wiley and Sons, 1975).

20. Ibid., p. 194.
21. Ibid.
22. Michael K. O'Leary and William D. Coplin, *Quantitative Techniques in Foreign Policy Analysis and Forecasting* (New York: Praeger, 1975).
23. Maizels and Nissanke, "Military Spending."
24. Ibid., p. 1137.
25. Harris, "Determinants of Defence Expenditure."
26. Ibid., p. 41.
27. Ruth L. Sivard, *World Military and Social Expenditures: 1985* (Washington, D.C.: World Priorities, Inc., 1985), p. 35. Missing data or limited time-series data made the inclusion of more countries difficult.
28. Ames and Goff, "Education and Defense Expenditures," p. 194.
29. All variables are in real terms. Nominal military expenditures derived from Stockholm International Peace Research Institute, *World Armament and Disarmament, SIPRI Yearbook* (Philadelphia: Taylor and Francis) and were deflated by the consumer price index in International Monetary Fund, *International Financial Statistics Yearbook: 1984* (Washington, D.C.: International Monetary Fund, 1984). Economic variables were also taken from this source.
30. For an excellent discussion on distributed lag equations, see Potluri Rao and Roger L. Miller, *Applied Econometrics* (Belmont, Calif.: Wadsworth Publishing Co., 1971), chap. 7. The functional form estimated here is similar to equation (7.10) on p. 165.
31. As noted below, GE (government expenditures) was preferred to GR (government revenues) except for two cases. The models and table 1 are described using GE.
32. Frederiksen and Looney, "Another Look."
33. Robert E. Looney and Peter C. Frederiksen, "Consequences of Military and Civilian Rule in Argentina," *Comparative Political Studies* (forthcoming); see also Merilee S. Grindle, "Civil-Military Relations and Budgetary Politics in Latin America," *Armed Forces & Society* 13, 2 (Winter 1987): pp. 255-275.
34. Robert E. Looney, "Factors Underlying Venezuelan Defense Expenditures: 1950–83," *Arms Control* 7 (1986): pp. 74-101.
35. All four models were estimated (Cochrane-Orcutt iterative technique) for each country. The model with the best fit is reported for each country in table 1. The complete results (four models for 10 countries) can be obtained from the authors on request. Only the *t*-statistics were reported in table 1; the estimated coefficients were not included since they were different currency units and were not standardized across countries.