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Looney, R.E. and Fredericksen, P.C., "The Impact of Latin American Arms Production on Economic Performance," Journal of Social, Political and Economic Studies, Fall 1987.

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The Journal of Social, Political and Economic Studies

Fall 1987 Vol. 12, No. 3

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THE IMPACT OF LATIN AMERICAN ARMS PRODUCTION ON ECONOMIC PERFORMANCE

By Robert E. Looney and Peter C. Frederiksen

There has been a growing interest over the past several years on the effect defense spending has on economic performance in developing countries. Chan(1) has recently summarized the literature and the three main directions of the current research: the tradeoffs between military spending and other forms of government spending, the role of politics in decisions about defense expenditures, and whether defense is the cause or the effect of high unemployment and low growth in many countries. Chan chose to restrict his survey to studies which examine the latter: how do defense expenditures affect economic performance, if at all. In his review of the literature, Chan notes that:

> Although numerous studies have suggested that defense spending can and does have an impact on economic performance, there is no consensus about the actual existence and nature of such an impact. Some scholars have also questioned the suitability of common statistical methodology, and the feasibility of obtaining valid and robust generalizations for a large number of countries or time points.(2)

Chan noted several other problems with past research. In his opinion, many studies have been based on very small samples, and yet in other cases the results have been biased either by including "outliers" in the sample or by the ideological assumptions of the researcher. The problem of determining the direction causality is common to all studies: does defense cause economic growth or does the growth of the economy "allow" countries to indulge in defense spending? Chan summarizes the state of the literature by noting that the theoretical impact of defense spending is usually agreed on.(3) The debate centers ". . . around when, how, for whom, and in what direction and magnitude is likely to be actually felt. . . ."(4) In other words he proposes that in the future research is targeted in the following directions:(5)

> 1. What kind of impact does defense spending make; when does it take place — direction, magnitude, timing

(short versus long-term), and statistical significance of the estimated coefficients?

2. How does this impact occur – first order (immediate direct impact) and second order (indirect effects on investment and savings)?

3. The impact of what – precisely what is meant by defense spending (percent of GNP or budget, types of defense spending) or economic growth (growth of GNP, income distribution welfare)?

4. Impact for which countries – is the relationship consistent with time for different countries with different economic conditions, or exposure to the international system?(5)

5. Impact at what opportunity costs – what would the economy be like if no defense spending had taken place?

Chan concludes by suggesting that the search for a universal relationship will be disappointing and by offering some alternative avenues for future research:

> An alternative and perhaps more fruitful approach would be to eschew claims of generality at the present, while recognizing the complexity of the problem. This complexity suggests the need to account explicitly for factors that can mediate the influence of defense spending on economic performance, the need to trace the reciprocal over-time interactions among the pertinent variables, and the need to show the economic consequences of alternative combinations of policies to spend on defense and to offset the potentially adverse effects of this spending.(7)

The purpose of this paper is to extend the discussion on the defense spending by testing for any statistical difference in the relationship between defense spending and economic performance in Latin American countries which produce weapons and Latin American countries which do not produce weapons. We hypothesize that the relationship should be positive and statistically significant for the producing countries and negative for the non-producing countries.

Since a major area of public enterprise in developing countries – and especially Latin America – is the defense industry, we argue that arms-producing nations are much more likely to derive positive economic benefits from military expenditures than their non-producing counterparts. This is likely to be true

for at least two reasons. First, a major benefit of arms production is that expenditures in the arms industry could be used quickly as a macroeconomic stabilization tool. The immediate impact of a change of on arms production is so rapid as to serve as a means of countercyclical fiscal policy. Obviously using this part of the defense budget is not an option for non-producing countries. Secondly, it is hypothesized that production spin-offs and linkages from defense production to other sectors of the economy would result in total military expenditures having much more of a positive (or less of a negative) effect on overall growth in producer countries. In other words, weapons production expenditures will have a much more direct positive and lasting effect on the economy than a similar amount spent on operations, maintenance, or training for example.

The first, section of this paper reviews the extent of and motives for arms production in developing countries with particular emphasis on Latin America. In the following section, the countries of Latin America are split into two groups (producers and non-producers) and regression equations are estimated to test the hupothesis that a postive relationship will be found between defense and growth in producing countries and a negative relationship in non-producing countries.

The Extent of and Motives for Arms Production

While the factors which determine whether a country becomes a producer or not are varied, the number of producers has grown in the last 30 years. For example, the number of developing countries producing at least one major weapon system has increased from 5 in 1950 to 26 in 1980. Neuman(8) has investigated the major socioeconomic reasons for domestic arms production. As a first step, she calculated a weighted average index of military production capability for the 26 countries producing arms in 1980. The index was based on three factors: length of production, experience, production capability, and technical capability. Countries were rank ordered by this weighted index and Kendall's tau rank correlations were calculated between the index and seven socioeconomic indicators (population, land size, size of military, Gross National Product (GNP), GNP per capita, number of professional and technical workers, and number of industrial workers). In addi-

TABLE ONE

LATIN AMERICAN AND CARIBBEAN PRODUCERS OF AT LEAST ONE MAJOR WEAPONS SYSTEM

Domestically Produced Weapons System

Country	1959-60	1969-70	1979-80
Argentina	Light Plane	Trainer Submarine	All Types
Brazil	Light Plane Trainers	Trainer Transport	All Types
Chile	Light Trainer	Tanker	
Colombia	Patrol Boat	Light Plane Submarine	Light Plane
Dominican Republic	Light Craft	Light Craft Patrol Boat	Light Plane
Ecuador	-	-	Corvette
Mexico	Patrol Boat	-	Patrol Boat
Peru	Tanker	Patrol Boat	Frigate Tanker
Venezuela	-	-	Patrol Boat

Source: Stephanie G. Newman, "International Stratification and Third World Military Industries," International Organization (Winter 1984), Table 2, pp. 172-73.

tion, correlation coefficients were computed for all countries in the sample by different regions of the world. Neuman concludes:

> The hypothesis that factors of scale might determine both the extent and level of arms production is well supported. Generally, for each region countries with the largest populations, producing the highest GNP, and sustaining the largest military forces are also the largest and most sophisticated producers of weapons.(9)
>
> The existence of a large military to provide an adequate market, combined with a generous national income and a sizable population to support the necessary industrial infrastructure, significantly affects a state's long-term ability to produce major weapon systems as well as the quantity and sophistication of its product.(10)

As noted above, defense industries comprise a substantial part of public sector enterprises in Latin American and the Caribbean. For example, Argentina's military industrial complex "Fabricaciones Militares"(11) is the largest firm in Latin America and one of the largest in the hemisphere. Brazil ranks as seventh among the world arms producers and exporters. As of 1980, nine of the twenty-one Latin American and Caribbean countries produced one major weapon system (Table 1) and in each case the companies are either government owned or are joint private-government companies. There is a growing concern in the region about the impact of these industries on budgets, foreign exchange, the overall performance of the economy, and stabilization of the economy.(12) Yet there is scant evidence of the specific economic role and impact of these companies. Clearly the macroeconomic linkage with defense expenditures in general and defense production in particular should provide valuable insights into the defense spending and economic performance debate.

Neuman did not explicitly consider the role of economic or financial variables in determining whether a country becomes a producer or not. As Tehral pointed out for India(13) the financial burden associated with arms production is considerable; we believe this is true for Latin America also. Many of these countries rely heavily on financial assistance, the spread of technology, and other forms of inter-country cooperation. Furthermore as Peleg has noted,(14) the capital entry requirements are large. As Ayres has also suggested, the characteristics

which separate producers from non-producers might be linked to the stages of "typical" country goes through on its transition to a producing nation.(15) These stages might include a) the importation of arms with domestic maintenance, b) license procurement and establishment of production bases, c) the local assembly of imported subassemblies, d) subassemblies and components made domestically, e) raw materials produced locally and f) complete indigenous production. Obviously, the new producers in developed countries and so access to foreign exchange becomes important for initial success.

In an earlier paper, we tested for the importance of economic variables in determining which countries become producers.(16) A discriminant analysis was used to see which variables best profile Latin American countries into producers and non-producers. As we noted:

> In general, the producers are more highly developed in terms of per capita income, and (as Neuman predicts) their income, population and area are larger. The producers have a much larger public external debt, although the debt as a percent of GNP is considerably higher for the non-producers. The producers were also able to sustain a much higher level of imports and exports over the period than were the non-producers.(17)

The results of the discriminant analysis based on size and military variables were somewhat mixed. While the non-producers were all correctly classified, Ecuador, Columbia, The Dominican Republic and Argentina were incorrectly classified as non-producers. The average probability of correct placement was approximately 85% for the producers and just over 90% for the non-producers. Using economic variables as discriminators substantially improved the results in terms of correct classification and average probabilities of correct classification. The results suggested access to foreign exchange is just as important as population or military expenditures in determining which countries eventually become producers. The following section examines whether the relationship between defense spending and economic growth is statistically different between the producing and non-producing countries.

Regression Estimates

Based solely on cost and comparative advantage, indigenous arms production seems suspect. While actual data on

CHART ONE

Producers

$$GNPGR = \underset{(8.4)^{**}}{1.29\ INVGR} + \underset{(2.8)^{**}}{0.39\ GDB} + \underset{(2.6)^{**}}{0.40\ MILEXP};\ r^2 = .97,\ dof = 7$$

Non-Producers

$$GNPGR = \underset{(3.76)^{**}}{1.02\ INVGR} + \underset{(2.55)^{**}}{0.53\ PDA} + \underset{(0.05)}{0.02\ GDB} - \underset{(-3.03)^{**}}{0.56\ MILEXP};\ r^2 = .88,\ dof = 10$$

$$GNPGR = \underset{(5.3)^{**}}{1.05\ INVGR} + \underset{(1.9)^{*}}{0.39\ PDB} - \underset{(-2.0)^{*}}{0.35 MILEXP};\ r^2 = .82,\ dof = 10$$

the cost of domestically produced weapons are not available, it appears reasonable to assume that it is cheaper to import than produce a similar weapon at home.(18) However, domestic production may be justified on other grounds. For example, linkage between the defense and civilian sectors in a developing country may warrant use of skilled personnel and scarce foreign exchange being used in defense production. As noted above, military expenditures may provide the government with a powerful stabilization tool.(19) For example the arms industry and the civilian economy are closely interrelated. The government can contract with other state enterprises for production of parts and the salaries of both the military and civilians in the industry are likely to be spent in local markets. Since military expenditures are often inflationary, reductions in the defense budget can act as a powerful anti-inflationary tool. Importantly, the military sector is under direct government control. A policy of economic expansion can be reached much more quickly through changes in new weapons contracts and production than say marginal tax changes for example.

Once this self-regulating mechanism is in place many people (such as senior military officers and the owners/managers of subcontracting firms) find it to their advantage to maintain the *status quo*. Together these groups wield significant power.(20) These propositions suggest a strong commitment to defense production purely on economic reasons and might explain the long term stability of defense spending in many Latin American countries.

An ideal test for the impact of defense production of the domestic economies in Latin America would require data on military output and value added in defense production sector. Unfortunately, such data are not published. As Chan's article indicated, the contribution of *total defense* spending to economic growth has been the object of close scrutiny recently. Along the lines of Benoit,(21) and our earlier papers,(22) we test for the role of defense expenditures in producer and non-producer countries by estimating a production function in the following form:

$$GNPGN = f(INVGR, FINAN, MILEXP),$$

where GNPGR and INVGR represent the 1970-1982 growth in GNP and investment, respectively, FINAN is a financing vari-

able, and MILEXP is the 1981 ratio of military expenditures to GNP. The financing variables used in the regression estimates were PDA and PDB, the external public debt in 1970 and 1982, respectively, and GDB, the 1982 central government fiscal surplus or deficit as a percent of Gross Domestic Product.(23) The estimated regression equation for all Latin American counties was as follows:(24)

$$GNPGR = 0.72\ INVGR + 0.3\ PDB - 0.25\ MILEXP;\ r^2 = .72\ dof = 19$$
$$(5.3)^{**} \qquad (2.3)^{**} \qquad (-1.5)$$

As can be seen, the estimated coefficient for MILEXP while negative is statistically insignificant at the 90 percent level. To test the hypothesis that externalities and linkages from defense production industries should result in total military expenditures having a positive effect on growth, the production function was estimated separately for the producing and non-producing countries. The results are seen in Chart One. Most importantly, the estimated coefficient for MILEXP is positive and statistically significant for the producers and negative and statistically significant for the non-producers. This tentatively confirms the hypothesis that in non-producer countries defense expenditures (for items such as imported equipment, operations and maintenance) represents very significant opportunity costs and are a drain on economic growth. It appears that in the producing countries, where a large part of total military expenditures is for production, growth is enhanced through externalities and stabilization as military spending expands and contracts. In all equations and coefficient of the investment variable is positive. For the financing variable, the results suggest that producing nations obtain higher rates of growth through fiscal policy: the lower the government deficit the higher the overall rate of growth. External public debt did not play an important role in growth for these countries. On the other hand, for the non-producers there was no correlation between fiscal surpluses and deficits and growth. During the period examined, it appears that these countries relied on external public sector borrowing to accelerate economic growth.

These results support our earlier work in grouping producers and non-producers by economic and financial variables.(25) Producing nations have a relatively lower foreign exchange constraint and are relatively more constrained by domestic resources.(26) The producers, while large absolute external borrowers, relied less on external funds than the non-producers.

Marginal additions of foreign funds for the producers are not as necessary to promote economic growth as domestic savings in the form of government surpluses. The non-producing nations face the opposite situation – relatively foreign-exchange constrained with marginal additions having a much greater impact on growth.

Summary and Conclusions

The purpose of this paper has been to investigate whether or not the effect of defense expenditures on economic growth is different in Latin American countries which produce major weapon and those which do not. An earlier work suggested economic variables as being important determinant whether a country produces arms or not. In this paper, the results indicate that the impact of military expenditures tends to be posibitely associated with economic growth in the producing nations and negatively associated with growth in the non-producing nations of the region. The results also indicate that producing countries tend to use fiscal policy (e.g. reductions in the deficit) to achieve higher rates of growth. On the other hand, the non-producers financed increaed growth through external public borrowing.

This evidence suggests that producing countries may be able to obtain positive benefits from military spending through some form of linkage from their state enterprise to overall fiscal policy. Apparently, the type of defense spending in non-producing countries does not generate any measureable spin-offs either to the economy in general or as part of overall stabilization efforts.

FOOTNOTES

(1) Steven Chan, "The Impact of Defense Spending on Economic Performance: A Survey of Evidence and Problems," *Orbis* 29 (Summer 1985), pp. 403-434.
(2) Ibid., p. 405.
(3) See however Wayne Joerding, "Economic Growth and Defense Spending," *Journal of Economic Development* 21 (1981), pp. 35-40.
(4) Chan, "The Impact of Defense Spending," p. 410.
(5) Ibid.

(6) Some of these points have been addressed in Robert E. Looney and P.C. Fredriksen, "Defense Expenditures, External Public Debt and Growth in Developing Countries," *Journal of Peace Research* 23 (Winter 1986), pp. 329-38.

(7) Chan, "The Impact of Defense Spending," pp. 433-34.

(8) Stephanie G. Neuman, "International Stratification and Third World Military Industries," *International Organization* 38 (Winter 1984), pp. 167-197.

(9) Ibid., p. 183.

(10) Ibid., p. 186.

(11) Jacquelyn S. Porth, "Argentina," in James Katz, ed. *Arms Production in Developing Countries* (Lexington: Lexington Books, 1984), pp. 53-72.

(12) See Clive Gray, "Toward a Conceptual Framework for Macroeconomic Evaluation of Public Enterprise Performance in Mixed Economies," in Robert Floyd et al., eds., *Public Enterprise in Mixed Economies: Some Macroeconomic Aspects* (Washington: International Monetary Fund, 1984), pp. 35-108.

(13) Peter Tehral, "Foreign Exchange Costs of the Indian Military, 1950-1972," *Journal of Peace Research* (1982), pp. 251-259.

(14) Ilan Peleg, "Military Production in Third World Countries: A Political Study," in Patrick J. McGowan and Charles W. Kegley, eds., *Threats, Weapons and Foreign Policy,* Sage International Yearbook of Foreign Policy Studies Vol. 5 (Beverly Hills, California: Sage Publishers, 1980), pp. 209-30.

(15) Ron Ayres, "Arms Production as a Form of Import-Substituting Industrialization: The Turkish Case," *World Development* (1983), p. 814.

(16) See Robert E. Looney and P.C. Frederiksen, 'Profiles of Current Latin American Military Producers," *International Organization* 40 (Summer 1986), pp. 745-52.

(17) Ibid., p. 746.

(18) James E. Katz, "Understanding Arms Production in Developing Counties," in Katz, *Arms Production,* pp. 5-7.

(19) David Whynes, *The Economics of Third World Military Expenditures* (London: Macmillan Press, 1979), pp. 26-27.

(20) Ibid., p. 27.

(21) Emil Benoit, "Growth Effects of Defense in Developing Countries," *International Development Review* 14 (January 1972), pp. 2-10.

(22) P.C. Frederiksen and Robert Looney, "Defense Expenditures and Economic Growth in Developing Countries," *Armed Forces and Society* 9 (Summer 1983), pp. 633-45; P.C. Frederiksen and Robert E. Looney, "Defense Expenditures and Economic Growth in Developing Countries: Some Further Empirical Evidence," *Journal of Economic Development* 7 (July 1982), pp. 113-25; and P.C. Frederiksen and Robert E. Looney, "Another Look at the Defense Spending and Developing Hypothesis," *Defense Analysis* 1 (Winter 1985), pp. 205-10.

(23) In Benoit's original work, foreign aid was the second variable in the regression equation. Benoit postulated a positive sign for this variable assuming that aid facilitated growth through loosening the foreign exchange constraint. Since foreign aid has played a relatively minor role over the last decade in Latin America, public external borrowing seems a more appropriate measure of the impact of foreign external savings on country growth. Domestic savings effort on the part of the government as provided by the public sector's surplus deficit (as of % of GDP) could similarly be assumed to contribute to overall resources availability and thus higher growth. See L. Taylor, *Structuralist Macroeconomics: Applicable Models for the Third World* (New York: Basic Books, 1983) pp. 130-34.

(24) The *t*-values appear in parentheses under the estimated coefficients. * Indicates statistical significance at the 90% level, and ** indicates significance at the 95% and above level.

(25) Robert Looney and P.C. Frederiksen, "Profiles of Current Latin American Military Producers.

(26) The concept of independent binding external and internal constraints on growth was first developed by H. Chenery. See H. Chenery and P. Eckstein, "Development Alternatives for Latin America," *Economic Development Report No. 29*, Project for Quantitative Research in Economic Development, (Cambridge, Massachusetts: Harvard University Press, 1967).