Office of Arms Control, Disarmament and International Security

University of Illinois at Urbana-Champaign

Re-Evaluating Economic and Technological Variables to Explain Global Arms Production and Sales

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The purpose of this paper is to stimulate discussion of the economic and technological incentives currently at play in the decision-making of nation-states that encourage the expansion of national arms production centers and the subsequent diffusion of arms and military technology across national borders. This focus contrasts with currently prevailing notions that emphasize strategic and political factors to explain the upward climb of military spending on arms and the growth of the arms trade. One recent, widely publicized book on the subject, for example, characterizes arms transfers as a "new diplomacy."[1] Another writer, long acquainted with the arms production in the developing world, argues that "the primary purpose of a Third World arms industry is enhanced national security."[2] These writers stress the real and perceived security needs of states, their desire to escape external manipulation by major suppliers, their effort to minimize external dependency on other states, their search for political bargaining leverage, and their pursuit of enhanced national status associated in many minds with strong military forces and indigenous production capabilities.[3]

Without slighting or denigrating these factors, they are not fully persuasive as an explanation of the driving forces behind increased arms spending, production, or transfers. Several states, like Mexico and the Philippines, face weak external threats but continue to produce arms. Others, like the West European democracies, produce more arms than they can absorb. Similarly, the superpowers, which dominate global arms transfers, also draw varied economic benefits from arms sales that tend to be obscured in the polemical exchanges between Moscow and Washington. The Soviet Union has sold Indian railroad rolling stock and cashews, received in exchange for arms, to acquire hard currency.[4] Several American corporations, like General Dynamics and McDonnell-Douglas, are heavily dependent on domestic and foreign arms sales. The Northrop Corporation specifically designed the highly successful F-5 for international sale, and the Pentagon has under study the development of a new fighter only for export, a proposal advanced by the Carter administration, which was ostensibly opposed to increasing arms sales. Developing states, like Israel, India, and Brazil, have also become notable arms producers and, as the discussion below suggests, only part of the growth in this area can be attributed to external threats.

The paper is divided into three parts. Part one sketches the growth in global military power over the past decade and its diffusion around the world, particularly to developing states. It provides a framework for the discussion of arms production, transfers, and acquisition. Part two discusses what might be termed "bounded" economic and technological rationality as a determinant of arms production and transfers. It refers to the economic incentives for expanded domestic arms production and foreign sales initially arising from the strategic-political considerations that initially prompted an indigenous arms production effort. From this perspective, the development and increasing sophistication of a state's arms production capacity and the active development of a foreign market for its products are seen as a set of dependent variables whose value is initially determined by a states's security needs and diplomatic objectives. However, the strategic-political incentives that led to the

organization of an arms industry and the production of increasingly advanced weapons are gradually modified as the economic constraints of sustaining an indigenous arms production and of responding to the demands of technological modernization are understood

In this early phase of "bounded" rationality, pressures rise to produce and sell arms to cut the costs of production through series runs, to schedule arms production more efficiently through optimal utilization of the factors of production, especially of highly skilled personnel, to seek foreign cooperation in covering the mounting cost of research and development and in selectively expanding the nation's weapons development and production capabilities, and to limit balance of payment deficits attributable to foreign arms purchases Gradually, these subsidiary economic-technological considerations assume an independent character and claim on national priorities These limit realization of an autonomous arms production system fully and singularly responsive to internal demand for more and better weapons and, accordingly, free of concern for foreign support of an indigenous arms industry Under terms of "bounded" rationality in arms production, the resource and technological capabilities of the nation's economic base, demands for internal welfare expenditures, and the need to use scarce weapons producing resources efficiently and effectively set parameters for the independence of the nation's arms complex and its ability to sustain and continuously renovate itself independent of outside assistance through arms sales and cooperative R and D or production arrangements with other states

One passes from "bounded" rationality in making decisions about arms production, sales, and acquisition to market and developmental rationality when public welfare and corporate and personal profit considerations gain the ascendancy In this second or mature phase (the focus of part three of the paper), arms are treated like any other good or service that can be made and exchanged to enhance the public good or private gain [5] While "bounded" rationality is by and large concerned with the <u>demand</u> side of weapons and the ways that the costs and burdens of producing arms can be relaxed and the reliability of supply assured, this market or developmental phase dwells on the <u>supply</u> side of arms production, transfers, and acquisition Factors shaping this phase are principally economic and technological, although the goods and services that are provided for the world market are lethal and destructive Considerations include competitive pricing for weapons to meet the terms of international competition, assured provision of raw materials, particularly energy resources (e g , oil) and scarce minerals, access to foreign markets, product leadership through arms sales to penetrate foreign civil markets controlled by competitors, maintenance of high domestic employment, economic growth, and investment opportunities Balance of payment concerns, moreover, center on preserving a state's competitive position and the strength of its currency, through increased arms sales abroad, rather than simply on husbanding scarce foreign reserves These welfare concerns are linked, moreover, to internal political demands for regime stability and party advantage

<u>The Growth of Military Power and</u>
<u>Its Diffusion through Arms Production and Transfers</u>

The decentralization of military power around the world and its diffusion within the developing world are suggested by several quantitative and qualitative measures. First, military spending is proceeding at a faster rate in developing over developed states. Much of the 14.6 percent growth in world military expenditures between 1968 and 1977 is attributable to the developing states. During this period the military spending of developed states rose from $305 billion to $319 billion in constant 1976 dollars, an increase of 4.6 percent, while expenditures among developing states jumped from $54 billion to $92 billion or 70.4 percent. The developing states outstrip the percentage increase in developed state spending in every region. Most prominent is the Middle East, which recorded increases of over 270 percent, followed by Africa (including the Maghreb), which doubled its military expenditures. In both instances the rate of military spending exceeded the growth in GNP. Meanwhile, North America experienced a decline of 25 percent. In three instances (Africa, Middle East, and East Asia), a higher percentage of a region's GNP was spent for military purposes in 1977 than in 1968. While the ratio of military spending to GNP fell for developed states by almost two percentage points (7.4 to 5.6 percent), this same ratio for developing states held almost steady, falling only two-tenths of a percentage point from 6.1 to 5.9 percent while GNP was increasing by almost 60 percent. These GNP-military spending ratios are confirmed as might be expected in per capita expenditure data. The developed states declined 2.9 percent on this scale, while the developing state percentage was a positive 38.1 percent.

Second, the developing states account for most of the growth of world armed forces since 1968. While the armed services of the developed countries were shrinking by almost 11 percent between 1968 and 1977, those of the emerging world expanded by over three million or 25 percent. In this connection Africa has changed most over 10 years. Armed forces are estimated to have increased from 635,000 to 1,340,000 or 111 percent. The Middle East follows with a 76 percent increase and then, surprisingly, Latin America, which has no outstanding military conflicts similar to those in Africa and the Middle East, registered a gain of almost 36 percent in personnel under arms.

Third, developing states have significantly increased the firepower, range, and reliability of their ground, sea, and air systems in the past decade. Table 1 reinforces the image of an increasingly diffuse international security system, characterized by a rising number of centers of military force. In 1950, SIPRI indicates that no Third World state had supersonic aircraft or missiles, and only one possessed armored fighting vehicles, such as tanks or armored personal carriers. By 1960, 38 countries had heavy armor in their inventories, 26 were manning modern warships and only one state (Taiwan) had supersonic aircraft. By 1977, almost 50 emerging countries had deployed supersonic aircraft, some as advanced as those found in the air forces of developed states. These included MiG 23's (North Korea, Syria, Iraq), Jaguars (India, Oman and Ecuador), Mirage 3's and 5's (17 states), and F-5's (16 states). The trend continues as South Korea and Pakistan has access to F-16's, Israel to F-15's and F-16's, Saudi Arabia to F-15's, and Syria and India, to MiG 25's. By the end of the 1970s, over 60 developing states possessed heavy armor, 42 had various missile capabilities, and 67 disposed modern warships in their navies, largely fast, light attack ships with impressive

destructive capabilities

Fourth, arms imports illustrate the upward rate of military expenditures and weapons acquisition of developing states Using five-year averages for 1968-1972 and 1973-1977, the developing states clearly outdistanced the developed states in the amount and in the growth rate of arms imports In 1968-1972, the developing states accounted for 70 1 percent of all transfers, in the next five year period of 1973-1977, the percentage rose to 73 1 percent Correspondingly, the rate of growth is also impressive since the base for developing state imports is greater to start with than for developed states The latter increased their imports by nearly 43 percent, the former jumped 163 1 percent The greatest rate of increase in arms imports was in Africa, including North Africa Over the last five years, imports into Africa leaped almost 450 percent over the previous five year period The Middle East is also a leader with an increase of slightly more than 300 percent Latin America is in third place in arms imports, followed by South and East Asia

More revealing than arms imports perhaps is the increasing tendency of developing states to produce their own weapons either indigenously or under license These range over heavy armor, supersonic and subsonic aircraft, helicopters, missiles, and warships While none of these states has been able to free itself from foreign dependence, they have been able, for a variety of reasons to be discussed below to increase their bargaining leverage vis-a-vis the developed states in acquiring the weapons that they need Not only are developing states able to produce more weapons than ever before but they are also able to design and fabricate a larger variety of sophisticated weapons systems

Table 2 lists the number of states in Africa, Asia, Latin America, and the Middle East which produce weapons in four major categories--aircraft, armored vehicles, tactical missiles, and naval vessels The 28 states which are covered in the survey are not distinguished by the level of independence that they have achieved in each category These levels, defined by Andrew Ross on a graded six-point scale, range from licensed assembly at the lowest point of capability to licensed component production, licensed system production, system modification and reverse engineering, dependent R & D and production, and independent R & D and production at succeeding higher levels on the scale [8]

In each of the weapons categories that are listed in Table 2, the number of states producing a particular item has grown, in several cases they have more than doubled in the decade between 1970 and 1980 Several areas bear particular notice Between 1970 and 1980, the number of states producing fighters grew from one to five basic trainers from four to 11, and helicopters from 2 to 11 Over-all, the number of states in the developing world producing aircraft doubled from 7 to 16 Similarly, naval craft producers climbed from 15 to 25 with a significant increase in the number of states capable of producing patrol and support craft [10]

Production of armored vehicles and tactical missiles has grown more slowly Over the decade since 1970, the number of states producing tanks increased from two to five and armored personnel carriers from zero to five The total number of producing states rose from 4 to 6 [11] The

producers of tactical missiles tripled in the same period from three to nine [12] Producers of SAM missiles leaped from zero to five,[13] those producing anti-tank weapons, from one to seven [14] Five states (Argentina, Brazil, India, Israel, and South Africa) produce arms at some level of independent capability in all four major categories

These figures also imply a high stage of technological development since aircraft, missiles, electronics, and aircraft engines require a broad scientific, engineering, and industrial base However much countries, like China or India, may be still considered underdeveloped, measured by GNP and per capita income figures, they have been able to accumulate the technological systems to produce advanced military equipment One can metaphorically speak of a "Belgium" emerging from India or a "Netherlands" arising from an otherwise underdeveloped China The same process of modernization, with military technology as the spearhead, may be seen to be operating in other states, like Brazil, Pakistan, and Argentina [15] Modernization is seen to be partially a function of a technologically advanced warfighting and economic system, linked to a capacity to sell arms and military know-how abroad

The interest in advanced military technology is associated logically with still another indicator of the growing military capability of developing states the proliferation of nuclear technology and weapons India's explosion of a nuclear device in 1974 ended any remaining illusions that nuclear proliferation might be arrested in the developing world [16] Pakistan, according to public reports, is rapidly approaching the explosion of the first "Islamic bomb "[17] Other candidates for nuclear status include Iraq, Taiwan, South Africa, South Korea, Brazil, and Argentina Many analysts assume that Israel has acquired the necessary technology and has assembled, short of testing, several nuclear bombs [18]

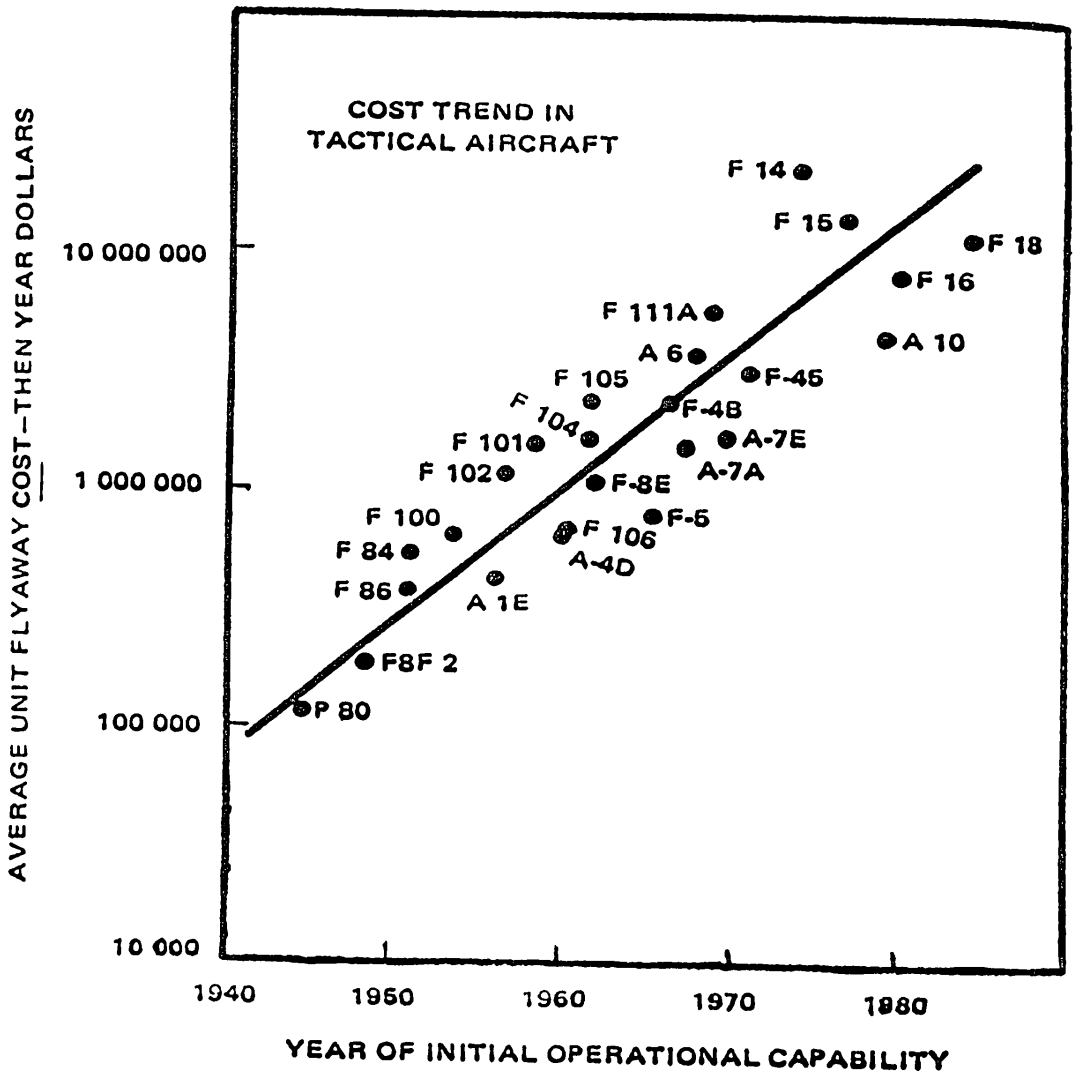
Bounded Rationality and Economic and Technological Incentives to Produce, Transfer, and Accumulate Arms

The mounting cost of new weapon systems is a major problem facing arms producers and military establishments Figure 1 sketches the increasing cost of American tactical aircraft from 1940 to 1980 The trend line is steeply upward, rising from approximately $100,000 a copy in the 1940s to an average of over $10 million in 1980

These same upward cost curves can also be discovered by comparing the cost figures for tanks, carriers, and fighter aircraft between earlier and later models As Figure 2 notes, the Sherman tank which cost $140,000 in 1940 is dwarfed by the estimated price of the newly planned XM-1 tank which will cost almost six times as much The Essex aircraft carrier cost $225 million in World War II, the Nimitz class carrier costs approximately five times as much Similarly, the price of the F-4 fighter was $3 5 million in 1960 while the F-14 requires an outlay approaching $20 million a copy

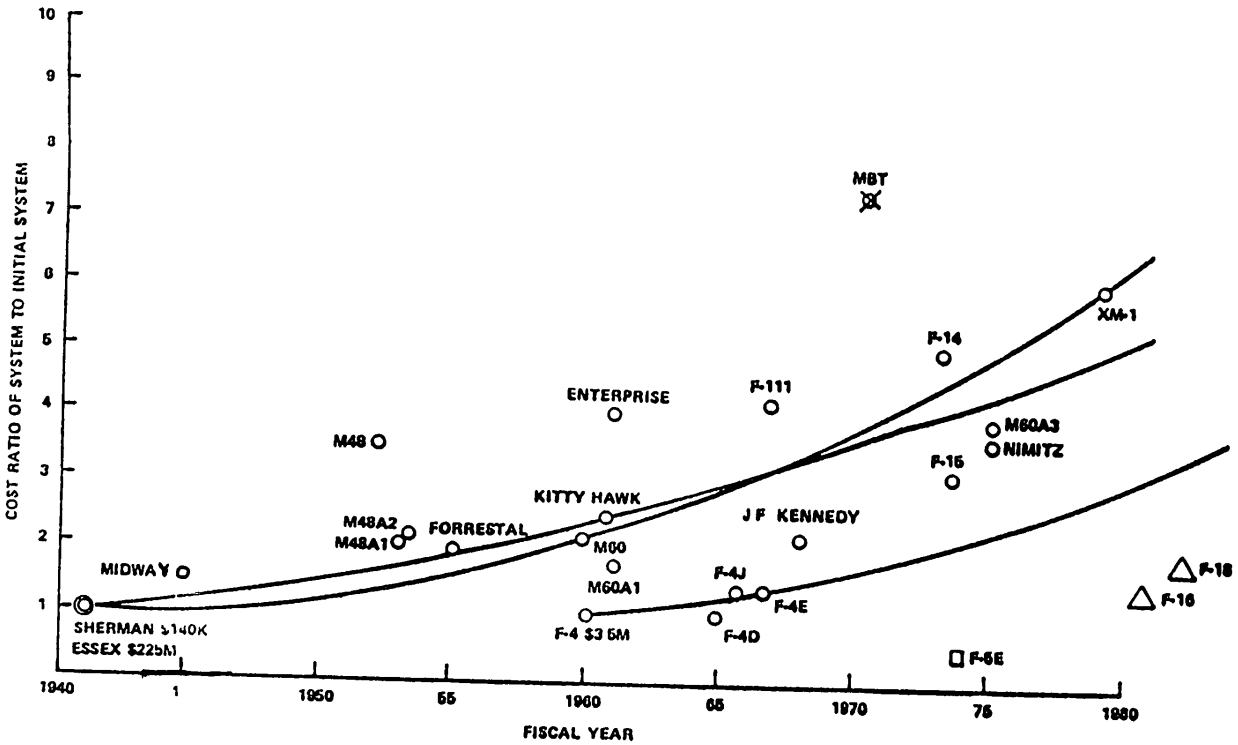
The rising costs of new weapons place great strain on the military establishments and economies of supplier states and recipients Increased costs mean that fewer systems can be purchased to fulfill a state's strategic needs Meanwhile, resources are drained from civilian segments of the economy and decision-makers must face a choice of cutting

FIGURE 1[1]



[1]Source U S , Department of Defense, Statement of William Perry, Assistant Secretary of Defense for Research and Engineering, Fiscal Year 1980, (January, 1979), p I-8

FIGURE 2[1]



The trend in procurement costs of weapons systems Examples used are aircraft carriers (indicated by names) tanks (Sherman and M numbers) and fighter aircraft (F numbers) Tank data are for 1 000th unit aircraft data for 100th unit All data are normalized to remove the costs of inflation and quantity changes

[1]Source Jacques Gansler, The Defense Industry (Cambridge MIT Press, 1980), p 16

expenditures for public welfare or accepting higher rates of inflation, potentially damaging to the economy he rising costs of weapons development and production tend to have an ironic impact on global arms production nd transfers One would expect that the value of arms produced and transferred would increase as a result of the upward push of prices for military goods and services Closer examination of the behavior of supplier and recipient states suggests, however, that the upward sloping price curve for armaments, whether purchased for home or foreign consumption, cannot be solely explained by reference to price inflation for arms As the discussion in part one above suggests, world demand for arms remains high despite rising costs It would appear that the demand for arms is inelastic relative to civilian consumer products

If West European states are a guide it would appear that major arms suppliers have sought to control their cost curves either by meeting and even stimulating the demand for arms abroad or by co-development and production accords with other arms producers, including recipient states Increasing sales to other countries has a number of economic benefits It spreads the cost of research, development, and production over a larger number of units, producing downward pressures on the price of a particular weapon system Production schedules can be arranged in more orderly fashion over longer periods of time if domestic and foreign purchases can be balanced aintaining employment also tends to become more manageable

These positive economic effects were very much on the minds of French policy-makers when the surge in French arms exports first began in the 1970s In the wake of the 1968 uprising, the government was forced to cut back defense spending and, specifically, arms procurement in favor of greater civilian and military welfare Table 3 charts the gradual decline in French military spending relative to GNP between 1960 and 1980 Drops in defense spending are particularly noticeable after the close of the Algerian war in 1962 and after the May events in 1968 Defense spending, as a percentage of GNP, steadily fell from approximately 6 2 percent in 1960 to 4 2 by 1969 Even this lower level of defense expenditures could not be sustained after 1968, and it continued to fall, first precipitately after 1968, and then gradually through most of the 1970s, reaching a floor of 3 4 percent for 1974-1976 he military program voted into law in 1976 envisioned a real increase in defense spending both as a percentage of governmental outlays and of GNP These decisions are evident in the slight upward movement in defense spending since 1976 as a percentage of GNP By 1980, defense spending represented approximately 3 8 percent of GNP It is by no means certain that this level of spending can be sustained in light of high, chronic unemployment, strong inflationary pressures, and a declining franc and balance of trade position Military expenditures as a percent of central governmental spending has not been arrested It has gradually declined from 28 5 percent in 1960 to slightly less than 17 percent by 1980

What is of more interest is the shift within the defense budget between procurement and personnel expenditures During the 1960s, once the Algerian war was terminated and the Fifth Republic cutback in land forces was achieved in favor of smaller armed forces grouped around a nuclear striking capability, French procurement expenditures as a percentage of the military budget continued to rise from a low of 36 2 percent in 1962 to a

TABLE 3

FRENCH DEFENSE BUDGET WITH SELECTED COMPONENTS
FOR PROCUREMENT AND PERSONNEL, AS
A PERCENTAGE OF TOTAL GOVERNMENTAL
SPENDING AND GNP
1960-1980

(in billions of dollars)

Defense Budget

Year	Total (initial)	Procurement	/	Personnel	/	Governmental Total Budget	% of Total Budget	GNP	/ of GNP
1960	3 35	1 21	36 2	2 14	63 8	11 75	28 5	54 03	6 2
1961	3 41	1 15	33 8	2 26	66 2	12 72	26 8	58 79	5 8
1962	3 50	1 17	33 5	2 33	66 5	14 17	24 7	64 81	5 4
963	3 76	1 57	41 8	2 19	58 2	15 73	23.9	73 73	5 1
964	4 02	1 84	45 7	2 18	54 3	17 48	23 0	82 04	4 9
965	4 21	2 11	50 1	2 10	49 9	18 71	22 5	87 71	4 8
966	4 46	2 28	51 2	2 18	48 8	20 46	21 8	94 89	4 7
1967	4 77	2 49	52 2	2 28	47 8	23 04	20 7	103 70	4 6
968	5 06	2 53	50 0	2 53	50 0	25 17	20 1	110 00	4 6
1969	5 08	2 49	49 0	2 59	51 0	28 54	17 8	120 95	4 2
970	4 90	2 31	47 1	2 59	52 9	27 84	17 6	125 64	3 9
1971	5 21	2 37	45 5	2 84	54 5	29 11	17 9	140 81	3 7
972	6 17	2 83	45 8	3 34	54 2	34 86	17 7	171 39	3 6
973	7 81	3 58	45 8	4 23	54 2	44 12	17 7	223 14	3 5
974	7 95	3 55	44 7	4 40	55 3	45 69	17 4	233 82	3 4
975	10 22	4 45	43 5	5 77	56 5	60 47	16 9	300 59	3 4
1976	10 46	4 38	41 9	6 08	58 1	61 17	17 1	307 65	3 4
977	11 89	4 87	41 0	7 02	59 0	68 33	17 4	330 28	3 6
1978	14 99	6 31	42 1	8 68	57 9	88 70	16 9	416 39	3 6
979	18 12	7 83	43 2	10 29	56 8	107 86	16 8	489 73	3 7
1980	20 97	9 44	45 0	11 53	55 0	124 08	16 9	551 84	3 8

Sources for Table 3 There is considerable variation among French official sources and those of other national and international agencies with respect to French spending on defense, the division of expenditures between personnel and capital purchases the total of central governmental spending, and GNP Compare for example these differences in French official sources over a period of five years France, Assemblée Nationale, Commission de la Défense Nationale et des Forces Armées (1977), Avis sur le projet de loi de finances pour 1978, No 3150, Défense Dépenses en capital, pp 13-17, idem, Commission des Finance (1979), Rapport sur le projet de loi de finances pour 1980, No 1292, Défense, Considérations Générales, pp 27, 81, 108-110, France, Sénat, Commission des Finances (1980), Rapport Général Défense, No 98, p 7, and France Ministere de Défense SIRPA Le Budgèt de la défense national pour 1981 (Paris 1981), pp 5-7 Defense expenditures are taken from Rapport No 1292 (1979), p 81 the percentage division between personnel and capital expenditures for 1960-1974 is drawn from Avis, No 3150 (1977), p 17 (initial budget figures) and from SIRPA, Le Budgèt de la défense national pour 1981, for 1975-1980 Central governmental expenditures percentages are taken from Avis No 3150 (1977), p 16 (initial budget figures) for 1960-1974 and from Sénat, Rapport, No 98 (1980), p 7, for 1975-1980 Percentage of GNP spent on defense, calculated in terms of the defense budget, is based on Sénat, Rapport, No 98 (1980), p 7, for 1960-1980 Percentages are rounded to nearest one-tenth of one percent

Exchange rates are taken from International Monetary Fund, International Financial Statistics 1977, XXI, No 5 (May, 1977), pp 166-167 and idem, May, 1981 pp 152 Note discrepancies between IMF figures for GNP and those deriving from French parliamentary sources which are lower The differences are partly due to the different base on which GNP is calculated The parliamentary reports depend on calculations for produit intérieur brut, a formula that generally leads to lower estimates of internal gross national product

Note also that oscillations in the percentage increase in the budget are partly due to the rate of inflation in France and the shifting exchange rate expressed in dollars For example, between 1969 and 1970, defense spending (crédit de paiements) increased from 26 4 to 27 19 billion francs However the rate of the franc declined relative to the dollar and, therefore, the dollar value of defense spending is shown to have fallen This distorted effect becomes especially acute after 1981 because of the devaluation of the French franc

These French sources conflict with other open literature sources for French defense spending GNP and central governmental expenditures Compare with U S , Arms Control and Disarmament Agency, World Military Expenditures and Arms Transfers 1970-1979 (Washington Government Printing Office, 1982), p 38 International Institute for Strategic Studies, Military Balance 1982-1983 (London, 1982) p 124, and SIPRI World Armaments and Disarmaments Yearbook, 1982 (London Taylor and Francis, 1982), p 150 These latter three sources generally cite higher ratios for defense spending relative to GNP and central governmental expenditures than does the French Ministry of Defense or parliamentary reports

For an alternative calculation of defense spending estimates from 1945-1976, see Michel Martin, Warriors to Managers the French Military Establishment Since 1945 (Chapel Hill University of North Carolina, 1981), p 54

high of almost 52 ½ percent in 1967. It is important to note that much of these purchases for new weapons could not be exported since they involved nuclear forces and their support equipment. This placed an added burden on the defense industry in terms of the cost of weapons. Pressures were bolstered, even before the May events swelled them, to find foreign outlets for excess production capacity. Defense Minister Michel Debre cited specifically several of these economic considerations in justifying his determination to increase French foreign arms sales. Arms sales led to a "better balance in scheduling orders, an increase in quantities that are produced, [and] therefore the spreading of fixed costs over a longer series [of units]."[19]

It would appear that not only France but also the principal West European states have adopted a vigorous export policy to control the rising costs of weapons and the burden that they put on defense spending, welfare expenditures, and the efficient management of the arms industry. Except for Italy, all of the states in Table 4 can be seen to have increased arms exports at a faster rate than defense expenditures. While other factors may explain these differential rates than a successful response to global demand for arms, the figures do provide prima facie evidence that cost-cutting considerations formed a part--and in the French case an important part--of the explanation for increased arms production and transfers. British and German defense spending increased by 7% and 8% percent, respectively, while arms deliveries rose 11% and 19% percent in each case. French defense spending approximately doubled during this period while arms transfers increased five-fold. Only Italy shows a net decline in the value of its arms transferred. The high point in transfers was attained in 1972, at the beginning of the period covered in Table 4. Italy has since never been able to reach that level.

There is reason to believe that ACDA's arms transfer figures are deflated. Its estimates for France are well below French parliamentary figures by a ratio of approximately 3 to 1.[20] There is also evidence that British arms transfer data are underestimated by a 2 to 1 ratio,[21] similarly one can suspect that the figures for Italy and Germany are undervalued. Even with ACDA data, however, the more rapid rate of arms transfers over defense spending is evident.

A second strategy adopted by developed state arms suppliers is co-development and co-production to cut national, if not over-all, program costs for new weapons and to assure markets for output through purchases by the armed forces of the producing states. Table 5 lists selected cooperative accords between France and other European states since 1960. France has entered into more of these arrangements than any other member of the Atlantic Alliance. The French example, as the largest arms producer in Western Europe, is in advance of the trend among other West European suppliers which are turning increasingly to joint development and production schemes as a way out of the impasse of high defense costs.

Rising weapons costs appear to have had the same effect on developing as developed states in encouraging indigenous arms production although the economic considerations underlying this expansion are somewhat different than those driving arms production decisions in developed states. Whereas developed states appear initially concerned about holding weapons costs

TABLE 4

DEFENSE EXPENDITURES AND ARMS TRANSFERS
OF SELECTED WEST EUROPEAN STATES
1972-1977[1]
(in billions of current dollars)

	ITALY		FRANCE		UNITED KINGDOM		WEST GERMANY	
	Defense Expenditures	Arms Transfers	Defense Expenditures	Arms Transfers[2]	Defense Expenditures	Arms Transfers	Defense Expenditures	Arms Transfers
1972	4 2	19	10 0	8	9 3	46	12 7	32
1973	4 4	12	10 8	1 2	10 0	6	14 1	12
1974	4 8	10	12 0	1 4	11 1	55	16 1	21
1975	4 9	7	13 6	1 9	11 9	53	17 5	42
1976	5 0	14	14 9	2 4	13 0	68	18 4	70
1977	5 7	14	16 5	3 0	13 5	88	19 4	90
1978	6 2	15	18 6	3 8	14 6	1 2	21 4	95
1979	7 2	11	121 0	4 8	16 5	1 0	23 7	93

[1]Source U S Arms Control and Disarmament Agency, World Military Expenditures and Arms Transfers (Washington, D C , 1982), pp 58-59, 63, 80, 100-101, 105, 122,

[2]Note that figures for French arms exports are derived directly from French parliamentary reports and subsequently translated into current exchange rates For French figures see France Assemblée Nationale, Commission des Finances, de l'Economie Generale et du Plan Rapport sur le projet de loi de finances pour 1981, No 1976, Défense, Dépenses en Capital October 9, 1980 p 196 and International Monetary Fund International Financial Statistics 1977, XXI, No 5 (May 1977) pp 166-167 and ibid May, 1981 p 152 Slight differences in citations between table and sources are due to rounding

SELECTED JOINT MILITARY DEVELOPMENT AND PRODUCTION PROGRAMS
BETWEEN FRANCE AND OTHER EUROPEAN STATES

ROGRAM	COOPERATING NATIONS	MAJOR CONTRACTORS	CONTRACTED OR START OF STUDY	SERVICE
Transall(transport)	West Germany(G)	Nord Aviation, MBB(G), Fokker(N)	1959	Army/Air Forc
lantique (marine patrol aircraft)	West Germany(G) Great Britian(GB) Belgium(B), Netherlands(N)	Bréguet, Sud-Aviation Dornier(G) Rolls Royce(GB), ABAP(B), Fokker(N)	1960	Navy/Air Forc
awk SAM ssile	Italy(I) G B, N	Consortium under SETEL grouped around Thomson-Houston	1960	Army
rtel ASM anti-dar(AS 37) IV uided version(AJ168)	GB	Matra and Hawker-Siddeley	1963	Air Force/ Navy
lan ti-tank missile	G	Euromissile(composed of Aérospatiale and MBB)	1964	Army
t	G	Euromissile	1964	Army
land I(clear ather) and II all weather)SAM	G	Euromissile	1964	Army
guar dual purpose aining and attack aircraft(various dels)	GB	SEPECAT, grouping British Aircraft Corporation(BAC) and Dassault-Bréguet motors by Rolls-Royce and Turboméca	1964	Air Force
licopters Puma[2] Gazelle Lynx	GB	Puma/Gazelle Aérospatiale and Turboméca, Lynx(Westland and Rolls Royce)	1967	Air Force/ Army
Exocet[2] AM 38 and 39,air-to-surface(ASM) naval missile	GB	Aérospatiale, BAC Hawker-Siddeley	1967	Air Force (AM 39) Navy (AM 38 AM 39)
ha-Jet	G	Dassault-Bréguet and Dornier(airframe), SNECMA, Turbomeca,MTU and KHD (motors)	1969	Air Force
tomat(SSM ASM) several successive rsions)	I	Matra, Thompson CSF, Thomson-Brandt, Turboméca SNPE, Oto Melara	1969	Navy

O-ASSM	G	Euromissile	1977[3]
AH-2/HAC licopter	G	Euromissile	1978[3]
S-2L, ASM	G	Euromissile	1978[3]
pard/AMX O Tank	G	GIAT, Krauss-Maffei & Krupp	1980[3]

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ource Various sources have been consulted Most important is the annual review of world armaments, issued by the Stockholm International Peace Research Institute, (SIPRI) , World Armaments and Disarmament The SIPRI Yearbook, 1962-1980, Jane's All the World s Aircraft (London MacDonald 1959-/5) Defense Marketing Systems, Foreign Military Markets France (Greenwich, Conn) and France, Assemblée Nationale, Commission de la Défense Nationale et des Forces Armées Avis sur le projet de loi de finances pour 1975 Défense Dépenses en capital, No 1233, pp 93-96

The sources are not always clear on these two points, the official accord between governments and the start of study and design of the project by one or more states

Design is French production essentially licensed by France to Great Britian

These projects are in the development stage

down, developing states appear more focused on the problem of acquiring weapons and technical know-how despite low hard-currency reserves and, except for oil producing states, an unfavorable position in world trade Although most developing states do not enjoy a high standard of living, their demand for weapons, including nuclear technology and fissionable materials, steadily grows Professor Yehezkel Dror also argues persuasively that the Third World demand for conventional and nuclear arms can be expected to grow in the immediate future even at the expense of domestic welfare and economic growth [22] In the short-run, however, the foreign reserves of a developing state is one of the principal restraints on its capacity to acquire arms As one study of Indian defense policy recently observed

> The dependence of defence production on foreign exchange is only about 10 percent of the total defence expenditure But since about 70 percent of the defence expenditure goes to Pay and Allowances, and Provisions and Stores, the actual dependence relative to the total allocation for the manufacture of weapons and equipment was consequently much higher And although steady advances had been made since 1964 in reducing external dependence on both components and technical know-how, the accelerating pace of development in military technology abroad made such dependence inevitable for the indefinite future [23]

An arms industry is viewed as a means to relax the constraints of inadequate foreign reserves It is seen as a reliable source of supply and as a mechanism for preserving and even improving a state's precarious balance of payments position The problem of high unit costs of production, which more advanced supplier states confront, does not appear as a deterrent to developing states The number of producing states, as noted earlier, have approximately doubled since 1970

The capability of these states to free themselves increasingly of exterior dependency appears to be growing Table 6 classifies the 28 arms producing states listed in Table 2 according to the developmental stage that each has reached along a scale of six levels of increasingly independent arms development and production capability between 1970 and 1980 The growth in indigenous arms production capabilities is impressive The development is across all major weapon systems, including aircraft, armored vehicles, tactical missiles, and naval vessels

Notable are the number of states that have reached the fourth stage of system modification and reverse engineering over the ten year period The acquisition and development of technical skills at this level position these states in the next decade to become almost totally independent in producing selected weapons although they are likely to remain dependent on technology transfers in highly specialized and advanced fields, like fighter aircraft, particularly engines and avionics, electronics, and computers Independent R and D and production capabilities have been achieved in only one area, tactical missiles Brazil has achieved this status in surface-to-air and air-to-ground missiles, Argentina in air-to-ground missiles, Israel in air-to-ground, surface-to-surface, and, with

Taiwan, in anti-tank missiles

Developing states are also insisting on various licenced agreements and an access to advanced technology as parts of their contract to purchase weapons Table 1 lists the license accords in force between several developing states and developed state suppliers Such arrangements are clearly on the rise from what was the pattern in the 1960s when most arms sales were restricted to the sale of end items This trend is likely to continue into the 1980s as recipient states insist on access not only to arms but also to increasingly more advanced military technology As these contractural relations are institutionalized, the developing states can be expected to move further along the way toward weapons independence, at least in areas of low or medium technology New producing centers can also be expected to join the ranks of developed states

The ironic outcome of this process of acquiring more know-how is that developing state producers will gradually confront the same cost problems and very likely begin to seek similar solutions through increased export and joint development and production arrangements in imitation of the developed states before them Advanced weapons producers in the developing world, like Israel, Brazil, and India, are already facing these choices and appear to be adopting the same strategies as the West European states and, to some extent, the superpowers as well in searching for export outlets and in insisting on expanded joint military and civilian ventures to compensate for arms purchases Increasingly, Ministers of Economics and Finance are joining Ministers of Defense and Arms Production in these discussions

An additional trend that may reinforce an increase or a bolstering of national arms producing centers is the progressive diversification of supply sources More states than ever before since World War II appear to be consciously attempting to avoid being dependent on any one state or small group of states[24] This trend will tend to open new outlets for an increasing number of suppliers who will be eager to service these markets and to encourage the extension of this diversification process so profitable to arms suppliers pressed to maintain their arms industrial complexes

Market and Developmental Incentives to Produce and Transfer Arms

Until now, the discussion has concentrated on the derivative economic incentives arising from strategic-political determinants of arms production and on how these economic considerations are gaining ascendancy in the calculations of national decision-making bodies Arms production and transfers can also be viewed as a good or service that can be bought and sold like any other economic product In greater or lesser measure it would appear that developed state suppliers view arms sales in this light The French are perhaps the most unambiguous about treating arms as a commodity and vehicle of economic exchange Weapons production and sales have progressively assumed a life of their own detached from the political or strategic objectives that may have initially prompted a decision to develop weapons indigenously Under this guise, arms are not tools of national defense but goods and services whose sale is beneficial for national welfare, economic growth, and high employment as well as for personal and corporate profit

TABLE 7[1]

LICENCED ARMS PRODUCTION ACCORDS ACQUIRED BY DEVELOPING STATES, 1970-1980[1]

	1970-80			
	Aircraft	Naval Vessels	Armored Vehicles	Tactical Missiles
Argentina	2	4	2	
Brazil	6			1
Chile		1		
Egypt	2			1
India	7	1	1	1
Indonesia	3	1		
Israel		1		
North Korea	1			
South Korea	4		1	
Libya	1			
Mexico		1		
Nigeria			1	
Pakistan	2		1	1
Peru		1		
Philippines	1			
South Africa	2	1	1	1
Taiwan	4			1
TOTALS	35	11	7	6

[1] SIPRI, World Armaments and Disarmament (Cambridge Oelgeschlager, Gunn, and Hain, 1981) pp 252-257

If domestic spending for arms is combined with arms deliveries, we can gain some notion of the over-all importance of arms production to the French economy These totals are likely to underestimate the economic impact of arms production since precise data are not publicly available with respect to the contribution of the arms industry to each sector of the French economy or to the economy as a whole Table 8 combines domestic and foreign demand for French arms and relates arms deliveries to business turnover By these measures of business turnover in arms production, the value of arms produced for sales to French and foreign armed forces doubled from $3 63 billion in 1972 to $7 86 billion in 1977, a rate faster than the index of industrial prices during the same period Also revealing is the increasing proportion of French arms exports to business turnover In 1972, this ratio stood at 22 0 percent and increased steadily at approximately three percentage points a year to 38 1 percent in 1977

The gradual replacement of foreign sales for domestic demand may also be measured by the ratio of arms deliveries to the procurement budget of the defense budget from 1972 through 1977 This ratio more than doubles over this period In 1972, the ratio stood at 26 3 percent Five years later the ratio of arms sales to domestic demand grew to 61 4 percent The implications of these measures is clear enough While the size of the arms industry has remained relatively static over the past twenty years, the proportion of the industry's resources devoted to export has progressively grown each year

Table 9 relates the business turnover figures calculated in Table 8 to GNP Arms production represented approximately 2 12 percent of GNP in 1972, it slowly rose to 2 38 percent by 1977 As these figures suggest the rate of increase in value for arms production was greater than the growth in GNP During this five year period, the value of arms production in current prices increased by 117 percent, GNP rose only 93 percent Not only is France's trade position significantly dependent on arms export, but domestic production and employment are tied more tightly than ever to arms production

Table 10 presents several revealing measures of the importance of French arms sales to the French economy Arms transfers have grown from three percent of over-all imports in 1972 to 4 6 percent in 1977 This is a substantial and growing proportion of French trade Arms are not merely a supplement to the defense budget, offsetting the high cost of weapons development and production, they are integral components of France's competitive position in international markets The importance of this rising dependence on arms transfers is accented by France's over-all dependency on international trade to sustain economic growth In 1955 trade represented approximately 20 percent of GNP, twenty years later, one-third of France's GNP was trade related

Viewed from the perspectives of oil imports and balance of payments, arms exports are also key elements of French prosperity The cost to France of oil more than quadrupled between 1972 and 1977, rising from $2 7 billion to $11 9 billion in 1977 Arms sales covered approximately 30% of French oil imports in 1972, this percentage fell to a low of 14% in 1974, and rose again to 25% in 1977 The jump in oil prices, however, required a rapid

TABLE 8[1]

ESTIMATED BUSINESS TURNOVER FOR FRENCH ARMAMENT INDUSTRY
1972-1977
(in billions of dollars)

	1972	1973	1974	1975	1976	1977
1 Domestic Procurement	2 83	3 58	3 55	4 45	4 38	4 87
2 Delivery of arms to other states	80	1 175	1 386	1 944	2 435	2 992
TOTAL 1 and 2	3 63	4 755	4 936	6 394	6 815	7 862
Percentage of arms sales to business turnover	22 0	24 7	28 1	30 4	35 7	38 1
Percentage of arms sales to domestic procurement	28 3	32 8	39 0	43 7	55 6	61 4

Source France, Assemblée Nationale, Commission de la Défense Nationale et des Forces Armées, Avis sur le projet de loi de finances pour 1978. Défense. Dépenses en capital. 11 October 1977, and France, Assemblée Nationale, Commission des Finances de l'Economie Générale et du Plan (CFEGP), Rapport sur le projet de loi de finances pour 1980. Défense. Considérations Générales, no 1292 2 October 1979 Exchange rates from International Monetary Fund, International Financial Statistics, 1977, XXI, no 5 (May 1977), pp 166-7, and (May 1981), p 152

TABLE 9[1]

BUSINESS TURNOVER FOR ARMS AS A PERCENTAGE OF GNP
(in billions of dollars)

	1972	1973	1974	1975	1976	1977
Business Turnover	3 63	4 755	4 936	6 394	6 815	7 862
GNP	171 39	223 14	233 82	300 59	307 65	330 28
Percentage	2 12	2 13	2 11	2 13	2 22	2 38

1 Source See Tables 8 and 3

TABLE 10[1]

ARMS TRANSFERS RELATED TO EXPORTS, OIL IMPORTS AND COMMERICAL BALANCES

(in billions of dollars)

	1972	1973	1974	1975	1976	1977
PORTS	26 43	36 48	46 16	53 01	57 16	64 97
rms deliveries/Exports	3	3 2	3 0	3 7	4 3	4 6
L IMPORTS	2 7	3 5	9 8	9 7	11 5	11 9
Arms deliveries/Oil imports	29 6	33 6	14 1	20	21 2	25 1
PORTS	27 0	37 55	52 84	53 94	64 46	70 50
lance Exports and ports	- 57	-1 07	-6 68	- 93	-7 30	-5 53
Arms Sales	80	1 175	1 386	1 944	2 435	2 992
ficit without rms Sales	-1 37	-2 245	-8 066	-2 874	-9 735	-8 522

Source France, Assemblée Nationale, Commission de la Défense Nationale et des Forces Armées, Avis sur le projet de loi de finances pour 1978. Défense. Dépenses en Capital, 11 October 1977, and France, Assemblée Nationale, Commission des Finances de l'Economie Générale et du Plan (CFEGP), Rapport sur le projet de loi de finances pour 1980. Défense. Considérations Générales, no 1292, 2 October 1979 Exchange rate export, import, and oil import data drawn from International Monetary Fund, International Financial Statistics, 1977, XXI, no 5 (May 1977), pp 166-7, and (May 1981), p 152

expansion in French arms sales merely to maintain the ratio of arms deliveries to oil imports of the pre-oil crisis period While civilian goods and services certainly contributed their share to conserving oil imports arms sales comprised a larger proportion of the increase Similarly arms deliveries account for a notable share of France's efforts to maintain an equilibrium in trade As Table 10 suggests, France's trade balances would have been sizeable if it had not been able to step up its arms deliveries In the absence of arms deliveries, deficits in 1972 might conceivably have risen from $570 million to $1 37 billion, in 1977 the rise in deficits might have increased from $5 53 billion to $8 52 billion

Two other features of French arms transfers also bear notice These refer to the contribution of arms transfers to total capital exports and to the geographic distribution of French deliveries During the 1970s French arms sales provided significant impetus to the expansion of France's capital goods exports Over-all capital exports are estimated to have increased by 48% between 1974 and 1976 while arms deliveries expanded by 75%.[25] These percentages suggest the weaker competitive position of France's civilian capital goods industry relative to its principal competitors within the OECD Arms deliveries, moreover, account for a significant share of France's trade with the developing world In 1970, less than 50 percent of French arms deliveries were outside the Atlantic community and Europe By 1976, the proportions had significantly shifted to 15 percent with the developed world and 85 percent with developing countries.[26] Within this latter sector, it was not surprising to discover that some of the largest gains in trade were with oil producers The first major breakthrough occurred with Libya in 1970 with the sale of 110 Mirage aircraft to the Kaddafi regime This spectacular sale was followed by others to Saudi Arabia and Iraq throughout the 1970s and into the 1980s

The French success in selling arms and military technology can be attributed to several market-related factors besides the attractive price tags associated with French arms and the concessionary financial arrangements and compensations often included in contracts for French arms American preoccupation with the Vietnam war during the 1960s opened new markets for French arms orders as American arms production was geared to the war and to the needs of selected allies French arms merchants, encouraged and abetted by governmental officials, were quick to fill growing world demand Other potential competitors, like Great Britain, West Germany, and Japan, were either unable or unwilling to fill the void The British government under Labor Party rule in the 1960s hesitated to increase foreign arms sales and relinquished its place as the third largest arms seller to France by the end of the 1960s West Germany and Japan had developed a profitable export industry based on civilian goods As defeated powers in World War II, expanding arms production would have opened their governments to charges of militarization from domestic and foreign critics

The success of French arms, particularly Mirage aircraft in the 1967 Arab-Israeli war, further promoted sales On the other hand, the weakness of French exports in non-military sectors, relative to its OECD competitors, encouraged increased reliance on military sales Of particular interest to the French was the sale of capital goods, like heavy complex armaments, whose added domestic value was high relative to consumer

products or semi-processed goods Also the employment opportunities, afforded arms sales for highly skilled, technical personnel, were considerable These varied economic and political factors gave France a comparative advantage in selling arms abroad

The size of the defense industry, measured by personnel, remained substantially stable from the late 1960s into the 1980s despite a decreasing demand for procurement by French military forces and continued social and potentially disruptive demands for increased social expenditures, economic growth, and full employment The arms industry employs approximately 300,000 scientists technicians, and workers and this number has not appreciably changed over the last decade The proportion of this work force devoted to arms sales abroad has of course increased as the French arms industry becomes more export dependent For French planners, arms sales were progressively viewed as a support for output that could not otherwise be sustained by domestic demand and as a complement to sagging civilian sales abroad Producing arms is an instrument of economic and social welfare Arms also act as product leaders to expand trade abroad and to open markets for civilian goods and services

The French case suggests that the economic notion of comparative advantage still operates in arms production as in civilian economic endeavors It is by no means restricted to French arms since other states besides the superpowers have been able to carve out selected markets for their specialized products among developing states, Israel, Brazil, and, to a lesser extent, India, have enjoyed some success as arms suppliers Israel has reached world stature as a supplier of quality products, some indigenously produced, like the Gabriel surface-to-surface missile, or adapted from the technology of its suppliers, like the Kfir fighter, patterned after the French Mirage airframe and powered by US-built GE engines

Israel sells military arms and equipment to a wide range of customers, including West Germany, Indonesia, South Africa, Singapore, Taiwan, Chile, Ecuador, Mexico, Honduras, Guatemala, and, until recently, Nicaragua It has reportedly sold war materiel to Iran although diplomatic relations between the two states have been severed It also produces civil aircraft, all forms of tactical missiles (listed in Table 2), patrol boats, armored vehicles, artillery and small arms, radar, communication, and navigation systems, industrial and shipborne monitoring and control systems, medical electronics, microelectronics, computers and computerized communications systems, fire control systems, security systems, air and ground crew equipment, ground-support equipment and mirowave components[27] ACDA lists exports of[28] $250 million for 1979, a figure that is likely to be conservative

Brazil has also captured markets in the Middle East and Africa and must be considered an important arms supplier In the Middle East, it has sold equipment, especially light armored vehicles, to Libya, Qatar, and Iraq The Cascavel, a light armored vehicle that mounts a 90 mm cannon and carries laser range -finders, has seen service with Iraqi armed forces in the war with Iran Brazil's state-owned Empresa Brasileira de Aeronautica (Embraer) is the world's sixth largest aviation firm It sells the twin-engine Bandeirante aircraft worldwide and also manufactures the

Xavante jet under Italian license Brazilian arms are also attractive to developed states The United States Marines are studying a Brazilian light tank for possible purchase, and France has already purchased Brazilian light transport aircraft for its armed forces Brazil is likely to continue to invest in its arms industry in the future As one close student of Brazilian politics and foreign and security policy observes

> Brazilian arms are especially attractive to third-world countries since they are comparatively simple, high quality, and free of ideological ties Because of the growing demand for Brazilian arms, and given that Brazil must increase exports to compensate for rising petroleum prices, the state continues to assign a high priority to investment in what already is the largest and most sophisticated conventional-weapons industry in South America As a major arms supplier, Brazil will be able to exert greater pressure on its neighbors and to increase its influence in the emerging commercial markets of black Africa, the Middle East, and Asia[29]

From two opposing viewpoints--developed state suppliers and emerging developing state arms producers--there appear to be attractive economic gains to be made from producing and selling arms For the established supplier, like France, there is a comparative advantage to selling military hardware and technology over other possible investment possibilities For the emerging arms producer, there may also be gain to be had in reducing the loss of foreign reserves and in penetrating markets previously held by more traditional suppliers These real and perceived economic benefits derive from a logic driven either by the notion of bounded rationality (where strategic-political considerations frame techno-economic decisions) or market and developmental economics (where welfare and profit are the predominant motivations)

There is much force in the argument that spending resources on arms reduces what can be devoted to welfare, and there is considerable documentation comparing expenditures for both objectives[30] However, this relationship is far from being a zero-sum game as perceived by national decision-makers concerned with security and welfare problems[31] As this paper has suggested, there are powerful economic and technological incentives that prompt decision-makers to invest in arms production At least in the short and middle term, marginal gains appear to be forthcoming, justifying the original investment It does little good to argue with the leadership of these national production centers that they are wasting national resources, much less does the argument cut that global resources are being squandered with the result that regional and world tensions are likely to rise These considerations apparently have lesser weight when one examines the specific decision taken by decision-makers at the national level where resource allocation goes on Announced commitment to arms control goals or to a decrease in arms traffic are repeatedly subordinated by arms producing states to the continued expansion of military production and transfers The effort of the Carter administration to cut American arms transfers had already failed before the Reagan regime further relaxed barriers to sales abroad The Giscard d'Estaing government and the succeeding Socialist regime in France, while both deploring arms

transfers, have presided over the greatest expansion of arms transfers in France's history Neutralist governments in India and Brazil, while critical of superpower arms policies, are committed to the expansion and improvement of their arms producing and marketing capabilities India integrates economic and military planning, going further than some non-western states The Brazilian leadership is no less bent on a policy of military and economic independence, however doubtful or illusory that goal may appear [32]

Some analysts in the developing world are prepared to argue that economic development can actually be spurred either as a spin-off of military preparedness or further, as a direct result of military expenditures The welfare-defense debate may be characterized in these terms If the predominant opinion within India still views defense spending as an economic burden, influential segments of the security community promote military expenditures and arms production as complements of civilian economic development or as a motor-force of the civilian economy [33]

From a political and psychological perspective, the economic claims of these schools of thought are not especially relevant What counts as much, if not more than real economic benefits, in determining resource allocations favoring arms production is the <u>perception</u> of economic and technological gain Further research will be needed to determine the validity of the economic claims of supporters of increased defense spending and arms production as well as the political strength of these advocates at the national level If the upward increase in global military spending, especially on the part of developing states is any guide, and if reference to specific case studies of the behavior of national leaders in Western Europe, Israel, Brazil, and India are any indication, the argument that one must sacrifice welfare for military prowess and vice versa is by no means universally accepted Many go beyond the guns-butter trade-off and argue more butter <u>because of</u> guns

<u>Conclusions</u>

An examination of prevailing trends in arms production and sales and of the behavior of elites concerned with arms production, purchases, and sales suggests that economic and technological variables play a significant role in explaining the continued expansion of activity in these domains Strategic-political factors while important, are insufficient to explain this upward movement Public welfare and corporate and personal profit are also driving military-industrial complexes forward We need to know more about how these techno-economic forces are shaping arms production and sales We also need to know more not only about how welfare and military expenditures are related but also how decison-makers perceive this relationshp There still exists a great deal of uninformed and wishful thinking about economic development and military expenditures Unless we make greater progress in determining this relationship, we will be hampered in fashioning policy tools to control the diffusion of arms and military technology A long and hard look at the economic and technological determinants of arms production, transfers, and accumulation, free from ideological barriers to precise analysis appears overdue

FOOTNOTES

1 Andrew Pierre, The Global Politics of Arms Sales (Princeton Princeton University Press, 1982) See also his article, "Arms Sales The New Diplomacy," Foreign Affairs, LX No 2 (Winter 1981-1982), 266-286

2 Michael Moodie, "Defense Industries in the Third World Problems and Promises," in Arms Transfers in the Modern World, eds Stephanie G Neuman and Robet E Harkavy (New York Praeger, 1979, p 300

3 Most of the writers in the Neuman-Harkavy reader on arms transfers, for example, accent strategic-political explanations of arms transfers See Ibid

4 Raju G C Thomas, The Defence of India (Delhi Macmillan, 1978) p 135

5 For an initial effort to model the economics of arms production transfers, and acquisition, see Arthur Alexander, William P Butz, and Michael Mihalka, Modeling the Production of International Trade of Arms. An Economic Framework for Analyzing Policy Alternatives, Rand Corporation, Santa Monica, California, March, 1981, p 1

6 These measures are elaborated in Edward A Kolodziej and Robert Harkavy, "Developing States and the International Security System," Journal of International Affairs, XXXIV, No 1 (Spring/Summer, 1980), 59-87

7 The Stockholm International Peace Research Institute (SIPRI), World Armaments and Disarmament. 1978 (New York Crane, Russak, 1978), pp 238-253

8 Andrew L Ross, Arms Production in Developing Countries. The Continuing Proliferation of Conventional Weapons, No N-1615-AF, Rand Corporation Note, Santa Monica, California, 1981, pp 16-19

9 Argentina, Brazil, Egypt, India, Indonesia, Israel, North Korea, South Korea, Libya, Nigeria, Pakistan Peru, Philippines, South Africa, Taiwan, Thailand

10 Argentina, Bangladesh, Brazil, Columbia, Dominican Republic, Egypt, Fiji, Gabon, India, Indonesia Israel, Ivory Coast, North Korea, South Korea, Malagasy Republic (Madagascar), Malaysia, Mexico, Peru, Philippines, Singapore, South Africa, Sri Lanka, Taiwan, Thailand, Venezuela

11 Argentina, Brazil, India, Israel, South Korea, South Africa

12 Argentina, Brazil, Egypt, India, Israel, South Korea, Pakistan, South Africa, Taiwan

13 Brazil, India, Israel, South Africa, and Taiwan

14 Argentina, Brazil, Egypt, India, Israel, Pakistan, Taiwan

15 See articles on these three states, respectively, by Professors David Myers, Stephen Cohen, and Edward Milenky, in Security Policies of Developing Countries. A Comparative Approach, eds Edward A Kolodziej and Robert Harkavy (Lexington Lexington Books, 1981)

16 For a useful review of developing state nuclear programs, consult John Kerry King, ed International Effects of the Spread of Nuclear Weapons (Washington, D C Government Printing Office, 1979)

17 P L Sintra and R R Subrahmanyam, Nuclear Pakistan (New Delhi Vision Books, 1980)

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19 Ministere de Defense, Livre Blanc sur la Defense Nationale, I (Paris, 1972), p 54

20 See the author's comparison of ACDA and French data in the author's "Measuring French Arms Transfers," Journal of Conflict Resolution XXIII, No 2 (June 1979), 195-227 For a review of French arms transfer policy and its economic consequences, consult the author's "France and the Arms Trade," International Affairs (January 1980), 54-72

21 This conclusion is suggested by Laurence Freedman in "British Foreign Policy to 1985 IV Britain and the Arms Trade," ibid (July 1978), 377-392

22 Yehezkel Dror, "Nuclear Weapons in Third-World Conflict," in Adelphi Papers No 161, The Future of Strategic Deterrence (London International Institute for Strategic Studies, 1980), Part II, pp 45-52

23 Thomas, pp 110-111

24 See Michael Mihalka, "Supplier-Client Patterns in Arms Transfers The Developing Countries, 1967-76," in Arms Transfers in the Modern World, pp 49-76, p 73 summarizes recent bloc changes in arms supplies and provides evidence for the growing multilateralization of the arms trade

25 See the author's "Determinants of French Arms Sales Behavior Implications for National and International Security," in Threats, Weapons, and Foreign Policy V Sage International Yearbook of Foreign Policy Studies (Beverly Hills Sage, 1980), pp 137-176

26 ibid

27 The list is drawn from Bernard Reich's analysis of Israeli security policy in Security Policies of Developing Countries, pp 216-217

28 ACDA, p 105

29 David J Myers, "Brazil" in Security Policies of Developing Countries, p 69

30 See ACDA and Ruth Leger Sivard, World Military and Social Expenditures 1981 (Leesburg, Va 1981)

31 Stephanie G Neuman, "Arms Transfers and Economic Development Some Research and Policy Issues," in Arms Transfers in the Modern World, pp 219-245, reviews the literature in arms sales and economic development

32 Myers, pp 53-72

33 Thomas surveys these schools of thought pp 125-135 K Subrahmanyam, Defence and Development (Calcutta Minerva, 1973) presents a spirited brief in support of the view that defense spending can contribute to economic development Also relevant are Rajesh K Agarwal, Defence Production and Development (New Delhi Arnold-Heinemann, 1978) and K Subrahmanyam, ed , Nuclear Myths and Realities (New Delhi ABC Publishing House, 1981)