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HAVE THIRD-WORLD ARMS INDUSTRIES REDUCED ARMS IMPORTS?

1. Introduction

In 1945 only Argentina, Brazil, India and South Africa in the Third World possessed domestic arms industries which produced weapons systems other than small arms and ammunition (SIPRI, 1987, 76). By the end of the 1960s, however, twentyseven Third World countries were producing equipment for their armed forces. For the most part, production was still largely confined to small arms and ammunition. Finally, in the early 1980s, according to Wulf (SIPRI 1985, 329–30), eleven Third World countries had established aircraft industries, while nine countries had developed indigenous shipbuilding industries, and six nations produced missiles and armored vehicles. While the number of new Third World nations with domestic defence programs seems to have slowed down somewhat since the mid-1980s, some of the advanced weapons systems in these countries had reached the point where they were competing with established arms suppliers (Evans 1986, 99).

The growing importance of this industry in the Third World has led to an increased concern about its impact on government budgets, foreign exchange use, and the overall performance of the economy. There is an increasing awareness that public enterprises, in general, and specifically, defense industries can be a major source of macroeconomic problems (Gray 1984, Tehral 1982, Ayres, 1983).

To date, most of the literature on the subject has emphasized strategic and political factors as the predominant motives underlying the creation of arms industries in developing countries (Väyrynen 1979, 66):

> The establishment of the domestic arms industry is often predominantly a political act which naturally has strong economic and technological underpinnings. The domestic capacity to produce weapons is a means of isolating oneself of the political and commercial pressures which the suppliers of advanced weapon systems, both governments and firms, can apply. That is why the arms-production capacity is concentrated in those developing countries which have faced an actual or a threat of an arms embargo and/or which have become involved in protracted regional conflicts.

What literature there is on the subject has tended to concentrate largely on the economic incentives used to encourage the expansion and possible exportation of arms by the developing countries (Looney 1986a, Katz 1984, Naur 1980 Adekanye 1983, Ross 1981). Presumably, one of the major reasons for establishing indigenous manufacturing capability is to reduce the level of arms imports, thus alleviating somewhat the overall pressures on the balance-of-payments. Interestingly enough, the literature has had little to say on this aspect of the subject. Nor has there been any detailed empirical examination of the impact that indigenous production has had on Third World arms imports.

In a major paper, however, Väyrynen (1979, 66) argues that indigenous production of various types of weapons systems in developing countries is unlikely to produce overall reductions in total arms imports:

> The domestic production of arms is, indeed, an effort to ensure capacity to pursue independent foreign and military policy. This independence is, however, often a mere myth because the domestic production of arms only seldom significantly curtails the import of arms and even if this happens the dependence of foreign military technology assumes only new, and even deeper forms. The economic effects of arms imports are mostly financial by their character, while the dependence on technology and intermediary inputs needed in the military industry has a negative impact on the entire industrial structure of the country.

This image of indigenous Third World arms production seems to be borne out to a certain extent by the limited amount of information we have on these industries. What statistics we have on the subject come largely from SIPRI sources (Brzoska and Ohlson 1986). SIPRI's data values weapons produced under license as both production and imports. This

share not only reflects the substitution of production for imports, but it also indicates the degree of independence in Third World arms production. The SIPRI data show (Brzoska and Ohlson 1986, 27) a slow but steady increase in arms import replacement during the 1960s after which the ratio levelled off at about 10 percent during the 1970s. The large increases in arms imports during the 1970s by a number of countries without sizeable arms production - such as Iran, Iraq, Libya, Saudi Arabia and Syria - explain the levelling off despite the steady increase in total production values.

For the 1980s, there is again an upward trend. Interestingly enough, however, the SIPRI figures show that it is not the countries with the highest production values that have become least dependent on arms imports. The import values are still much higher than the production values in India and Israel. In India, substitution is even decreasing. The highest production-to-import ratios are instead found in Brazil (also reflecting substantial arms exports), North Korea and South Africa. To a lesser extent this is also true for South Korea and Taiwan (Brzoska and Ohlson 1986, 28).

If this is in fact the case, it would appear that the arms industry in developing countries is following a path fairly typically produced by the package of policies often used to encourage import-substitution industrialization. In this regard the literature on import-substitution has been fairly negative, again much of it questioning whether or not the programs associated with import-substitution have resulted in reducing imports in those sectors singled out for import replacement. As Bruton (1970, 124) notes, the term "import substitution" has a variety of meanings in the literature:

> When attention is limited to a single product, there is little difficulty. Here IS refers to a policy that reduces or eliminates entirely the importation of the commodity and hence, leaves the domestic market exclusive for domestic producers. Measures of IS that are based on changes in the ratio of imports of specific products to their total domestic absorption are of course concerned with this definition. Difficulties emerge when we seek to aggregate. A policy that reduces the proportion of the quantity of a product that is imported may at the same time increase that proportion of another product. Whether the policy in this case should be called IS becomes ambiguous. Similarly, changes in the aggregate import-GNP ratio tend to hide the impact of IS policies on specific sectors.

While it is apparent that the import substitution policies in the arms industry initiated by a number of developing countries have actually reduced the imports of specific armaments, have these same policies resulted in a general reduction in arms imports? If the arms industry is a typical import substitution industry, historical precedent would probably suggest that the answer is no.

The purpose of this article is to throw some light on the link between indigenous arms production and arms imports in developing countries. Specifically:

1. Have developing countries producing arms been able to significantly reduce their importation of arms, relative to non-arms producing countries? and
2. What other variables significantly affect the importation of arms by developing countries?

2. Unique Features of the Arms Trade

As noted above, the arms trade is unique, and its rapid growth since the Second World War can be partly explained by the economic and political policies pursued by the major suppliers. The policy on supply adopted by each country is invariably determined by political decisions which may reflect not only the position of the supplying country in the international system, but also in the case of Western countries, of the economic profitability of these sales (Albrecht 1986, Brigagao 1986, Klieman 1986). Broadly speaking, there are three factors that determine the pattern and level of supply of arms (Ayres 1983, 813).

1. The hegemony factor - which refers to the control of arms transfers by a supplier in order to maintain or achieve a position of hegenomy or domination, either within the receiving country, or more widely within the Third World.
2. The economic profitability factor - which relates to the economic advantages of large-scale production and long production runs. Both the government in the form of the military, and the firms producing arms benefit by selling more and thereby reducing unit costs. As long as an item is procured by a country's armed forces, the cost to the government drops correspondingly, but firms may also benefit with higher profits.
3. The restrictive factor - whereby the supplier declines to provide arms to other countries if it is likely to operate against the economic and/or hegemony interests of the supplier.

Presumably, one of the major motivations to produce arms in the Third World is to avoid the restrictive factor. Clearly, the manner in which the restrictive factor was utilized by the major producers against

Argentina during 1982 had the effect of reinforcing the intentional of several countries (e.g., Brazil, Libya, Turkey, and Argentina herself) to achieve a minimum level of self-sufficiency in arms production. As Ayres (1983, 813–14) notes, the rapid expansion in both the numbers of producers and the types of weapons produced in the Third World is primarily related to concern about availability of supply from the major producers.

As noted earlier, many developing countries have hoped that indigenous arms industries would reduce their overall import requirements as part of a general policy of import-substitution industrilization. To these ends, the build-up of domestic arms production capacities can be considered in terms of seven stages:

1. arms are imported, but are serviced and maintained domestically;
2. a license to produce arms is acquired and production facilities are built, but requiring huge technical and personnel assistance from the supplier;
3. production starts, and to begin with, involves local assembly of imported sub-assemblies;
4. the sub-assemblies are assembled locally from imported components and sometimes re-exported to the licenser;
5. components are manufactured locally from imported raw materials;
6. local production of raw materials;
7. complete indigenous production including design, raw materials, and manufacture.

Few, if any, developing countries are at stage seven of the production sequence. Of relevance for imports of arms is the fact that stages one through three undoubtedly are associated with increased imports of arms or at least of goods and services related to military production. It is unlikely that arms imports could actually show a significant reduction until the country had reached stage five or six in the production sequence.

Clearly, then, indigenous arms production in the Third World could be associated at any time with either reduced or increased levels of imports The following sections attempt to determine empirically which of these situations has dominated. More precisely the purpose of the empirical tests below is to determine whether there have been statistically significant reductions in arms imports in the Third World as a result of indigenous production.

3. Factors Affecting Third World Arms Imports

A number of economic and political factors interact to affect the level of Third World arms imports. The model developed below attempts to capture the impact of as many of these variables as possible, recognizing, of course that in any one year, arms imports may deviate considerably from their average or normal levels due to:

1. a big purchase, associated with the adoption of a major new weapons system;
2. the break-out of internal or external conflict;
3. the completion of a phase of equipment modernization;
4. a marked change in government priorities, due to a change in regime; and
5. a shift in foreign alliances.

This list is of course not exhaustive, but simply intended to stress the potential year-to-year instability of imports.

For many countries, incremental increases in arms imports are not possible simply because the high cost of major weapons systems (relative to their total import bill), and the fact that weapons systems tend to be sold in "packages", rather than as individual items or components. Given these caveats, it is hypothesized that arms imports in any one year are a function of:

1. total military expenditures (ME).
2. total imports (TI).
3. total resources, as depicted by the gross national product (GNP).
4. central government expenditures (GEC).
5. armed forces (AF).
6. the balance of payments deficit (BI). and
7. the regime type (MILITARY).

Most of these variables are self-explanatory. It is assumed here that arms imports *ceteris paribus* should be higher, the larger overall military budgets, gross national product and armed forces. However it is not clear from the literature[1] which of these variables should, given political and strategic factors, be most influential in setting the overall bounds for arms imports. Hence each was tested in the regression equation. The import variable (TI) is intended to capture some of the progress made in armament import substitution. If, in fact, indigenous arms production has reached the point of actually enabling a country to reduce its required level of arms imports, then we would expect to find a negative sign for this term.

For non-arms producers, on the other hand, total imports are undoubtedly reflective of the ability of these countries to earn or borrow foreign exchange, since most developing countries are foreign exchange constrained (Looney and Frederiksen 1986c, Frede-

riksen and Looney 1985). Hence, we can assume that at any time, a pent-up demand for additional imports of all kinds exists. In this context, increased total imports would undoubtedly have *ceteris paribus* a significant military component. The ability to finance additional imports at any one time can be proxied by the current account deficit of the balance-of-payments. If, in fact, non-arms producing countries are constrained by foreign exchange in importing additional arms, the balance-of-payments term should have a negative sign, i.e., the greater the deficit in current account, the more external finance available for arms importation.

In terms of political variables, the literature (Grindle 1987) McKinlay and Cohen 1975, Looney 1987) tends to suggest that military regimes may *ceteris paribus* be more inclined to import arms. This undoubtedly reflects the overall priorities of these regimes. It might, however, also reflect the fact that during periods of increased hostility, stemming either from increased internal insurrection or external threat, military regimes often come to power (Richards 1985). To test for this factor, the political variable (MILITARY) was given a value of 0 for civilian regimes, and 1 for military regimes[2]. A positive sign would, therefore, confirm the tendency for military regimes to shift resources toward imported armaments.

Formally, therefore, we may specify arms producer's demand for arms imports (AI), together with their expected signs, as:

AI = f (ME+, TI-, GNP+, GEC+, AF+, MILITARY+, BI+)

For non-arms producers the same function would produce several differences in expected signs:

AI = f (ME+, TI+, GNP+, GEC+, AF+, MILITARY+, BI-)

All the data is taken from the United States Arms Control and Disarmament Agency (1987), and is for the year 1981[3].

The classification of countries as an arms or non-arms producer is based on Neuman's (1984) analysis. In general, Neuman classifies a country (as of 1979-80) as an arms producer if it produces at least one major weapon system. Depending on the completeness of data and the variables included in the regression equations, the number of producers averages around twenty countries (due to missing observations), while the number of non-producers averages around 48 countries.

4. Results: Arms and Non-Arms Producers

The results[4] for both the producers and non-producers show a number of interesting contrasts, several of which were not anticipated above (Table 1):

1. The producing countries tend to exhibit a much closer relationship between arms imports and total military expenditures than their non-producer counterparts. For arms accounting for sixty five percent of the gross country differences in arms imports (equation 1 Table 1). On the other hand, military expenditures were statistically insignificant for the non-producers.
2. The most significant variable affecting non-producers arms imports was the total level of imports (TI). On the other hand, this variable was negative and statistically insignificant for the arms producers. This result appears to confirm that, in general, arms production in the producing countries may have reached the point whereby significant reductions in arms imports are possible. On the other hand, arms imports of the non-producing countries appear to be largely a function of the overall ability of these countries to finance imports. This is further confirmed by the statistically significant sign on the balance of payments (BI) term (equation 10 Table 1) for the non-producers.
3. Gross National Product (GNP) or the overall economic strength of the country does not appear to be a factor affecting the overall level of arms imports (after controlling for total military expenditures, ME). This result may also be in conformity with the notion that foreign exchange, rather than the overall level of resources is the binding constraint (Landow 1971) affecting arms imports, particularly in the case of the non-producers.
4. Military regimes appear more likely than their civilian counterparts to expand arms imports. This result (equation 9 Table 1), however, apparently only holds for the non-producers.

In sum, several interesting factors appear to differentiate arms producers from their non-producer counterparts with regard to their propensities to import arms. The close relationship between arms imports and total military spending in the producing countries may reflect the fact that the producing countries do not appear to be as constrained by foreign exchange as the non-producers.

As the work of Looney and Frederiksen (1986a, Looney 1987a) demonstrates, one of the major differences between arms producers and non-producers in the Third World tends to be the relative abundance of

Table 1
Factors affecting Third World arms imports: producing, non-producing countries (standardized estimates)

	Independent variables							Statistics		
Equation	ME	TI	GNP	GEC	AF	MILIT.	BI	r^2	F	DF
Producers										
(1) Arms Imputs =	0.81									
	(6.10)							0.650	37.21	21
(2)	0.93	-0.34								
	(7.13)	(-2.63)						0.739	25.45	20
(3)	0.95	-0.29	-0.12							
	(7.09)	(-1.90)	(-0.77)					0.747	16.79	20
(4)	0.90	-0.34	-0.83	0.80						
	(7.17)	(-2.42)	(-2.05)	(1.92)				0.809	15.85	19
(5)	0.68	-0.30	-1.32	1.21	0.30					
	(3.41)	(-2.17)	(-2.54)	(2.49)	(1.43)			0.833	13.98	19
(6)	0.91	-0.35	-0.81	-0.78		-0.03				
	(6.94)	(-2.35)	(-1.90)	(1.81)		(-0.25)		0.810	11.91	19
(7)	0.87	0.40	-1.03	1.03			-0.17			
	(6.83)	(-2.74)	(-2.41)	(2.32)			(-1.20)	0.829	13.61	19
(8) *Non Producers*	0.46	1.39	-0.89	-0.34	0.18					
	(1.40)	(6.70)	(-3.53)	(-0.25)	(2.78)			0.847	147.26	48
(9)	0.09	0.19	-0.03	-0.02		0.19				
	(0.41)	(1.49)	(-0.29)	(-0.87)		(3.34)		0.857	51.44	48
(10)	0.12	1.42	-0.68	-0.03			-0.22			
	(0.58)	(6.52)	(-0.02)	(-0.87)			(-2.09)	0.837	43.27	47

r^2 = coefficient of determination; F = F statistic; DF = degrees of freedom

foreign exchange possessed by the producing countries, and the scarcity of foreign exchange in the non-producing countries. If, in fact, there tends to be some optimal stock of military equipment (Looney and Frederiksen 1986b) given a level of military expenditures, both the indigenous production capabilities and import capacity of the arms producers would allow adjustments of the actual stock of equipment to the desired level to occur much more smoothly than in the case of the non-producers.

For the purposes of this article, however, it appears that the most important finding is that arms producers have been able to significantly reduce their levels of, and dependence on, eternal sources of arms. If, in fact, this was the underlying motive in these countries for producing arms, then we must conclude that they have been successful.

All in all, the results suggest that somewhat different environments affecting arms imports exist in the Third World, and that any analysis of this problem must take these differences explicitly into account.

5. Results: Constrained and Unconstrained Countries

It appears from the results presented above that for a large group of countries, foreign exchange may be the most important factor affecting arms imports. As with many issues concerning Third World countries, the economic literature is somewhat vague as to the "best" model to specify for purposes of hypothesis testing. As a result, many empirical findings are more or less predetermined by the manner in which the research design was conceptualized. One way to overcome these difficulties is to attempt to determine the generality of findings, through constructing alternative research designs.

As indicated above, an alternative classification of developing countries could be based on their relative

degree of resource constraint. In other words, given the fact that import capacity was a major factor affecting arms imports for non-producing countries, additional insights into the factors affecting arms imports should be obtained by examining the patterns of imports associated with the constrained and unconstrained groups of countries.

The operational question here is how best to group countries on the basis of relative resource constraint. Clearly there is not one overall index that can be used for that purpose. Since the problem of resource constraint is a multi-dimensional one, we decided to use factor and discriminant analysis for country grouping. This procedure enables an objective classification of countries in a situation where one might be tempted to interject subjective impressions of relative resource abundance.

Based on these considerations a factor analysis was performed using a number[5] of measures of debt and capital flows, the main trends in the data were identified (Table 2) and a discriminant analysis[6] was then performed using as variables those with the highest loading[7] on each one of the (seven) factors or main trends in the data. The orthogonal rotation (Table 2) assures that each variable selected had a relatively low degree of correlation with the others in the sample.

Table 2
Orthogonally Rotated Factor Pattern: (Loadings) Economic Variables

	Factors						
Variables	1 Factors Facilitating Public Consumption	2 Factors Contributing to 1982 External Debt	3 Gross International Reserves	4 Share of 1982 Public External Debt in GDP	5 Growth in Exports	6 External Debt. Service 1982	7 Public External Debt 1970
Gross Inflow Public Loans/Exports 1982	97*	0	-14	8	2	- 9	5
Public Debt/Exports 1982	96*	3	-13	2	- 4	-13	6
Resource Balance as % of GDP 1982	94*	11	1	-14	7	7	7
Growth in Public Consumption 1970-82	92*	3	- 5	4	26	- 7	2
Public External Borrowing Commitments/Exports 1982	91*	- 4	-13	8	12	-11	23
Gross Inflow Public Loans/GDP 1982	86*	7	- 8	- 2	-11	-13	-25
Public Consumption as % of GDP 1982	63*	- 5	- 9	55	-13	- 5	27
Growth in Private Consumption 1970-1982	62*	12	10	1	48	8	2
Private Consumption as % of GDP 1960	-72*	7	-15	-16	1	-13	-44
Private Consumption as % of GDP 1982	-82*	-15	-16	-28	-11	-19	-10
Terms of Trade 1982	-83*	21	21	9	10	17	- 5
Total Public External Debt 1982	0	94*	11	0	20	20	- 4
Gross Inflow Public Loans 1970	14	92*	20	- 7	-18	- 7	9
Interest Payments on External Debt 1970	9	90*	13	-16	-20	2	-10
Repayment of Principal on Public Loans 1982	4	89*	10	-11	-15	12	-17
Gross Inflow Public Loans 1982	- 5	86*	10	1	29	28	-11
Public External Borrowing Commitments 1982	- 6	85*	14	- 4	34	18	- 4
Interest Payments on External Debt 1982	- 6	82*	6	2	30	38	- 8
Total Public Esternal Debt 1970	15	80*	19	-14	-23	-30	10
Net Inflow of Public External Loans 1970	19	77*	23	- 2	-17	-19	25
Repayment of Principal on External Loans 1982	- 4	73*	21	5	31	37	7
Growth in Exports 1970-82	- 2	39*	25	3	5	- 8	-36
Current Account Balance 1970	15	-80*	- 1	- 6	-29	1	10
Gross International Reserves 1982	- 8	19	89*	-11	9	- 7	9
Gross International Reserves 1970	- 8	29	85*	- 5	- 7	1	- 6
Average Maturity of Public External Debt	23	-18	-48*	5	-11	-43	23
Current Account Balance 1982	13	-26	-59*	10	-22	0	21
Public External Debt as % of GDP 1982	9	- 9	-29	76*	-15	12	17
Exports as % of GDP 1982	- 8	- 8	7	76*	4	22	5
Growth in Exports 1960-1970	8	2	- 6	67*	7	-27	-24
Public Consumption as % of GDP 1960	47	-11	-12	55*	20	-18	37
Growth in Imports 1970-82	36	-18	19	- 1	71*	- 6	1
External Debt Service as % of GDP 1982	- 8	27	- 7	5	- 6	59*	7
Public External Debt as % of GDP 1970	50	0	-23	20	5	- 1	55*

Note: All military variables together with Gross Domestic Product and per capita income are omitted.

The variables thus selected for splitting the countries into two groups were:

1. Gross Inflow of Public Loans/Exports, 1982
2. Total Public External Debt, 1982
3. Gross International Reserves, 1982
4. Public External Debt as a % of GDP, 1982
5. Growth in Imports, 1970–82
6. External Debt Service as a % of GDP, 1982
7. Public External as a % of GDP, 1970

Table 3
Discriminant Analysis Total Sample Countries Based on Economic Factor Analysis High Loadings

Group I		Group II	
Country	Probability of Correct Placement	Country	Probability of Correct Placement
1. Israel	69.34	1. Greece	57.78
2. Honduras	83.48	2. India	84.91
3. Cameroon	60.73	3. Nigeria	89.07
4. Sudan	66.47	4. Indonesia	90.67
5. Costa Rica	92.64	5. Egypt	68.20
6. Bolivia	86.27	6. Korea	89.95
7. Somalia	86.46	7. Rwanda	69.08
8. Tunisia	68.31	8. Turkey	66.95
9. Morocco	73.06	9. Spain	51.89
10. Guatemala	54.91	10. Venezuela	80.26
11. Malawi	91.40	11. Mexico	99.69
12. El Salvador	65.90	12. Brazil	99.02
13. Mali	97.12	13. Algeria	76.44
14. Pakistan	86.98	14. Philippines	55.78
15. Paraguay	60.02	15. Libya	75.69
16. Ecuador	56.61	16. Colombia	54.63
17. Dominican Republic	74.12	17. Thailand	60.95
18. Liberia	94.77	18. Malaysia	65.16
19. Ivory Coast	84.42	19. Argentina	66.09
20. Mauritania	96.04	20. Saudi Arabia	94.65
21. Sierra Leone	86.05	21. Kuwait	81.31
22. Panama	94.37	22. Syria	63.95
23. Chile	70.09	23. Jordan	50.81
24. Chad	87.18		
25. Uruguay	67.87		
26. Tanzania	79.87		
27. Uganda	88.76		
28. Ethiopia	70.24		
29. Central African Republic	76.89		
30. Ghana	78.72		
31. Burma	82.91		
32. Sri Lanka	75.39		
33. Jamaica	90.66		
34. Trinidad	77.62		
35. Zambia	95.88		
36. Peru	71.67		
37. Zimbabwe	85.68		
38. Kenya	86.61		

The results of the discriminant analysis (Table 3) show a high degree of probability of correct placement in each group, i.e., the discriminating variables selected from the factor analysis are able to split the sample countries into two fairly distinct groupings based largely on the external debt situation facing each set of countries. The Group II or unconstrained countries consist of several major oil exporters and several of the more dynamic newly industrializing nations such as Mexico, Greece, India, Korea, Spain, Algeria, and Malaysia. Group I or constrained countries in general seem to be the poorer, less economic dynamic nations, this group being heavily weighted with African and poorer Latin American countries.

Further insight into the two groups can be gained by examining the means (Table 4) of various measures of economic performance for each group:

1. Group I countries resorted to a much higher (3.6 times) inflow of external public loans in 1982 relative to their exports that year;
2. On the other hand, the overall level of total public external debt in 1982 averages nearly four and one half times as much for Group II countries as is the case for Group I countries;

Table 4 Structural and Performance Differences Between Group I and Group II Countries

(Means)

Symbol Variable	Total Sample	Group I	Group II
Export-External Variables			
FEB Share of fuels, minerals in merchandise exports 1982	32.4	25.2	43.6
EI Export instability 1968-71	9.1	8.1	10.8
ZGB Growth in imports 1970-82	4.0	0.7	9.5
EGB Growth in exports 1970-82	1.8	0.4	3.9
EGA Growth in exports 1960-70	8.0	6.7	10.1
EB Share of Exports in GDP 1982	25.2	23.4	28.3
CAA Current account Balance 1970	-119.1	- 66.9	-208.6
CAB Current account Balance 1982	-382.7	-507.7	-178.2
OPCEB Share of other primary commodities in exports 1982	44.3	55.5	27.0
IMPFB Share of food imports in merchandise imports 1982	14.4	15.1	13.3
External Debt Variables			
PDA External public debt 1970	735.5	412.6	1278.4
PDB External public debt 1982	6098.5	2716.2	11178.9
PDPA External public debt as % GDP 1970	16.1	19.5	10.3
PDPB External public debt as % GDP 1982	34.8	44.1	19.3
DSEA External public debt as % exports 1970	8.1	7.7	8.8
DSEB External public debt as % exports 1982	14.4	15.5	12.5
BCIBE Gross inflow of public external debt as % exports 1982	0.6	0.7	0.3
Fiscal-Savings Variables			
AS Average national savings 1970-81	17.1	11.9	25.8
MS Average marginal national survey 1970-81	12.6	4.3	26.3
RTCRYB Government revenues as % GDP 1982	20.9	20.0	22.8
GETYB Government expenditures as % GDP 1982	26.3	26.8	25.4
GDB Government deficits as % of GDP 1982	-5.0	-6.2	-2.9
Composition of GDP			
AB Share of agriculture in GDP 1982	23.4	27.5	16.5
IB Share of industry in GDP 1982	30.8	25.6	39.4
MB Share of manufactures in GDP 1982	14.1	13.0	15.9
SB Share of services in GDP 1982	45.8	46.9	44.0
Performance Variables			
GDPGB Growth in GDP 1970-82	4.4	3.6	5.6
IMFB Inflation 1970-82	20.3	19.9	21.0
GDIGB Growth investment 1978-82	5.9	3.1	10.5
GDIB Share of investment in GDP 1982	22.0	19.4	26.3
ICOR Investment capital output ratio 1968-73	3.8	4.8	2.3
GIRA Gross international reserves 1970	298.3	113.5	600.7
GIRP Gross international reserves 1982	2699.8	654.9	6138.8
AGB Growth in agriculture 1970-82	2.8	2.4	3.5

3. The level of international reserves is also much higher for Group II countries - nearly 10 times as much as the average for group I countries;
4. With regard to shares of debt in gross domestic product, however, Group I countries have much lighter levels of commitment, averaging nearly twice as much as Group II countries in both 1970 and 1972. The debt service ratio to exports is correspondingly higher for Group I countries; and
5. The rate of growth of imports was nearly ten times higher over the 1970-82 period for Group II countries.

In terms of profiles, therefore, the Group II countries are considerably larger, more affluent, and less reliant on external debt as a percentage of gross domestic product. They tend to spend relatively large amounts on military activities, but not necessarily significantly greater amounts of their overall budgets.

Modifying the model of arms imports developed above for the producer and non-producer countries, we hypothesize that for the constrained and unconstrained countries, arms imports are a function of;

1. total military expenditures (ME);
2. new external debt (debt contracted for the same year as the arms imports)[7].
3. whether or not the country was an arms producer (PRODUCE). Here, the producer countries are assigned a value of one while the non-producing economies were assigned a value of zero. Hence, a negative and statistically significant sign for this variable would suggest that producing countries were able *ceteris paribus* to reduce their overall level of arms imports.
4. total governmental expenditures (GEC).
5. arms imports in the previous year (AI80) were included to test the robustness of the results and also to partially determine whether or not 1981 was an "unusual" year in the sense that the levels of arms imports that year were significantly different than those in the previous year.
6. Gross National Product (GNP) was again included as a control variable.

Table 5
Factors affecting Third World arms imports: constrained, unconstrained countries (standardized estimates)

	Independent variables						Statistics		
Equation	ME	PBCB	Produce	GEC	AI80	GNP	r^2	F	DF
Constrained Countries									
(1)	0.93	0.13	-0.11						
	(15.55)	(2.13)	(-2.18)				0.948	190.03	34
(2)	0.75	0.16	-0.10	0.18					
	(7.19)	(3.51)	(-2.77)	(1.73)			0.974	275.18	33
(3)	0.67	0.12	-0.10		0.30				
	(10.10)	(2.72)	(-2.75)		(5.26)		0.974	266.10	33
(4)	0.70	0.14	-0.08		0.30	-0.08			
	(10.78)	(3.19)	(-2.07)		(5.43)	(-1.97)	0.977	234.77	33
Unconstrained Countries									
(5)	0.50	-0.28	-0.34						
	(3.08)	(1.69)	(-2.08)				0.551	6.96	20
(6)	0.27	-0.11	-0.11		0.72				
	(3.12)	(-1.33)	(-1.22)		(7.25)		0.895	34.17	20
(7)	0.24	-0.15	-0.12		0.71	0.06			
	(2.12)	(-1.08)	(-1.23)		(7.05)	(0.36)	0.896	25.86	20

r^2 = coefficient of determination
F = F Statistics
DF = Degree of freedom
( ) = t statistic

Based on the discussion above, the model tested (with its expected signs for the constrained countries) was of the form:
Arms Imports (AI) = f(ME+, PBCB+, PRODUCE-, GEC+ AI80+ GNP+)

While for the unconstrained countries:
Arms Imports (AI) = f(ME+, PBCB+, PRODUCE- GEC+ AI80+, GNP+)

The results (Table 5) indicate that:

1. As with non-producers, arms imports in constrained countries have a particularly strong link with total military expenditures. This link, while still significant is not nearly as strong (evidenced by the size of the standardized regression coefficient and t values) for the unconstrained countries.
2. As anticipated, increased external debt (PBCB) has been associated with arms imported by the constrained countries (but not the unconstrained).
3. Both constrained and unconstrained countries were *ceteris paribus* able to reduce their overall level of arms imports through the indigenous production of arms.
4. 1981 does not appear all that unusual a year (given the high degree of correlation of arms imports that year with those of the previous year).
5. Again, the overall availability of resources as proxied by Gross National Product does not appear to be a factor affecting Third World arms imports.

In general, therefore, the result obtained by examining countries as resource constrained and unconstrained paints essentially the same picture as that produced through an examination of countries grouped on the basis (or lack of) of an indigenous arms industry.

6. *Conclusions*

The results of the empirical work undertaken above can be easily summarized:

1. Indigenous arms production in the Third World has tended to reduce the importation of arms.
2. The arms imports themselves are largely affected by foreign exchange availability, rather than political or strategic factors. This point needs some elaboration. When examining the arms imports of arms producers and non-producers, the highest correlation coefficients were in the mid-80s. The specifications included such political variables as the type of government and to a certain extent the total number of men under arms as a proxy for internal-external conflict.
3. On the other hand the groupings of countries on the basis of relative scarcity of foreign exchange produced correlation coefficients in the high 90s for the foreign exchange constrained countries. Given that only economic variables were used in these regressions it appears that foreign exchange controls the amount of arms imports much more precisely than the "need" or "desire", for additional armaments. The lower correlation coefficient for the unconstrained countries, together with the significantly smaller regression coefficient (and smaller t value) on the military expenditure term for this group of countries indicates that Third World arms producers have much more flexibility and choice as to arms imports (presumably because they are not limited in their imports of arms to the extent that the constrained countries are).
4. Finally, it appears that arms imports will most likely not reach levels attained in the late 1970s due not so much to a general spirit of constraint on the part of suppliers and recipients, but more to lack of money on part of many of the Third World countries and the development of indigenous production capabilities on the part of others.

NOTES

1. Obviously there is quite a high degree of correlation between these variables making definitive statistical tests extremely difficult.
2. The classification used for military and civilian regimes was that developed by Sivard (1983, 11).
3. 1981 was selected as the year for analysis largely because of the completeness of data for that year, and because this year preceded the distripution in world trade caused by the August 1982 world debt crisis.
4. The regression coefficients are in standardized form to facilitate a direct comparison of the relative strength of each variable in impacting on arms imports.
5. Data were taken from World Bank (1984) and United States Arms Control and Disarmament Agency (1984).
6. For a description of the discriminant analysis program see Statistical Analysis System (1982). The sample of countries was initially assigned an arbitrary one or zero so that placement could be made into two groups. A three-group division of countries did not produce a clear split between the centroids of the groups, i.e., there was not a high prob-

ability of correct placement for each country in one of the three groups!

7. An excellent description of factor analysis techniques used is in Rummel (1970).
8. The variable used for this purpose is the World Bank's "public external commitments", described in World Bank (1984).

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