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Development

A Symposium on Research Issues

edited by
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with Valeriana Kallab

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Foreword

The World Bank's business is development. Traditionally, therefore, it has not concerned itself with matters relating to national security and the military. In recent years, however, two trends have combined to raise renewed debate within Bank member countries, and within the Bank itself, about levels of military expenditure (and in some countries also military industries) and their impact on economic development.

First, global political changes and the relaxation of Cold War tensions have held out a prospect--still all too elusive, in the light of post-Cold War nationalist and ethnic tensions--of decreased need for military outlays, especially in areas where regional conflict also had strong Cold War dimensions.

Second, both public and private resources for economic development will continue to be tightly constrained in most developing countries, and in the countries in transition from command economies, throughout this decade. For governments and for the Bank, this prompts a hard look at the adequacy of public money committed to development, and in many countries is already producing an increased readiness to search for economies in non-developmental expenditure--including the military.

The Bank's leadership has underlined the importance of working collaboratively with member governments, and with the IMF, to explore the fiscal and developmental issues involved. Where our borrowers are embarking on reductions in military expenditure or production and seek our involvement, the Bank also stands ready to assist--for example, with programs to facilitate the integration of former military personnel and facilities into the private economy and, on a market-driven basis, the phasing-down or conversion of military industries.

Effective action in the sensitive area between national development and national security demands careful appreciation of the complexities. Military expenditure data are almost always incomplete or misleading. The relationship between military expenditure and economic growth is neither uniform across countries nor monotonic within them. Converting military industries poses

difficult issues of efficiency and industrial policy, as well as social and political problems. And, of course, the internal, regional and international factors driving military expenditure are extremely diverse.

These complexities prompted the Bank to commission the survey papers in this volume, as a contribution to its own thinking and to the wider debate. Given the nature of the Bank's interest, the papers focus specifically on the economic aspects of military expenditure in developing countries. Initial versions were discussed at an international symposium organized by the editor of this volume, Geoffrey Lamb, in Washington in December 1990. They have since been extensively revised, in part to take some account of the rapidity of international developments in 1991 and 1992. This activity was supported by a research grant from the Bank's Research Administrator.



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Nicole Ball, Davidson Sommers Fellow at the Overseas Development Council;

Michael Brzoska, lecturer in International Relations in the Political Science Department of the University of Hamburg and Research Fellow on Wars, Armaments, and Development;

Saadet Deger, Senior Researcher at the Stockholm International Peace Research Institute and leader of the SIPRI World Military Expenditure Project;

Somnath Sen, Senior Lecturer at the University of Birmingham, United Kingdom, and Senior Researcher at the Stockholm International Peace Research Institute; and

Robert L. West, until his death in 1991 Professor of International Economic Relations at the Fletcher School of Law and Diplomacy at Tufts University.

All of those involved in this volume would like to dedicate it to the memory of Robert West, colleague and friend, 1925-1991.

Geoffrey Lamb

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MILITARY EXPENDITURE DATA FOR DEVELOPING COUNTRIES: METHODS AND MEASUREMENT

Somnath Sen

Introduction

Formal research on the impact of military expenditure on economic growth and socio-economic development has been bedeviled by the problems of data. The quantification of the effect of military expenditure on economic development is still a controversial issue, and without a proper data base, the final conclusions remain tentative. For various reasons, including secrecy due to national security concerns as well more fundamental statistical problems, transparency in military expenditure data, particularly in less developed countries, is limited. It is difficult to appreciate why *expenditure* data should be of major concern in the framework of national security. Rather, details on active forces and weapons stocks could have a direct effect on threat perceptions and trigger so-called arms races. Data on expenditure is of more relevance to domestic concerns, particularly in the evaluation of opportunity costs.

Perceptions about the economic burden of militarization are based on statistics; hence it is particularly important that these be of the right order of magnitude and show approximately correct trends. To take one example: according to the Stockholm International Peace Research Institute (SIPRI), military expenditure in the Third World rose rapidly, almost without interruption, in the 1970s and in the first half of the 1980s; it has been declining in the Third World since the mid-1980s. As a proportion of world military expenditure, the share of the Third World rose from 6 per cent in the late 1960s to 18 per cent in the mid-1980s, after which it fell to 15 per cent in 1989. Currently, over 4 per cent of aggregate Third World gross domestic product (GDP) is spent on defense. This economic burden is higher than in most industrial countries. Though defense spending has fallen, except perhaps in Latin America, this decline has not been a result of any arms control agreements or any serious resolution of disputes. Rather, it has been a product of economic problems. Hence the potential for expansion is ever present when economic growth eventually picks up (see Deger and Sen 1990). Such conclusions can only have credibility if the data base is structured on hard information.

Note: The author wishes to express special thanks to Ravi Kanbur, Dan Gillick, and Geoffrey Lamb, as well as to the participants in the World Bank Symposium for comments and helpful suggestions.

It is widely believed that military expenditure (hereafter called MILEX) data is of low quality and based on relatively 'soft' information. Public discussion is negligible--often nonexistent. There is no clear-cut distinction between what is the jurisdiction of military expenditure and what lies in the domain of internal security spending. In countries where the influence of the military establishment is pervasive, often for good reason, the distinction between military and civilian budgetary allocations is even less distinct. Scheetz (1990) puts it scathingly:

The public and their elected representatives must someday arrive at a position where defense questions (especially budgetary aspects) are a matter of public debate, not for back-room secret discussions. After all, countries' potential enemies generally are quite aware of each other's arms stocks and operational capabilities. The silence on budgetary questions is defended by the various armed forces as a question of secrecy. Usually it is simply to keep their citizens in the dark.

In evaluating the quality of defense spending data in less developed countries, three issues should be kept in mind. *First*, questions regarding reliability have been raised about all categories of social and economic data in these countries. In particular, disaggregated data--say, for components of GDP such as agricultural output--are often rough estimates. In highly inflationary economies, price deflators are usually approximate. This is partly due to the structural problems of underdevelopment: the collection and dissemination of information is often related to economic development. Financial information about military activity may be more sensitive but is not necessarily fundamentally different from other types of information. The difference may be one of degree rather than of kind. *Second*, for some countries, particularly in Latin America,

budgetary details are available, provided analysts can dig them out with care. Some countries do not have a general account under the Ministry of Defense, while others appropriate funds in other ministries for purposes that clearly have a military function (such as spending on the paramilitary, or even arms imports). *Third*, secrecy about items of military spending is not necessarily confined to developing economies. An example is given by Neild (1981) about nuclear weapons purchase and installation in the United Kingdom: "Recently, expenditure of 1,100 million on Chevaline, the multiple warhead developed by Britain for her Polaris missiles, was concealed, making it the largest matter in recent years not to have gained mention in the annual defense estimates." However, the level of independent scrutiny is much lower in less developed countries, making it more difficult to identify *ex post* such missing items.

The purpose of this paper is to evaluate the problems with military expenditure data and the methodology employed by the collecting institutions (for useful background information, see Appendix, pp. 147-51). A primary objective is to identify gaps and to suggest research areas where positive changes can be made. The paper first describes the alternative definitions that have been employed and the various international sources for the data. It next deals with four major issues that need to be analyzed if a proper evaluation and use is to be made of the information. The paper then analyzes the use of data in the evaluation of the opportunity costs of military spending, and it concludes with suggestions for further research.

Definitions and Sources

The main purpose of military expenditure data, whatever the source, is to provide an easily identifiable measure, over time, of the scale of resources absorbed by the military in various countries. This objective of producing

an *input* measure is not to be confused with that relating to the *output* of the defense sector, such as military strength or national security. Expenditure data is only indirectly and informally related to military capability, although it can be utilized to judge the perceptions of governments towards defense and military strength. This makes it more amenable to economic analysis--although formidable problems remain regarding a proper measure of opportunity costs.

Two basic definitions exist for MILEX. The IMF definition, which is the most explicit, describes defense as covering:

all expenditure, whether by defense or other departments, for the maintenance of military forces, including the purchase of military supplies and equipment (including the stockpiling of finished items but not the industrial raw materials required for their production), military construction, recruiting, training, equipping, moving, feeding, clothing and housing members of the armed forces, and providing remuneration, medical care, and other services for them. Also included are capital expenditures for the provision of quarters to families of military personnel, outlays on military schools, and research and development serving clearly and foremost the purposes of defense. Military forces also include paramilitary organizations such as gendarmerie, constabulary, security forces, border and customs guards, and others trained, equipped and available for use as military personnel. Also falling under this category are expenditures for purposes of strengthening the public services to meet wartime emergencies, training civil defense personnel, and acquiring materials and equipment for these purposes. Included also are expenditures for foreign military aid and contributions to international military organizations and alliances. This

category excludes expenditures for non-military purposes, though incurred by a ministry or department of defense, and any payments or services provided to war veterans and retired military personnel.

The NATO definition is similar--though more vague:

the following items are included: all current and capital expenditure on the armed forces, in the running of defense departments and other government agencies engaged in defense projects as well as space projects; the cost of paramilitary forces and police when judged to be trained and equipped for military operations; military R&D, tests and evaluation costs; and costs of retirement pensions of service personnel, including pensions of civilian employees. Military aid is included in the expenditure of the donor countries. Excluded are items on civil defense, interest on war debts and veterans' payments.

There are two basic differences--one a matter of interpretation, the other substantive. The status of foreign military aid received is rather unclear in the IMF definition, and it may or may not be included in country submissions to the Fund. More important, the IMF definition, based on national account practices, excludes military pensions, since this is a transfer payment. Yet when one calculates the burden of defense spending, the weight of military pensions is borne by the civilian economy. The same problem arises regarding some war-related expenditures for veterans' payments and interest on war debt. Both definitions exclude these and have the merit of consistency in terms of current costs in an aggregative framework. However, in a two-sector model of an economy, which characterizes the trade-offs between the military and civilian sectors, such expenditures by the military do have real costs. This is

particularly true for the developing world, where over thirty major conflicts raged in 1989.

Increasingly, as discussed later, there are demands for more disaggregated data to conduct proper economic analysis. The United Nations (1986) gives the most detailed disaggregated categorization in terms of three major groups: operating costs, procurement and construction, and research and development. Member countries are asked to fill out details of financial expenditure in each category and to submit these to the U.N. Reduction of Military Budget Programme. The U.N. groupings are as follows:

A. Operating Costs

- (1) *Personnel*: a) conscripts, b) other military, c) civilian;
- (2) *Operations and Maintenance*: a) current-use material, b) maintenance and repairs, c) purchased services, d) rent, e) others.

B. Procurement and Construction

- (1) *Procurement*: a) aircraft and engines, b) missiles, including conventional warheads, c) nuclear warheads and bombs, d) ships and boats, e) armored vehicles, f) artillery, g) other ordnance and ground force arms, h) ammunition, i) electronics and communications, j) non-armored vehicles, k) others;
- (2) *Construction*: a) airbases, b) missile sites, c) naval bases, d) electronics etc., e) personnel, f) medical, g) training, h) warehouses and depots, i) command, administration, j) fortifications, k) shelters, l) lands, m) others.

C. Research and Development

- (1) *Basic and applied*;
- (2) *Development, testing, and evaluation*.

An alternative, following the U.S. grouping, is to have: **Military Personnel;**

Operations and Maintenance (which includes civilian pay); **Weapons Procurement; Construction; Research, Development, Testing, and Evaluation (RDT&E)**. The first two roughly measure operating expenditure, while the remainder measure 'investment' in forces. The disaggregation employed by NATO in revealing financial data corresponds to expenditures on personnel, equipment, infrastructure, and other operating expenditure (which includes R&D not provided separately).

The U.N. definition of disaggregation is preferable, since it clearly distinguishes among the three functional categories that have specific opportunity costs: manpower and operational items, investment in weapons and current assets, and investment for the future. Discussions on resource re-allocation should be based on such divisions, even though financial resources are largely fungible. The fundamental distinction that must be maintained in data reporting is that between 'operating' and 'investment' (or capital) costs. The former will include all personnel (military and civilian), pensions, as well as operations and maintenance expenditures. The latter includes procurement and additional defense industrial expenses (such as subsidies), as well as military research expenditure. When discussing economic effects, the outcome may be different depending on which category of MILEX—operating or investment—one uses.

Having an appropriate definition clearly does not assure strict adherence to it. Most international sources report official data with modest adjustments. Ultimately, the responsibility to reveal carefully their defense expenditure and its constituent parts rests with governments. There are many reasons why governments may not be honest in revealing their data. Defense adds to security, protects the economy against enemy actions, and in some cases enhances stability, which may be required for development. These may add up

to societal welfare. On the other hand, the withdrawal of resources from more productive spending reduces growth and social welfare. Depending on the nature of society's social welfare function, as reflected in government preference and in terms of public choice, there may be a tendency to overstate or under-report military expenditure. The process is affected by the position of the military in society, the signals sent out to adversaries and allies, as well as technical ability to monitor all avenues of expenditure. The contamination of economic data by the political framework within which military decisions are taken creates major problems for evaluating and filtering the information available.

Six methods are allegedly used to misreveal data: double bookkeeping, excessive aggregation, extra-budgetary finance, unidentified use of foreign exchange, military aid, and defense-related debt burden (see Ball 1984; Deger 1986). Double bookkeeping involves the use of two (or multiple) sets of accounts, so that published budgetary statistics are somewhat different from those used internally by civil servants and politicians. Excessive aggregation (for example, a single line entry) implies that independent scrutiny is impossible. Defense-related spending in other ministries (connected with social security, housing, education, health, developmental expenditures) is then also difficult to extract. Extra-budgetary finance (including offshore accounts) is particularly relevant when the military is heavily involved in the civilian economy. Unidentified use of foreign exchange can occur when a part of government export earnings is not entered into official accounting systems and is then used to import weapons. Military aid may not be reported fully, or it may be obfuscated with economic aid. Interest payments on military-related debt are invariably difficult to trace from the recipient country's budget. However, it should be noted that donor countries that provide military assistance

usually keep better records, and that in principle it is possible to gather these types of information. The recent example of Egypt's repudiation of its military debt owed to the United States after the Gulf crisis (Sen 1991) demonstrates that the values of aid and debt are known—at least for some countries.

Unless detailed records are studied, it is not possible to judge the extent of misrevelation of the data. For most data-collecting organizations, such information (i.e., the accounts of all the relevant ministries) simply is not available. The World Bank and the IMF have better access, but the extent of their coverage is not known to outsiders. A classic example was the World Bank study of Argentina (World Bank 1985), which showed that during the 1970s actual military spending was about 50 per cent higher than that revealed as defense-related expenditure. The Report claimed that:

On a number of accounts, central government defense expenditures through the end of 1982, as shown in official statistics, may have been understated. Reportedly, most military construction and purchases of equipment were classified under economic development, rather than defense. Similarly, some personnel related military costs, such as Treasury transfers to the military retirement fund, the construction of military housing, health care for the military and dependents, etc., were counted as social, rather than defense, expenditures. Finally, some defense expenditures financed out of extra-budgetary military resources (special funds, foreign loans, etc.) may not have been recorded in the budget (World Bank Country Study: Argentina, 1985, p.46).

The three international institutions that regularly publish time series data on military expenditure in developing countries are: the

U.S. Arms Control and Disarmament Agency (ACDA), which publishes *World Military Expenditure and Arms Transfers*; the International Monetary Fund (IMF); and the Stockholm International Peace Research Institute (SIPRI), which publishes its data in *SIPRI Yearbook: World Armaments and Disarmament* (see also Deger and Sen 1991). The ACDA's MILEX data, for "non-communist countries . . . are generally the expenditures of the ministry of defense." Some effort is made to exclude the costs of internal security when these are known. The primary sources are those of the files of U.S. government departments, particularly the Agency for International Development, as well as the IMF. Details of U.S. government-reported raw data are not available. SIPRI data is unique in the sense that it uses open sources alone, and this lends it a rather strong credibility. The primary sources are national budgets (for "large" countries and major powers) and IMF data (for "small" countries or those not considered of strategic significance). Extensive manipulations are made on the primary data, particularly to include estimates of military pensions, spending on paramilitary forces, and the appropriate allocation of foreign aid. A specific, thorny question concerns the appropriate payments mechanism for imported arms: cash, aid, barter, compensatory trade agreements, and debt-creation. *Ad hoc* methods are used to sort out this problem, but it remains unavoidable. The nature of IMF data in the Government Finance Statistics Yearbook is well known and depends on government submissions. The only important point to note is that the Fund provides an element of disaggregation. However, its capital costs probably do not include weapons purchase, since the revealed data does not resemble anything similar to independent information for many countries. This category therefore possibly contains items like construction.

With a few notable exceptions, economic data are mostly taken from the IMF and the World Bank. Information on non-member countries is collected from national sources by SIPRI. In the cases of oil exporters in the Gulf, ACDA uses its own method of estimating GNP. SIPRI provides three annual series: MILEX in current prices; MILEX in constant price and U.S. dollars for a specific year (occasionally updated); and MILEX as a share of GDP. ACDA provides a number of series: MILEX in constant dollars; MILEX in current dollars (both series change in every annual issue due to changes in the base year measurement); and MILEX as shares of GNP and central government expenditures. It is difficult to do long-term time series analysis with ACDA information, but the various series can be chained with some effort.

Finally come the questions of how much distortion there exists (see Blackaby and Ohlson 1982; Brzoska 1981; Goertz and Diehl 1986) and whether the various sources are roughly comparable. Among analysts who do formal models with the data, there is a pessimistic view and an optimistic view. Scheetz (1990) compares his own budgetary search data with international sources and claims: "If one compares the Chilean MILEX figures . . . with the international data sources (U.S. Arms Control and Disarmament Agency, International Monetary Fund, International Institute for Strategic Studies, and the Stockholm International Peace Research Institute) the differences are alarming." On the other hand, Deger (1986) states that: "the *trends* observed for defense spending--whether for major individual countries (in the developing world), or for a cross-section of countries at various periods of time or in different geographical regions--are broadly consistent among different institutions entrusted with preparing the data." By looking at the series appropriately transformed, casual empiricism suggests that there are some differences between SIPRI and

ACDA data. However, regressing one series on another, for a number of countries, reveals that the trends do tend to be similar, although individual country variations could be significant. A general conclusion is that cross-sectional studies, or those using pooled time series/cross-section data, can get relatively robust conclusions. For country studies, more care is needed, unless one is certain of the reliability of the source, and, at the least, extensive sensitivity tests are required by comparing the econometric results from different data sources.

A brief discussion on arms trade data follows (for a detailed evaluation, see Brzoska and Ohlson 1987). SIPRI arms imports data are trend indicator values, which reflect the trends in major weapons transfers to the Third World. These values are constructed from quantitative information on weapons transferred between countries, multiplied by a fixed price vector (dollar values in 1985 prices); they do not represent financial transactions or monies actually paid. The trade is conducted in various ways--sales, barter, gifts, creation of debt, and compensatory trade agreements (CTAs) such as offsets. The data is not designed to show the economic burden or the opportunity costs of such transfers. Its main purpose is to identify aggregate trends in terms of an index that is readily understood.

However, rising (or falling) trends in Third World arms imports do have indirect economic implications, and these can be unraveled by using supplementary economic information (Sen 1991). There are a number of ways in which the data on trends can be interpreted to show economic costs to the recipients in less developed countries.

1. When arms are actually paid for, even at concessional prices, the importers incur costs that have a negative effect on their ability to buy civilian products. Arms imports often compete with those of machinery and

industrial investment goods, whose productivity is particularly high in less developed countries. Overall, they divert scarce foreign exchange away from competing needs.

2. Arms imports exacerbate balance-of-payments problems for less developed countries. At a time of dwindling reserves and harsh stabilization measures to correct for payments imbalances, these macroeconomic costs (in addition to the opportunity costs of trade diversion) could be particularly high.

3. Debts are incurred that may require servicing. It is commonly believed that such debts, incurred on an official basis for political reasons, are not paid back. However, until they are canceled or repudiated, interest payments must continue--and this has an economic cost like any other form of debt servicing.

4. Barter trade does not involve direct costs. However, there are indirect or opportunity costs if the bartered commodity could have been sold in the open international market. Where there are domestic shortages, barter exports (for arms) exacerbate such shortages and create additional difficulties.

5. Even when the arms are given free, there are additional costs of operations and support that inevitably have to be paid by the home government. Econometric analysis shows that military expenditure is positively and significantly related to arms imports for some of the major arms importers. The economic burden of arms-import-induced defense spending needs to be accounted for.

6. Arms imports often lead to the decision of setting up domestic industries to produce armaments. This version of import-substituting industrialization (ISI) is often claimed to have large 'spin-offs' for the civilian sectors. Formal evidence, based on

country studies for some major arms producers, does not show any positive effects. Rather, there may be 'spin-ins' where the civilian sectors are drained of engineering and scientific personnel as well as R&D capacity. Absorptive capacity constraints in less developed countries can be tightened through arms industrialization.

SIPRI maintains transactions information on five categories of weapons: aircraft, armor and artillery, guidance and radar systems, missiles, and warships. The registers and data *do not include* small arms, artillery under 100 mm. calibre, ammunition, support services, components or component technology. Inclusion of an item in the data base depends on whether it is for military application alone. Thus, unarmored military lorries are not included, although armored personnel carriers are included.

SIPRI data on the value of arms transfers tends to underestimate the value of Third World arms imports. This is because it takes into account the transfers of major conventional weapons (and licenses sold for production) but not that of small arms. In addition, it concentrates mainly on armaments purchased by governments and generally leaves out sub-national actors in the trade. Since the data base relies on open sources alone, black-market transactions cannot be recorded.

ACDA records arms trade for all categories of weapons. Its reliability cannot be judged, however, since neither the sources nor the price system is revealed. In general, economic analysis with arms transfer data is difficult for reasons pointed out above. There is, however, a special problem with ACDA data: Soviet and East European arms exports are probably valued at U.S. prices and therefore add a further distortion to the data of importing countries that rely on such imports. If, as widely believed, Soviet arms exports are

subsidized, then the economic effects are rather different from those suggested by ACDA data.

SIPRI has recently begun publication of a list of the 100 largest arms-producing companies in the OECD in order to get a better idea of military *production*. For each company, information is given on country of origin, arms produced, total and weapons sales, profit, and total employment. Unfortunately, this data is not comparable with national arms trade data, so that statistics on company sales (or production) cannot be integrated with net exports or national procurement expenditures. There is also no comparable data on military industrial employment, since total employment from company balance sheets is not disaggregated between military and civilian uses. Finally, this data base is not relevant for socialist countries. All aggregate estimates of Soviet and Chinese arms industries are either distorted (due to their price distortions) or relatively rough.

No clear answers are available to basic questions such as the total employment of the world arms industry, the net output of the world defense industry, the capital stock employed in the weapons industry in aggregate, or the rate of return on capital. Substantial further research is required about arms production; this area lags far behind the data available for aggregate military expenditure and the arms trade. The quantitative economic characteristics of weapons industries are a really large knowledge void. Oddly enough, the technological and engineering characteristics are extremely well known. Once again, the excuse that national security reasons prohibit the gathering of information cannot be substantiated. Much is known about the physical and technical capability of the industry's output. Very little is known about

the financial and economic costs of the industry's input.

Issues

Given our basic understanding of the problems related to defining MILEX, there remain three substantive issues regarding the data base for defense spending. The first relates to the choice of a suitable *deflator* to derive a volume index of the defense effort or cost (Huisken 1973). The second relates to *comparisons* over time and across countries. The third relates to the *valuation of resources* associated with the defense sector.

SIPRI data emphasizes opportunity costs of increased MILEX for society and therefore uses the consumer price index (CPI) as a deflator. ACDA utilizes the GNP deflator and thus implicitly values MILEX in terms of other elements of national output. If an alternative assumption regarding opportunity costs were made--say, resource transfer from defense to investment--then an investment price deflator could be used.

In terms of internal consistency, it may be preferable to construct an explicit military price deflator in order to show the real change in terms of the product mix of the defense sector itself. There are few examples of such price deflators in practice, partly due to theoretical problems but also because of secrecy. The theoretical analysis is similar to those obtained when any government services need to be priced, with a few specific 'military twists.'

There are two alternatives: to use an output measure or to use an input measure. As regards the output measure, there is the usual problem of aggregation common to all such indices. More important, there is little agreement as to what military expenditure produces, i.e., how to define the 'output' of the defense sector. What exactly does defense

produce--security? offensive power?--and how can these ever be measured? It has even been suggested that the explosive power of weapons could be used as a measure, but this gets into problems of comparing small nuclear weapons with large conventional forces. Economic analysis is better used elsewhere!

The input measure closely follows the economics of the 'ideal price index' corresponding to the 'ideal cost of living index' (Samuelson and Swami 1974). If X_i inputs ($i = 1, \dots, n$) produce security S and the relation is, for example,

$$S = X_1^{a_1} \dots X_n^{a_n}$$

then the price index P is given by

$$P = P_1^{a_1} \dots P_n^{a_n}$$

where the P_i are the prices of the inputs and the a_i are expenditure shares.

Even though log linearity in the S -index is not essential (a CES function would give similar price transforms), the basic idea is that some implicit security function (preferably tractable) is required to get a price index as the aggregation of the individual prices of inputs that contribute to security. The use of such 'dual' properties can be used to produce explicit military price deflators. Despite a host of difficulties in practice, in principle it may be worthwhile to consider the construction of a military price deflator, at least for the components of the arms internationally traded. Then imports and possibly domestic production costed at 'border prices' will be adequately deflated to get constant price series for weapons procurement.

As for the comparability of defense spending data across most countries in the sample, both SIPRI and ACDA use official

exchange rates to transform local currency values into dollars. Both ACDA and SIPRI utilize purchasing-power parities (PPPs) for the European socialist countries only; for less developed countries, ACDA uses PPPs for China alone, whereas SIPRI uses exchange rates for China as well. As is well known, exchange rates do not provide adequate comparability, particularly if they are over- or under-valued. Massive devaluations in the late 1980s—for example, in African countries—have made their 1988 dollar values (in the latest SIPRI tables) look smaller relative to the world total, as compared to previously used exchange rates. On the other hand, over-valuation of the peso in the early 1980s made the domestic currency value of Argentina quite low because much of defense spending was for arms imports.

Clearly the optimum method is to construct PPPs explicitly for the defense sector (see Cars and Fontanel 1987; Heston 1990). There are major difficulties in such an exercise. Most important among these are the following: (i) the problems inherent in securing MILEX data at a sufficiently disaggregated level; (ii) the difficulties of comparing defense products bought, produced, and used in one country with those in other countries, due to the degree of product differentiation; (iii) the absence of well-defined prices, particularly the lack of a 'market' where such prices can be established. We deal with each in turn.

The construction of adequate PPPs requires a substantial amount of price and expenditure data at a disaggregated level. It is useful, for example, to have information on operating costs (broken down into personnel, military, and civilian; and operations and maintenance) and capital costs (procurement and construction) for forces, industry, and R&D; this is a bare minimum. In each sub-category it is also necessary to have highly disaggregate data in as much detail as possible. One of the

principal purposes of PPP is to have as wide a representative sample of products for the expenditure category as can be obtained, with due consideration being given to common and comparable characteristics; the method clearly is information intensive. Given the general secrecy with which military data is shrouded, and the genuine difficulties of obtaining information even when available somewhere, the data set required for efficient computation is not easy to get.

Continuous technological progress, obsolescence, trade in second-hand weapons, differences in specification due to specific country needs, small production runs for specialized weapons, variations in industrial structures for arms producers, and absorptive capacity for arms importers all combine to produce wide ranges of product differentiation in terms of innate characteristics and uses. Comparability of like with like is exceedingly difficult.

Finally come the well known problems of pricing military equipment and the fundamental difficulty of not having a proper 'market,' as well as other difficulties, such as those of industrial organization and the formation of natural monopolies. But even with cost-plus pricing, it is not easy to impute and allocate costs for specific equipment and functions. The difficulties are exacerbated by hidden subsidies, foreign aid, compensatory trade agreements, illegal imports and smuggling against embargoes, purchase of weapon systems without adequate consideration of operations and support costs, and many other such problems.

In the absence of explicit military PPPs, a 'short-cut' method would be to convert MILEX by government expenditure PPPs instead—and then compare. Alternatively, the GDP parity can be used. Table 1 gives data showing the rather startling differences

**Table 1. Military Expenditure, 1975, Using Alternative Conversion Rates
(millions of dollars)**

Country	Exchange Rate	PPP ^a for GDP	PPP ^a for Government Expenditure
Brazil	1,308	2,062	3,099
Colombia	130	373	473
India	2,843	9,198	16,430
Iran	7,283	12,401	12,854
Jamaica	19	24	24
Malaysia	159	835	871
Mexico	581	981	1,068
Pakistan	726	2,268	4,319
Philippines	487	1,226	2,477
Sri Lanka	18	66	148
Thailand	409	1,097	5,832
Zambia	90	135	190

^aPurchasing-power parity.

Source: Author's calculations.

between the figures. The second and third columns, in Kravis-based 'international' dollars (see Summers and Heston 1991, pp. 327-68), usually provide much higher values for MILEX. It is instructive to note that the proportion of aggregate MILEX for these twelve countries as a share of U.S. MILEX varies enormously, which could color

our perceptions of how much the Third World is actually spending. Using government-expenditure PPPs for conversion, aggregate MILEX for only these twelve countries in the Third World comes out to an incredible 52.5 per cent of the MILEX of the United States--the highest military spender in the world.

For market economies, the valuation of resources generally is not a major problem. Centrally planned economies like China's have maintained differential prices for civilian and military goods--in the process managing to keep MILEX artificially low. But this is not the general practice, with one type of exception. In countries where conscripts rather than voluntary or professional soldiers are used, military expenditure may be low, yet its economic impact may be high. If there is substantial unemployment, or even under-employment, then clearly the opportunity costs are negligible. If, on the other hand, the military employs skilled labor, then how these resources are valued makes a difference. Conscriptation makes it possible to understate MILEX, even though the precise effects differ from country to country.

It is also important to calculate the value of military stocks or assets--both as a consistency check with flow data on procurement expenditure and to evaluate the resource cost of weapons purchases. Though the practical problems are formidable, the theoretical issues should be clarified. Hilderbrandt (1990) has suggested a measure of military capital which, in principle, summarizes the net benefits (in money terms) obtained from military assets over the remainder of the service lives of such assets and equipment. The assets are depreciated according to age. The index of military capital is also an aggregate monetary measure. Equipment is valued at its procurement cost at the time of purchase. Therefore the implicit assumption is that the procurement cost represents the lifetime benefit of the particular equipment. After the initial entry, later valuation is done according to the specific depreciation method used. The levels and changes in the value of military capital stock, as defined, would be an useful consistency check on the flow of military expenditures--specifically on that for procurement and operations and maintenance (O&M). Gross inconsistencies would be

revealed quickly. For example, if military expenditure were declining over a period of time when military capital value was rising, then the postulated trend in defense spending would be highly suspect.

In the absence of such sophisticated measures for less developed countries, a simpler method would be to apply consistency checks on defense expenditure by comparing its trend with that of arms imports does. In a sense, the SIPRI measure of arms imports does indeed give a valuation of the changes in stocks of arms (due to imported weapons alone as well as domestic production by license) and therefore has similarities with the (increments to) military capital stocks discussed earlier. Further, data on defense spending and arms trade are derived in conceptually different ways, and there is no risk of spurious correlation. Thus the trends in all revealed military expenditure data series should in the first instance be compared to arms imports for the relevant country, and any fundamental divergence should be checked for consistency. For most countries, arms imports are essentially similar to procurement costs. In a like fashion, the trends for military spending should also be compared with the level of armed forces and some index of personnel costs. The latter could be approximated by multiplying the number of forces by the industrial wage rate (for a volunteer army), or, alternatively, by some monetary measure of the cost of living (for a conscript force). Strong divergence between indices of aggregate military expenditure, arms imports, and personnel expenditure would be a sign of problematic data.

Though the specific characteristics of MILEX data have been mentioned in general, it may be useful to bring them together. In particular, it is necessary to emphasize the differences with other categories of government expenditure, especially with the expenditure data on social services such as

health and education, since comparisons are often made to measure resource costs of the military sector. I mention the most important characteristics that distinguish the military sector in terms of data evaluation.

First, the difference between conscript and volunteer (enlisted) armed forces needs to be accounted for. The former usually imply lower personnel costs, although the opportunity costs for the civilian economy are similar to the latter case. Inter-country comparisons of aggregate military spending, the defense burden, and disaggregated costs for manpower need to be done carefully. This differential in human resource costs is peculiar to military expenditure.

Second, there is a serious need to include pension payments within total military spending. There are two reasons for this. Military pensions tend to be higher than civilian pensions in less developed countries. In addition, various attractive early retirement schemes with full pension entitlements for the armed forces imply an inflated budget for this category of expenditure. More important, when the opportunity costs of defense are being calculated in a two-sector economy, with the military and civilian sectors being compared, pension benefits add to the cost of maintaining the defense establishment. From a strictly national accounting perspective, transfer payments should not be included in government consumption, but such a logic is inapplicable in a disaggregative model that tends to measure the costs of defense.

Third, military procurement is often import-intensive--much more so than other forms of government socio-economic spending. Depending on the way such imports are financed--whether through foreign exchange, military aid and assistance, or debt creation--their opportunity-cost measure will vary. For example, the military-related debt servicing burden is rarely accounted for

explicitly in debt statistics; yet this category of repayments is important in measuring defense costs.

Fourth, military procurement is the sole prerogative of the government or the state. When weapons are produced domestically, this monopsonistic character of the weapons market creates the possibility of distortions, which are reflected in the data. For example, the weapons may be priced artificially low and the procurement budget thereby arbitrarily reduced. Yet defense industries may be subsidized from other parts of the state budget (say, industrial ministries), so that the true costs of production are not reflected in procurement costs. At the same time, if there are monopolies in defense production, then the incentives for cost efficiency are also lost.

Fifth, military hardware tends to be R&D-intensive. However, the costs of such research, particularly in the basic sciences, may be borne by civilian institutions, with defense-related spending thus maintained at lower levels. The presence of such sunk costs implies that unit costs tend to be high if production runs are not maintained at high rates. Yet studies of new weapons production in developing countries show that such 'excessive' costs do not seem to appear in budgets.

Sixth, technological obsolescence is rapid in the modern military sector. The existence of arms races also means that there is a need to maintain technical superiority with one's adversary. For the military, 'invention becomes the mother of necessity.' This factor is conspicuous by its absence in social spending on health or education in most developing countries. The presence of such a factor would imply that procurement costs would be higher than 'normal,' since write-off costs need to be included. Yet this rarely happens. Again, it is highly probable that industrial subsidies from non-military budgets

take care of the potential losses that defense industries would suffer if proper accounting practices were maintained.

Opportunity Costs

The opportunity costs of defense spending can be measured by using two ratios. The military "burden" is defined as the share of MILEX in GDP or GNP. The military "share" is defined as the ratio of defense spending in total central government expenditure (CGE).

With respect to comparing the military burden across countries, it is often believed that this measure avoids problems of currency conversion discussed earlier. For instance, Ball (1984) claims that "For the other measure, economic burden, measurements that rely on military expenditure in national currencies are clearly preferred to those in US dollars . . . as the conversion problem does not exist." However, if military PPPs did exist and were utilized in calculating the burden or share ratios, there clearly would be a difference.

In the absence of explicit military price-conversion rates, use can be made of the disaggregated PPPs for government spending, consumption, and capital formation and observation of the differences. One method for calculating the military burden, advocated by West (1987), is to transform defense spending to international dollars by using the government expenditure PPP. This value is then divided by GDP, suitably changed according to its own conversion rate, to arrive at the military burden. As the basic data in Table 1 shows, the dollar value of MILEX will be higher when using government spending PPP compared to that using GDP parities; hence the burden could be substantially higher than the usual data reported by SIPRI or ACDA.

Even though this method produces 'inflated' values of the military burden in less developed countries, and is potentially a more realistic measure of opportunity costs, it suffers from a number of specific disadvantages for the purposes of analyzing military expenditures. Government spending PPPs tend to attach high prices to U.S. personnel; in LDC militaries, in contrast, this is potentially a source of financial savings. Conscripts are paid little, and even professional armies tend to be compensated with 'perks' rather than high wages. Armed forces are labor-intensive, from a military point of view, and the elasticity of substitution tends to be low. On the other hand, imported weapons equipment could be expensive, particularly if not paid from foreign aid. Finally, use of such a measure for any category of public-sector expenditure would produce such high ratios. It could then be claimed that less developed countries have higher shares of health, education, or other categories in aggregate GDP than is usually supposed. Just as the 'burden' of defense will look higher, so will the 'benefits' of health, etc., look higher than standard measures suggest.

An alternative method of measuring the burden would be to convert weapons imports into dollars by using U.S. military prices directly (or some index of international prices). Added to this would be personnel costs, which can be transformed by utilizing the PPPs for consumption. This value of military expenditure in 'international' dollars could then be divided by GDP, suitably transformed, to measure the burden. In a similar vein, dividing by central government expenditure (CGE) changed by government spending PPPs would indicate the value of military shares. It would be interesting to see how the various measures of military burden would differ.

Recent attempts to construct military PPPs for a broad set of countries (Heston 1990) show that although the level of developing-country defense spending in international dollars is higher relative to exchange-rate conversion, the differential is far less than that for government expenditure PPPs in general. Thus the ratio of military to total central-government expenditure actually falls when military and CGE PPPs are used to do the respective conversions. Since arms imports play a major role in procurement spending, it is not surprising that international differentials are relatively low in the military sector as compared to, for example, health or education, which utilize more domestic resources.

When disaggregated data is available, even in a broad sense, the distinction between operating costs (personnel, pensions, and O&M) and investment costs (weapons procurement, construction, military R&D) is important. The differential impact on the civilian economy of these two types of resource use in the defense sector is important. Calculations of the military burden utilizing this distinction are important for further research.

Table 2 provides information on the calculation of the military burden using a number of options. The first column gives the normal figure, where local-currency MILEX is divided by GDP. The military burden in the second column, Option 1, is calculated in the following way. Actual operating costs incurred are changed into international dollars by using the consumption PPP, while budgetary investment costs are converted by utilizing the capital formation PPP. The totals are then added to get aggregate military spending in international dollars. GDP is converted by using its own PPP. Dividing the two, we get military burden for Option 1 in Table 2.

The third column provides information on Option 2, which considers a hypothetical transfer of resources. Suppose that reduced military expenditure releases resources that are transferred to the civilian economy and transformed into consumption and investment in the same proportion as in GDP. Aggregate military spending is therefore broken up into two parts, depending upon the proportion of consumption and investment in national output. The separate parts are then converted into international dollars using the respective PPPs. The total is divided by GDP (suitably adjusted), and the ratio is the military burden.

Comparison of the columns reveals an interesting feature. There seems to be little difference among the three measures for the countries studied here. It is difficult to say whether this is a specific feature dependent on the particular sample chosen, or whether it is a general characteristic. However, such calculations seem to be important in deriving the 'true' burden, and rendering military expenditure more comparable to other categories of government expenditure (health or education, for example).

If there are indeed differential impacts of military spending on the economy, then the usually asked 'how much?' question will have to be supplemented by a new one: 'in which way?' Alternative calculations of the military burden, using disaggregated data, and comparisons with other categories of social expenditures, would then be useful. Specifically, operating costs within military expenditure do sometimes have an economic function: human capital formation or employment. Investment costs are more inherently wasteful and therefore need to be reduced first. An indirect effect, of course, will be that political tensions will be reduced, since weapons acquisition is the most destabilizing factor in inter-state tension. A virtuous circle may then be set up that stops an arms race.

Table 2. Military Burden, 1975, Under Alternative Hypothesized Options (percentages)

Country	Burden (Normal)	Burden (Option 1)	Burden (Option 2)
Brazil	1.02	0.98	0.96
Colombia	0.97	0.97	0.97
India	3.21	3.18	3.05
Iran	13.78	11.40	13.60
Jamaica	0.67	0.72	0.65
Malaysia	4.56	4.53	4.48
Mexico	0.66	0.62	0.65
Pakistan	6.49	5.89	6.03
Philippines	3.09	3.20	2.85
Sri Lanka	0.72	0.71	0.69
Thailand	2.79	2.91	2.68
Zambia	3.66	3.34	3.19

Source: Author's estimates from basic data in Ball (1984).

Concluding Suggestions

Future research on data must emphasize more transparency, greater detail, deeper study of budgetary information where available, and the need for disaggregation, however limited. In terms of transparency, increasing democratization should help to speed the process. Providing more detail could be technically difficult for governments; more help can be given them through specialized agencies and statistical services. A more

intensive study of budgets is necessary in the field of defense by multilateral agencies such as the United Nations, the IMF, and the World Bank. All of the aspects highlighted for future emphasis are essentially matters for political economy--since, by its very nature, purely economic analysis of military expenditure issues will not be possible.

Disaggregation of data is of more concern to economists, since the opportunity costs are best studied in this context. An uniform

definition is required, particularly for weapon procurement. It is a potential candidate for both 'consumption' and 'investment' in government expenditure definitions. In terms of the former category, once military hardware is purchased, it is potentially destructible, and therefore has a depreciation rate of 100 per cent. However, if one is concerned about alternative uses—and this is the rationale of opportunity costs—military weapon purchase often directly competes with government investment. Thus there is a strong case for considering it as part of military 'investment'

and seeing whether resource re-allocation is possible. The case where arms are bought from domestic industries or paid for by foreign exchange and debt is even more important in terms of investment costs.

The use and misuse of data for defense economics is an important issue. The information should be used with care and caution. But with the help of imaginative data mining and the study of individual country cases, a considerable amount of formal analysis can be done. ◻

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PATTERNS AND TRENDS IN THE MILITARY EXPENDITURES OF DEVELOPING COUNTRIES

Robert L. West

Introduction

This paper examines the patterns of international distribution and the trends in military expenditures of groups of countries, comparing expenditure estimates derived by the use of convertors based on exchange rates and purchasing-power parities. Although it is widely acknowledged that the use of exchange-rate convertors introduces distortions in the cross-country and inter-temporal comparisons of real expenditures, the magnitudes of the deviations are not generally known. The primary data sources for military expenditure, and the convertors they employ, are discussed in the Appendix to this paper (see pp. 147-51).

This analysis will focus on: (a) whether the distortions are systematic and significant in magnitude, and (b) the extent to which the international pattern of distribution and trends in military expenditures described by exchange-rate-converted data correspond to, or deviate from, the patterns and trends revealed by estimates based on purchasing-power parities.

For the computation of estimates that appear in this paper for all countries and all years, the underlying data on military

expenditures, central government expenditures, and GNP in local currency, at current prices, are the same as those employed by ACDA in computing the estimates that appear in *World Military Expenditures and Arms Transfers 1988*.¹

ACDA's statistical tables report data for 144 countries.² Seventeen of these are centrally planned economies, for which the methods of data collection and estimation differ significantly from the market-oriented countries; for the purposes of this paper, we omit these 17 nations. Eight other, small, market-oriented economies are omitted because purchasing-power parities and price levels have not been computed by the International Comparison Project.³

The coverage of the estimates presented in this paper includes 119 (of ACDA's 127) market-oriented countries. Twenty-six are classified as "industrialized market-oriented economies," including all of the nations of Western and Southern Europe (except Turkey) and North America, plus Japan, Australia, New Zealand, South Africa, and Israel. The other 93 countries are classified as "developing market-oriented economies"; the geographical regions into which these countries are further divided are similar to

Table 1. Military Expenditures, Central Government Expenditures, and Gross National Product in Base Year 1980

	Low- Income Countries (34)	Lower- Middle- Income Countries (36)	Upper- Middle- Income Countries (19)	High- Income Oil Exporters (4)	All Developing Economies (93)	Industrial Market Economies (26)
Exchange-Rate Convertors (billions dollars at 1980 current prices):						
MILEX	10	21	35	20	86	291
CGE	61	132	262	77	532	2,309
GNP	307	531	978	184	2,001	7,865
				(percentages)		
MILEX/CGE	16.7	16.0	13.2	25.6	16.1	12.6
CGE/GNP	19.8	24.9	26.8	41.7	26.6	29.4
MILEX/GNP	3.3	4.0	3.6	10.7	4.3	3.7
Purchasing-Power Parity Convertors (billions 1980 international dollars; MILEX converted at military parity):						
MILEX	19	32	35	19	104	267
CGE	300	306	400	66	1,073	1,871
GNP	710	879	1,340	166	3,094	7,199
				(percentages)		
MILEX/CGE	6.3	10.5	8.8	27.9	9.7	14.3
CGE/GNP	42.3	34.8	29.8	40.1	34.7	26.0
MILEX/GNP	2.6	3.6	2.6	11.2	3.4	3.7
Purchasing-Power Parity Convertors (billions 1980 international dollars; MILEX converted at government parity):						
MILEX	51	49	54	17	170	245
CGE	300	306	400	66	1,073	1,871
GNP	710	879	1,340	166	3,094	7,199
				(percentages)		
MILEX/CGE	16.8	15.9	13.5	25.4	15.9	13.1
CGE/GNP	42.3	34.8	29.8	40.1	34.7	26.0
MILEX/GNP	7.1	5.6	4.0	10.2	5.5	3.4

those defined by ACDA (with Egypt assigned to the Middle East and Mexico to Latin America), except that the ACDA "Oceania" group is included in Asia. The per capita income classification is that of the World Bank's *World Development Indicators for 1988*.⁴

The Pattern of Military Expenditures in 1980

Table 1 presents estimates of total military expenditures (MILEX), central government expenditures (CGE), and GNP for groups of countries--classified by levels of per capita income--in the base year 1980. It shows the ratios that are widely used as indicators of the relative level of effort by governments to provide for national security: MILEX to CGE, or the "defense share" of central government expenditures; CGE to GNP, a measure of the "size of the public sector"; and MILEX to GNP, the "military burden."

The upper panel of Table 1 contains the estimates derived by use of exchange-rate convertors for the base year 1980. For each country, the expenditures and GNP estimates in local currency at 1980 current prices (from the ACDA data set) have been converted at the 1980 annual average market/par exchange rate. The values are in ACDA constant 1980 dollars.

The middle panel of Table 1 contains the estimates derived by use of purchasing-power parity (PPP) convertors. The estimates of MILEX, CGE, and GNP in local currency at 1980 current prices (from the ACDA data set) have been converted by use of their respective parities. The values are in PPP 1980 international dollars. The method of conversion of military expenditures is consistent with the concept of measuring the value of total input resources devoted by each nation to its military sector.

The bottom panel of Table 1 contains estimates derived in the same way as the middle panel, except that the military expenditures have been converted by use of the government expenditures parities. This method of conversion of military expenditures is consistent with the concept of measuring the opportunity cost of each country's budgetary allocation for national security.

Exchange rates do not adequately reflect the differences among countries in price levels, and conversion by use of exchange rates does not take into account the within-country differences in the structure of prices for various sectors and purposes, such as military or central government expenditures and GNP. The extent of these differences in price levels and in the structures of prices--for groups of the 119 countries represented in Table 1--is illustrated in Table 2.

Table 2 shows (for MILEX, CGE, and GNP) the averages of the price-level indexes for the member countries of each income group in 1980. (The price-level index is equal to the ratio of the purchasing-power parity to the exchange rate for the given year and expenditure category.) As may readily be seen, there is a systematic difference in the price levels; the price-level indexes vary directly with the per capita income levels of the countries. But the elasticity of the price-level/income relationship is much higher for total central government expenditures than for either military expenditures or GNP. The structure of within-country prices differs for countries in the various income-level groups, and the variation in structure is directly associated with the per capita income levels of the countries.

Another indicator of the differences among groups of countries in price levels and parities is the "exchange-rate deviation index," the ratio of real MILEX, CGE, or GNP,

Table 2. 1980 Price-Level Indexes
(U.S. = 100; averages for countries within the group)

	Military Expenditures	Central Government Expenditures	Gross National Product
34 Low-Income Countries	62.2	34.2	60.7
36 Lower-Middle Income Countries	75.4	42.2	67.2
19 Upper-Middle Income Countries	101.7	62.1	81.0
4 High-Income Oil Exporters	113.6	116.3	111.3
26 Industrial Market Economies	115.0	107.7	113.7
United States	100.0	100.0	100.0

converted by use of purchasing-power parities, to exchange-rate-converted values.

Table 3 shows the averages of the exchange-rate deviation indexes for the countries in each of the income-level groups in 1980. As the country groups are arranged in order of per capita income levels, ascending from top to bottom of the table, the systematic

relationship between the PPP estimates and the exchange-rate-derived figures can be readily seen in the table. For MILEX, CGE, and GNP, the deviation index falls as per capita real income rises. The slope of the relationship is much steeper for central government expenditures than for GNP. The reasons for the systematic variation in the deviations associated with levels of national

Table 3. 1980 Exchange-Rate Deviation Indexes
(U.S. = 100; averages for countries within the group)

	Military Expenditures	Central Government Expenditures	Gross National Product
34 Low-Income Countries	169.4	345.1	180.8
36 Lower-Middle Income Countries	150.5	256.0	159.8
19 Upper-Middle Income Countries	115.0	177.9	130.6
4 High-Income Oil Exporters	95.5	90.1	90.4
26 Industrial Market Economies	101.3	108.6	93.3
United States	100.0	100.0	100.0

Table 4. 1980 Real Military Expenditures
(U.S. = 100; total expenditures for countries within the group)

	Military Expenditures Converted by:		
	Exchange Rates	Military Parities	Government Parities
34 Low-Income Countries	6.9	14.1	41.7
36 Lower-Middle Income Countries	14.6	23.7	40.1
19 Upper-Middle Income Countries	24.3	26.0	44.1
4 High-Income Oil Exporters	13.9	14.1	13.9
25 Industrial Market Economies	102.1	98.1	100.3
United States	100.0	100.0	100.0

per capita income has been explored by the International Comparison Project analysts and attributed to the relatively low prices of non-tradable goods and services relative to tradables in low per capita income countries—a phenomenon that can be explained by the "productivity differential" model. Non-tradables, notably including services, weigh much more heavily in government expenditures than in GNP as a whole, and this accounts for the more pronounced variation of CGE deviations with income-levels.⁵

An indication of the effect of the distortion introduced by exchange-rate convertors in the cross-country comparison of military expenditures is provided in Table 4. The table shows the 1980 magnitude of total military expenditures by the developing countries that are members of the various income-level groups, and by the 25 industrial market economies other than the United States—relative to military expenditures by the United States in that year. We can compare the estimates of the real quantities derived from use of military parities and government parities with the values in ACDA constant 1980 dollars computed by use of exchange

rates. The use of exchange rates very substantially underestimates the real quantities of inputs devoted to national security by low-income and lower-middle-income countries relative to industrialized countries (compare the indexes of quantities in the exchange-rate and military-parities columns). The use of exchange-rate convertors results in a much greater degree of underestimation of the opportunity cost of military expenditures by all low- and middle-income developing countries relative to the military expenditures by industrialized countries.

The estimates presented in Table 1, using purchasing-power parities as convertors and measuring the opportunity cost of military expenditures (bottom of Table 1), show that the military burdens of the developing countries (MILEX/GNP) in 1980 were inversely related to their per capita income levels—except for the small group of high-income, oil-exporting countries. In 1980, the military burdens for all groups of developing countries were significantly higher than for the industrial market economies. This rank ordering of military burdens does not obtain for the measurement of real inputs devoted to

national security (estimated by the use of military parities to convert MILEX), and it is disguised by the use of exchange-rate convertors.

Trends in Military Expenditures, 1970-85

Annex Tables A-1 to A-3 (pp. 28-30) contain estimates of MILEX, CGE, and GNP and the ratios widely used as indicators of effort by governments to provide for national security for 119 countries in the years 1970, 1980, and 1985. The estimates were computed by use of *exchange-rate convertors* and are expressed in ACDA constant 1980 dollars. Growth rates of each of the aggregates and ratios are shown for the periods 1970-80 and 1980-85.

Annex Tables A-4 to A-6 (pp. 31-33) contain estimates for the same aggregates, ratios, and growth rates, but the estimates were computed by use of *purchasing-power parities*. Corresponding to the "opportunity cost" concept of military expenditure, the government-sector parities were used for the conversion of military spending.

The exchange-rate converted data in Tables A-1 to A-3 illustrates the evidence supporting the conventional wisdom regarding trends in military expenditures in the 1970s and in the first half of the 1980s. Comparison with the estimates based on conversion using parities, shown in Tables A-4 to A-6, reveals some additional trends and changes that have occurred in the military expenditures of developing countries but that are less clearly indicated, or disguised, by the use of exchange-rate convertors.

Comparison of industrialized and developing countries. In the decade of 1970-80, the industrialized market economies experienced growth of GNP in excess of 3 per cent annually but a very low growth rate of military expenditures. Central government

expenditures grew rapidly, but the defense share of government spending declined sharply. The military burden declined throughout the decade.

In contrast, the developing countries, while also experiencing a high rate of growth of GNP and of central government expenditures, had a high growth rate of military expenditures. There was a resultant rise in the military burden over the decade.

From 1980 to 1985, the GNP and government expenditure growth rates of industrialized countries declined from the high levels of the 1970s, but the growth rate of military expenditures rose sharply. This resulted in an increase in the military burden.

Among developing countries, in the first half of the 1980s, there was a very sharp decline in the growth rates of all aggregates. The military burden continued to rise--although at a rate below that of the 1970s.

Although evidence for all of these broad trends--for both the industrialized and developing groups of countries--can be identified in the estimates based on conversion by exchange rates and by parities, the use of exchange rates does not show that the growth rates of MILEX, CGE, and GNP were all higher in developing countries than in the industrialized countries in the period 1980-85 as well as in the preceding decade. As one consequence of the persisting growth of the real military burden in the large group of developing countries, the level of the burden in developing countries has been above that of the industrialized countries since the early 1970s. The gap between the two continued to grow throughout the period under review, even in the era of rising military expenditures by industrialized countries during the 1980s.

Figures 1 and 2 illustrate the trends in the military burdens of the two groups of

Figure 1. Military Burden in ACDA 1980 Constant Dollars

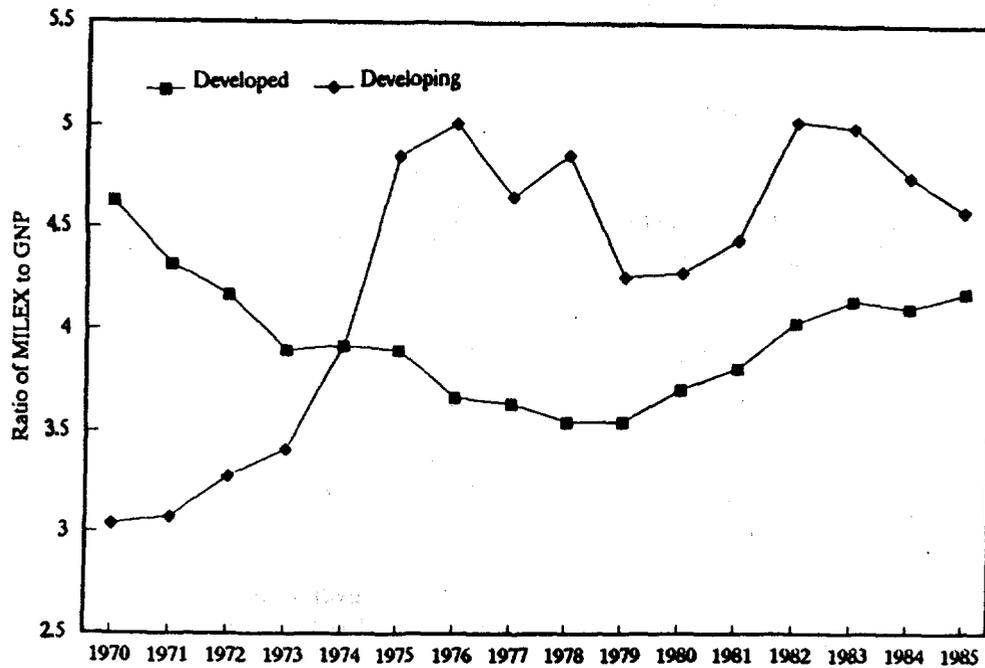
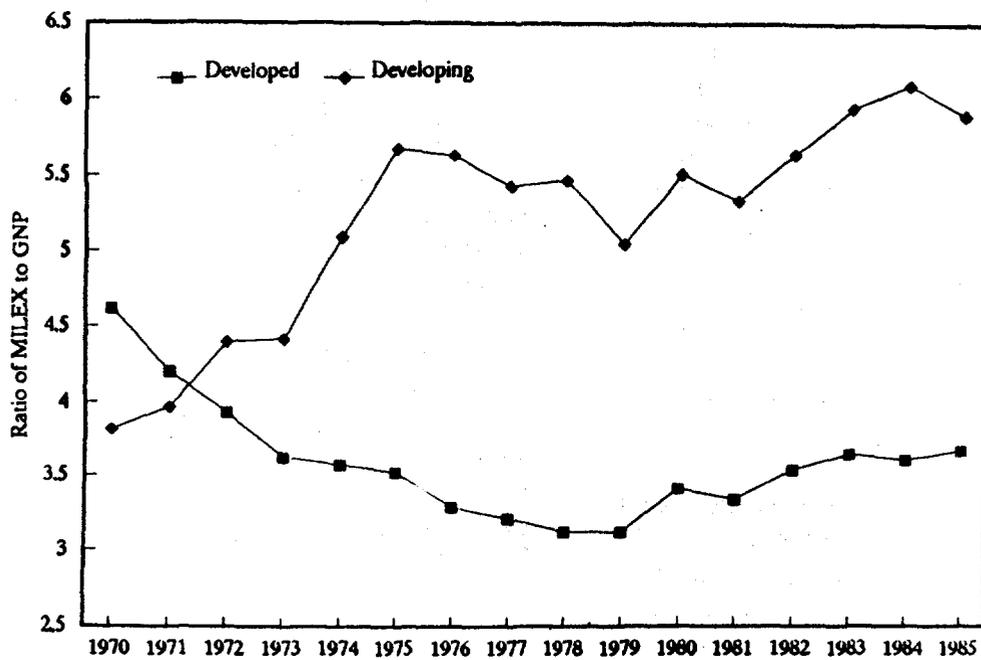


Figure 2. Military Burden in PPP 1980 Constant Dollars



countries over the 1970-85 period. The graphs also show that failure to adjust the expenditures data for changes in price levels and structures--as by the use of exchange-rate convertors--results in disguising the relationship between the real military burdens of the two groups of countries. For the group of developing countries, the exchange-rate converted estimates in Figure 1 show much more erratic year-to-year variation, and they disguise the persistent growth of the real military burden in the first half of the 1980s.

Trends in the military expenditures of developing regions. In the decade 1970-80, there was relatively rapid growth in both expenditures and GNP in all regions of the developing world. Generally, the growth of the government sector was greater than that of military expenditures, and both grew more rapidly than GNP. Only in countries of the Latin American region was the growth rate of GNP higher than that of military spending. The military burden grew in all regions other than Latin America.

These relationships can be inferred from both the exchange-rate-converted and parities-converted estimates. However, the real growth rates of the size of the government sector and the military burden in the Middle East and in Africa during the 1970s are much higher in the estimates converted by use of parities than in the exchange-rate-converted data.

In the 1980-85 period, there was a sharp fall in growth rates in both the Middle East and Africa, and a more modest decline in Asia and Latin America. The result was a reduced growth rate of the military burden in the Middle East and Asia and an absolute decline in the military burden for the African group of countries, but a rise in the growth rate of the military burden in Latin America.

Again, these trends can be observed in both exchange-rate- and parities-converted data. What the exchange-rate-converted estimates do not reveal is that, throughout the 1980s, real military burdens (as shown by the estimates converted by use of parities) for countries in the regions of the Middle East, Africa, and Asia were all higher than the military burden of the group of industrialized countries. Only in Latin America was the real military burden in the 1980s lower than in the group of industrialized countries; but the real military burden in Latin America was growing much more rapidly than in industrialized countries during the first half of the 1980s, and this, too, was disguised by the distortion in the estimates converted by use of exchange rates.

Trends in the military expenditures of different income groups of countries. In the decade 1970-80, growth rates were generally higher in the middle-income countries than in the low-income countries. During this period, generally, the higher the per capita income, the higher the growth rates of the size of the government sector and the military burden. The evidence of these relative growth rates can be found in both exchange-rate-converted and parities-converted estimates.

In 1980-85, the relation between growth rates and per capita income levels reversed. In general, the growth rates were higher in the low-income countries; the rates of growth in the size of the government sector and in the military burden were higher in low-income than in middle-income countries. This pattern can be observed in both exchange-rate- and parities-converted data.

Using exchange-rate-converted data, the size of the government sector (as shown by the CGE/GNP ratio) appears to be about the same for groups of countries at different levels of per capita income. But this is not the case when differences in the within-country

structure of prices are taken into account, and the systematic distortion attributable to exchange-rate conversion is eliminated. In the estimates based on conversion using parities, the real government sector size is much larger in countries at lower income levels.

Measured in real opportunity-cost terms, the military burden (see Annex Table A-6)

was inversely related to per capita income levels throughout the period reviewed, and the burden rose for all groups of developing countries from 1970 to 1985. Moreover, during the first half of the 1980s, the military burden grew more rapidly in low-income than in middle-income developing countries. These relationships and trends cannot be seen clearly in the exchange-rate-converted estimates.

Statistical Annex

Table A-1						
Real Military Expenditures, Central Government Expenditures,						
and Gross National Product, 1970, 1980, and 1985						
(billions of ACDA constant 1980 dollars; ratios and growth rates in percentages)						
	1970	1980	1985	Growth Rates		
				1970-80	1980-85	
Industrial Market Economies (26)						
				<i>(percentages)</i>		
MILEX	266	291	366	0.9	4.7	
CGE	1,285	2,309	2,731	6.0	3.4	
GNP	5,760	7,865	8,757	3.2	2.2	
		<i>(percentages)</i>				
MILEX/CGE	20.7	12.6	13.4	-4.9	1.2	
CGE/GNP	22.3	29.4	31.2	2.8	1.2	
MILEX/GNP	4.6	3.7	4.2	-2.2	2.5	
Developing Market Economies (93)						
MILEX	33	86	97	10.1	2.4	
CGE	192	532	607	10.7	2.6	
GNP	1,072	2,001	2,111	6.4	1.1	
		<i>(percentages)</i>				
MILEX/CGE	17.0	16.1	15.9	-0.5	-0.2	
CGE/GNP	17.9	26.6	28.8	4.0	1.6	
MILEX/GNP	3.0	4.3	4.6	3.5	1.4	
Middle Eastern Countries (13)						
MILEX	9	44	49	16.8	2.0	
CGE	35	183	171	18.1	-1.4	
GNP	113	425	378	14.2	-2.4	
		<i>(percentages)</i>				
MILEX/CGE	26.9	24.2	28.5	-1.1	3.4	
CGE/GNP	30.8	43.0	45.2	3.4	1.0	
MILEX/GNP	8.3	10.4	13.0	2.3	4.4	

Table A-2
Real Military Expenditures, Central Government Expenditures,
and Gross National Product, 1970, 1980, and 1985
 (billions of ACDA constant 1980 dollars; ratios and growth rates in percentages)

	1970	1980	1985	Growth Rates	
				1970-80	1980-85
African Countries (41)					
				(percentages)	
MILEX	5	10	8	6.4	-2.6
CGE	33	70	79	7.7	2.5
GNP	199	288	302	3.7	1.0
		(percentages)			
MILEX/CGE	15.4	13.6	10.6	-1.2	-5.0
CGE/GNP	16.7	24.3	26.2	3.8	1.5
MILEX/GNP	2.6	3.3	2.8	2.6	-3.5
Asian Countries (15)					
MILEX	10	20	26	6.6	6.0
CGE	48	106	144	8.3	6.4
GNP	294	503	646	5.5	5.1
		(percentages)			
MILEX/CGE	21.8	18.6	18.3	-1.6	-0.4
CGE/GNP	16.3	21.0	22.3	2.6	1.2
MILEX/GNP	3.5	3.9	4.1	1.0	0.8
Latin American Countries (24)					
MILEX	8	12	13	4.7	1.5
CGE	76	174	213	8.6	4.1
GNP	466	785	784	5.4	0.0
		(percentages)			
MILEX/CGE	10.1	7.0	6.2	-3.6	-2.5
CGE/GNP	16.4	22.2	27.1	3.1	4.1
MILEX/GNP	1.7	1.6	1.7	-0.6	1.5

Table A-3
Real Military Expenditures, Central Government Expenditures,
and Gross National Product, 1970, 1980, and 1985
 (billions of ACDA constant 1980 dollars; ratios and growth rates in percentages)

	1970	1980	1985	Growth Rates	
				1970-80	1980-85
Low-Income Countries (34)					
				<i>(percentages)</i>	
MILEX	7	10	13	4.3	5.2
CGE	39	61	83	4.7	6.4
GNP	229	307	374	3.0	4.0
		<i>(percentages)</i>			
MILEX/CGE	17.3	16.7	15.8	-0.4	-1.1
CGE/GNP	16.8	19.8	22.2	1.6	2.3
MILEX/GNP	2.9	3.3	3.5	1.3	1.2
Lower-Middle-Income Countries (36)					
MILEX	11	21	24	6.8	2.5
CGE	54	132	146	9.4	2.0
GNP	320	531	585	5.2	1.9
		<i>(percentages)</i>			
MILEX/CGE	20.1	16.0	16.4	-2.3	0.5
CGE/GNP	16.9	24.9	24.9	4.0	0.0
MILEX/GNP	3.4	4.0	4.1	1.6	0.6
Upper-Middle-Income Countries (19)					
MILEX	14	35	38	9.7	2.0
CGE	93	262	296	10.9	2.4
GNP	510	978	1,034	6.8	1.1
		<i>(percentages)</i>			
MILEX/CGE	14.8	13.2	13.0	-1.1	-0.4
CGE/GNP	18.4	26.8	28.6	3.9	1.3
MILEX/GNP	2.7	3.6	3.7	2.7	0.8

Table A-4
Real Military Expenditures, Central Government Expenditures,
and Gross National Product, 1970, 1980, and 1985
 (billions of PPP 1980 international dollars; ratios and growth rates in percentages)

	1970	1980	1985	Growth Rates	
				1970-80	1980-85
Industrial Market Economies (26)					
				<i>(percentages)</i>	
MILEX	234	245	297	0.4	3.9
CGE	1,093	1,871	2,103	5.5	2.4
GNP	5,061	7,199	8,101	3.6	2.4
		<i>(percentages)</i>			
MILEX/CGE	21.4	13.1	14.1	-4.8	1.5
CGE/GNP	21.6	26.0	26.0	1.9	-0.0
MILEX/GNP	4.6	3.4	3.7	-3.0	1.5
Developing Market Economies (93)					
MILEX	69	170	207	9.5	4.0
CGE	383	1,073	1,286	10.8	3.7
GNP	1,797	3,094	3,518	5.6	2.6
		<i>(percentages)</i>			
MILEX/CGE	17.9	15.9	16.1	-1.2	0.3
CGE/GNP	21.3	34.7	36.6	5.0	1.1
MILEX/GNP	3.8	5.5	5.9	3.7	1.4
Middle Eastern Countries (13)					
MILEX	16	66	78	15.2	3.4
CGE	56	281	271	17.4	-0.7
GNP	270	538	608	7.1	2.5
		<i>(percentages)</i>			
MILEX/CGE	28.4	23.4	28.7	-1.9	4.2
CGE/GNP	20.8	52.1	44.5	9.6	-3.1
MILEX/GNP	5.9	12.2	12.8	7.5	0.9

Table A-5
Real Military Expenditures, Central Government Expenditures,
and Gross National Product, 1970, 1980, and 1985
 (billions of PPP 1980 international dollars; ratios and growth rates in percentages)

	1970	1980	1985	Growth Rates	
				1970-80	1980-85
African Countries (41)					
				<i>(percentages)</i>	
MILEX	6	16	16	9.4	0.5
CGE	43	108	135	9.5	4.6
GNP	202	293	318	3.8	1.6
		<i>(percentages)</i>			
MILEX/CGE	14.8	14.6	11.9	-0.2	-3.9
CGE/GNP	21.5	36.7	42.3	5.5	2.9
MILEX/GNP	3.2	5.4	5.1	5.3	-1.2
Asian Countries (15)					
MILEX	35	72	94	7.4	5.6
CGE	171	417	576	9.3	6.7
GNP	657	1,121	1,467	5.5	5.5
		<i>(percentages)</i>			
MILEX/CGE	20.5	17.2	16.4	-1.7	-1.0
CGE/GNP	26.0	37.2	39.2	3.6	1.1
MILEX/GNP	5.3	6.4	6.4	1.8	0.0
Latin American Countries (24)					
MILEX	11	17	20	4.5	2.8
CGE	112	267	305	9.1	2.7
GNP	668	1,141	1,124	5.5	-0.3
		<i>(percentages)</i>			
MILEX/CGE	9.9	6.4	6.5	-4.2	0.2
CGE/GNP	16.8	23.4	27.2	3.4	3.0
MILEX/GNP	1.7	1.5	1.8	-0.9	3.1

Table A-6
Real Military Expenditures, Central Government Expenditures,
and Gross National Product, 1970, 1980, and 1985
 (billions of PPP 1980 international dollars; ratios and growth rates in percentages)

	1970	1980	1985	Growth Rates	
				1970-80	1980-85
Low-Income Countries (34)					
				<i>(percentages)</i>	
MILEX	27	51	73	6.6	7.5
CGE	143	300	456	7.7	8.7
GNP	501	710	940	3.5	5.8
		<i>(percentages)</i>			
MILEX/CGE	18.7	16.8	15.9	-1.0	-1.1
CGE/GNP	28.4	42.3	48.5	4.0	2.8
MILEX/GNP	5.3	7.1	7.7	3.0	1.6
Lower-Middle-Income Countries (36)					
MILEX	20	49	56	9.6	2.6
CGE	104	306	342	11.5	2.2
GNP	496	879	979	5.9	2.2
		<i>(percentages)</i>			
MILEX/CGE	18.8	15.9	16.2	-1.7	0.4
CGE/GNP	20.9	34.8	35.0	5.3	0.1
MILEX/GNP	3.9	5.6	5.7	3.5	0.4
Upper-Middle-Income Countries (19)					
MILEX	21	54	63	9.9	3.1
CGE	130	400	426	11.9	1.3
GNP	743	1,340	1,482	6.1	2.0
		<i>(percentages)</i>			
MILEX/CGE	16.2	13.5	14.8	-1.8	1.8
CGE/GNP	17.5	29.8	28.8	5.5	-0.7
MILEX/GNP	2.8	4.0	4.3	3.6	1.1

REFERENCES

Notes

- ¹ The "ACDA constant dollar" estimates that appear in Table I of *WMEAT 1988* are in prices of the base year 1987. For the purposes of this paper, the local-currency, current-price data set has been reconverted by the ACDA method for the base year 1980. The same set of GNP deflators (converted to base year 1980) and exchange rates used by ACDA for its *WMEAT 1988* computations was used to derive the estimates that appear in this paper. For all the countries included in this paper, ACDA uses central government expenditure and GNP (current and constant price) estimates from the World Bank data bank. See the "Statistical Notes," *WMEAT 1988*, pp. 129-37.
- ² Country coverage is described in *ibid.*, p. 129.
- ³ See Robert Summers and Alan Heston, *op.cit.*, 1988. The Penn World Table IV data set consists of 130 countries, of which ten (including Afghanistan) are centrally planned nations omitted in this paper. Hong Kong, included in the PWT4 data set, is also omitted in this paper. The 17 centrally planned economies included in the ACDA tables are the 9 Eastern European states, including Yugoslavia, plus Afghanistan, China, North Korea, Mongolia, Cambodia, Laos, Vietnam, and Cuba. The 8 market-oriented economies (included in the ACDA tables) for which PPPs are not available are: Cape Verde, Equatorial Guinea, Guinea-Bissau, Lebanon, Libya, Qatar, Sao Tome and Principe, and Yemen (Aden).
- ⁴ See World Bank, *World Development Report 1988* (New York: Oxford University Press), p. 212 ff. The assignment of developing countries is to the categories of low, lower-middle, upper-middle, and high (oil-exporting) per capita income, as in the World Development Indicators section of the *Report*. But note that, for the purposes of this paper, we classify 7 countries as "industrial market economies" in addition to the 19 in the World Bank category. These seven countries are Israel, South Africa, Greece, Iceland, Luxembourg, Malta and Portugal; they are excluded from the developing-country income and regional groupings in this paper.
- ⁵ For the definitions of the indexes reviewed here and discussion of the systematic relationships, see the United Nations International Comparison Project Phase III Report: Irving B. Kravis, Alan Heston, and Robert Summers, *op.cit.*, pp. 9-23 and Chapter 8. An explanation of the systematic variations in price-levels, quantities, and parities, in terms of the productivity differential model, emphasizes that "services, which are non-traded goods, are very cheap in low-income countries. Hence, exchange-rate conversions greatly understate the true quantities of services in low-income countries relative to those in high-income countries. The low prices of services in the price structure of low-income countries encourage their use and lead to quantities that are high relative to the quantities of the relatively more expensive commodities." In the case of commodities, the understatement of real quantities by exchange-rate conversion is also substantial and inversely related to income levels, but much less so than in the case of services.

MILITARY EXPENDITURE AND ECONOMIC DEVELOPMENT: ISSUES AND DEBATES

Saadet Deger

Introduction

Military expenditure in the developing world has been declining since the mid-1980s after fifteen years of uninterrupted rise. This decline is taking place from a very high peak, however, and it is still modest and slow. Third World military expenditure (MILEX) as a share of total world military expenditure rose from 6 per cent in the late 1960s to 18 per cent in the mid-1980s, after which it fell to 16 per cent in 1990. (Total world MILEX in 1990 was \$950 billion dollars.) Currently, at a conservative estimate, over 4 per cent of the GDP of less developed countries is allocated to the military sector. In addition, there are hidden expenditures--indirect costs, industrial subsidies, and arms-related debt creation--that are not reflected in the data. In 1985, there were more than 18 million people in uniform in the developing world. War-related costs are almost never included in military statistics. Though defense spending

has fallen, this has not been a result of any arms control agreements or any serious resolution of disputes, except perhaps in Latin America. Rather, the decline has been a product of economic problems. Hence, the potential for the *expansion* of military expenditure is ever present.

Developmental failures lead to loss of economic security, and this is potentially destabilizing. The legitimacy of the government is eroded, and this leads to a decline in the legitimacy of the state--itself threatening the democratization process that is evolving in the developing world. Intra-state conflicts require increasing expenditure on internal security police, the paramilitary, drug control, and suppression of revolts. The effects spill over to neighboring countries, and inter-state relations are also affected adversely. In spite of the fact that the number of major conflicts has been declining since about 1986, the decline has been painfully slow, and, as the Gulf crisis shows, the potential for escalation remains strong. For the Third World as a whole, the number of major conflicts in 1990 was 31; this was fewer than the 35 conflicts recorded in 1986 and 1987 as well as the 34 recorded for 1988 and the 33 for 1989. Although this is a downward trend, the total nevertheless represents a large

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number of major conflicts. In the future, developmental failures, environmental problems, and food scarcity will mean that resource conflicts may increase. In particular, a number of unresolved disagreements over water resources threaten stability in many parts of the world. There are implicit conflicts about the waters of the Nile, Euphrates/Tigris, Jordan, Indus, Salween/Nu Jiang, Mekong, Parana, Lauca, and Rio Grande. These involve about twenty-five Third World countries. In addition, there are territorial disputes about sea resources and attempts to establish exclusive economic zones around coastal waters--all of which lead to naval expansion and back again to high defense expenditure.

In this setting, the possibilities for 'spontaneous arms control' and for the reduction of MILEX need to be increased by putting pressure on aid recipients to resolve disputes and cut defense spending to release domestic resources for development. But this cannot be done unless aid levels themselves are raised. Foreign economic aid can only be used as an incentive if it is high enough for developing countries to gain substantially from such inflows. Otherwise, perceived security threats will force military expenditure to increase when economic and budgetary constraints are relaxed. If the terms of receiving foreign aid are made stricter, through defense conditionality, then there must be some compensation through higher aid levels (see Deger and Sen 1991). There is a need to analyze the potential for the disarmament dividend, whereby the industrial countries could pass on a part of their savings from defense cuts to aid recipients. The relaxation of the East-West confrontation allows the possibility of transferring donor countries' defense expenditure and military aid to economic assistance programs.

Third World countries are faced with a rather tragic contradiction between the

'security dilemma' and the 'poverty trap.' They do have genuine military security problems: history, colonialism, internal dissension, regional problems, intervention (both direct and indirect) by the major military powers, and the weakness of domestic democratic institutions are all important. These profound security concerns lead to governments giving primacy to defense spending over most other forms of expenditure. Some econometrics evidence also shows that defense spending tends to be determined relatively autonomously of the domestic economy. Clearly there are exceptions; for example, the rise in oil revenue may produce an orgy of defense spending. But even in this case there is no close connection between wealth and the amount that society is willing to provide for its defense. Security considerations--the eternal vigilance theme--seem to explain the evolution of defense behavior. Given that causality, it is formally valid to ask what effects defense expenditure will have on economic growth and development.

The problem would be simplified if there were a very clear guns and butter, or tank and tractor, trade-off. If we could be sure that, always and everywhere, military spending reduces economic performance, the only remaining analytical task would be to quantify the negative multipliers. But this is not true. In addition to heuristic evidence and country studies, empirical work now exists showing that defense expenditure also has some positive effects on the economy. The task of the analyst becomes more complicated, since both the sign and the amount of the effect is controversial.

The major purpose of this paper is to see how defense affects growth and development and to summarize some of the empirical evidence that has appeared in recent years. Almost all of the econometric studies are of recent vintage. In 1978, Kaldor claimed:

"Most of the analyses . . . are necessarily speculative. Very little empirical work has been done in the field." That seems to have changed dramatically over the last decade. The two major variables used are: the military burden, or the ratio of defense spending to national product (GDP); and the rate of growth of GDP (or growth of GDP per capita). In addition, the share of the defense sector in central government expenditure (CGE) is used as an explanatory variable to analyze the impact of defense on growth.

The next three sections briefly discuss the background to the defense-growth controversy, provide the theoretical framework, and survey the econometrics evidence. The paper then considers wider issues of development and offers some brief conclusions.

The Trade-Off Between Defense and Economic Growth: The Theoretical Framework

A large literature now exists on the general relationship between defense and development. An earlier formal survey is found in Deger (1986); the more recent formal survey is in Grobar and Porter (1990). Descriptive surveys are available in Chan (1985) and Ball (1988). The empirical analysis concentrates on the rate of growth, since broader developmental factors are not easily identified empirically. However, increasing attention is also being given to socio-economic development beyond narrow indicators of economic growth. The basic idea can be put starkly: Defense spending increases national security and therefore improves the environment within which growth and development can prosper. In addition, there are spin-offs that promote development. Taken together, these factors imply that, potentially, military spending could enhance economic growth. On the other hand, military expenditure reduces resources available for investment and possibly for consumption. In

addition, it causes distortions in the economy that reduce efficiency. Taken together, these latter factors imply that military spending reduces the rate of growth. The debate arises out of the evaluation of the *net effect* across countries and over time--whether defense retards growth and development overall and by how much.

Much of the literature is heuristic, but the formal literature has also grown fast in recent years. The impetus to the empirical work that focuses on the effect of military spending on economic growth came from Benoit's seminal work (1973, 1978). Contrary to expectation, he found that defense spending has a positive effect on the rate of growth of national product (income) in less developed countries. Benoit used cross-section data and estimated a single-equation simple trivariate relation with military burden and investment affecting growth rates.

In a sense, most of the econometrics studies on the subject are a response to the challenge posed by the Benoit result. Benoit identified a number of positive and negative channels through which defense is expected to affect growth. The negative effects are standard: a) resource transfer from investment to defense, and b) the fact that the government sector (including the military) exhibits no measured productivity increases--hence its relative expansion lowers the national growth rate. But Benoit also identified a host of factors that directly or indirectly increase growth. He claims that:

Defense programs of most countries make tangible contributions to the civilian economies by (1) feeding, clothing, and housing a number of people who would otherwise have to be fed, housed, and clothed by the civilian economy--and sometimes doing so, especially in less developed countries, in ways that involve sharply raising their nutritional and other

consumption standards and expectations; (2) providing education and medical care as well as vocational and technical training (e.g., in the operation and repair of cars, planes and radios; in hygiene and medical care; in construction methods) that may have high civilian utility; (3) engaging in a variety of communication networks, etc., that may in part serve civilian uses; and (4) engaging in scientific and technical specialties such as hydrographic studies, mapping, aerial surveys, dredging, meteorology, soil conservation, and forestry projects as well as certain quasi-civilian activities such as coast guard, lighthouse operation, customs work, border guard, and disaster relief which would otherwise have to be performed by civilian personnel. Military forces also engage in certain R&D and production activities which diffuse skills to the civilian economy and engage in or finance self-help projects producing certain manufactured items for combined civilian and military use which might not be economically produced solely for civilian demand (Benoit 1978).

Benoit's econometrics is simplistic, since it follows from a rather basic relation regarding the effect of defense spending on growth. A more complicated formulation would have to take into account quite a few other channels and balance the various influences to produce the net effect.

For cross-section studies taking many less developed countries together, at the theoretical as well as empirical level, there have been three basic ways of evaluating, analyzing, and criticizing the hypothesis that defense spending increases growth rates in these countries:

- The *first method* uses growth and planning models to discuss the possible channels through which defense spending can affect growth. After analytically

identifying the relevant channels, the econometric studies try to measure whether the net effect is negative or positive.

- The *second method* looks at finer sub-groupings and tries to see whether specific economic and developmental characteristics can be identified that point to one or another type of growth effect of defense expenditure.
- The *third method* looks at structuralist models of developing countries and focuses on those elements in the interconnection—for example, the share of agriculture or of investment—that structuralists consider crucial in the growth process.

Broader measures of economic development are also utilized, though less commonly, to measure the effect of defense spending. The general growth models sometimes add on other expenditure shares as dependent variables (such as government health or education spending); more qualitative variables (infant mortality rates, quality of life indicators) are also sometimes considered. Models of the second type, which emphasize specific characteristics, introduce wider, mostly political, notions of development (such as government effectiveness or the role of the military in controlling the state). Structuralist models can also incorporate broader considerations about economic development. For example, the growth of defense spending crowds out agricultural investment, which in turn reduces food output and increases poverty. Alternatively, rapid increases in military expenditure, say during a war, can cause differential price effects, which in turn lead to entitlement losses and possibly famine.

In a series of papers, Deger (1984, 1985, 1986) and Deger and Sen (1983, 1987) have used analytical growth theory to identify three

major channels through which defense can impact on growth. These can be christened the "spin-off," "allocation," and "mobilization" effects. The first includes the entire host of non-quantifiable factors, such as 'modernization' or 'discipline' that militarism can provide to relatively backward societies. It also includes economic services that the military may put into the economy. For arms-producing countries, there also can be inter-industrial linkages, dual-purpose R&D, as well as technological feed-backs from sophisticated weapons manufacture. The second channel concerns the use of resources that could go into investment but instead are transferred to the military. This does not mean, of course, that in the absence of military spending, all of the released resources would automatically flow into investment. Identifying the amount of crowding out is important and can only be done empirically. Finally, additional defense spending can mobilize new resources (taxation, inflation, foreign aid from military alliance partners) or reduce saving (by raising the consumption propensity as other public goods diminish, or by reducing foreign saving used up for arms imports). The aggregate effect, combining both negative and positive elements, can be of either sign; it is certainly complex.

Overall, therefore, from the points of view of both theory and empirical analysis, the military expenditure-growth relationship should allow for the following aggregate channels:

- (1) A direct effect of defense spending on growth through various spin-offs that may on balance be positive (these are essentially the points discussed by Benoit);
- (2) An indirect effect through the savings rate, reflecting the fact that military expenditure increases government consumption and reallocates its savings away from productive investment;
- (3) Resource mobilization and a possible decrease in the private sector's propensity to save may be diminished as household expenditure goes up to compensate for lower state spending on civilian, publicly funded goods; and
- (4) Open economy considerations claiming that military imports may crowd out civilian imports and reduce foreign savings entering the country; on the other hand, if military aid is used to reduce domestic burdens or if donor countries give more aid to strategic allies, then clearly a positive nexus is set up.

Models of the second type are concerned with developmental specificity and country sub-groupings according to economic characteristics. One analytical issue is concerned with the *non-linearities* (the term is due to Boulding 1974) in the defense growth relation. Essentially this implies that the parameter (showing the effect of military burden on growth) may be negative for one range of countries; yet for another range of countries, it might become positive. It is of course not easy to identify theoretically which type of country falls within which category. A working hypothesis might be that, for small values of the defense burden, there may well be positive effects that overcome the growth retardation arising out of lost investment. However, once a 'threshold' is crossed, the negative role of resource reallocation and mobilization dominates. Thus we could expect countries with relatively low military burdens to have non-negative parameters while countries with high burdens will show the standard negative effects of military spending.

Another related way of looking at non-linearities (Deger 1986) is to claim that high-, low-, and middle-income countries have different ways of responding to military expenditure. It is possible that high- and low-income countries can derive and absorb the

benefits of military expenditure so that the negative impact is modified. On the other hand, middle-income countries tend to suffer more than they gain from increased defense spending. The explanation behind this non-linearity is important. All countries, whatever their per capita income, lose out from allocation effects, with military spending reducing the amount of resources available for productive expenditure. But the military also has spin-off effects. It is possible that high- and low-income economies receive more of the beneficial effects of defense-related spin-off than do the countries in the middle. *Low-income countries* at an early stage of development may gain from the whole plethora of concepts most generally termed 'modernization.' If the country is not specifically at war, the civic action programs of the military may help in development. Even if the country is at war, the military may contribute to the cohesion of the state; for example, as pointed out by Kennedy (1974), Nigeria's civil war may have helped to build the nation rather than divide it, due to the exemplary behavior of the central army after victory. *High income-countries*, on the other hand, gain from technological spin-off and effective demand creation (Greece, South Korea), particularly if they are starting their own arms-building capacity. *Middle-income countries* are sufficiently advanced in development not to get much leverage from modernization, yet their economies are not advanced enough to benefit from the military-industrial complex. Thus the allocation effect dominates the weak spin-off, and increases in military burden tend to depress growth. This is clearly an area for further empirical research.

Another variant of such classification schemes is to group countries as resource-abundant (rich) and resource-constrained (poor) and see whether there is a difference between them (see Frederiksen and Looney 1983, 1986). In particular, countries with

high endowments of foreign exchange, say after an oil price rise, might withstand the negative impact of resource re-allocation towards the military, at the same time gaining the fruits of spin-off.

The third approach to understanding the relationship of military expenditure to the macroeconomy is through the concepts of structuralism. This is particularly true of short-run economic behavior, on which we concentrate. Instead of dealing with the aggregate nature of the economic system--a common foundation of demand management and supply considerations of classical/Keynesian models--structuralist theories emphasize the dualism, or dichotomy, that characterizes the less developed countries' socio-economic structures. The best economic way to identify the dualism is through the Hicksian flex-price, fix-price distinction. The fix-price sub-system behaves in Keynesian fashion; there is usually surplus capacity, and aggregate demand (through inventory adjustments) determines output. Mark-up pricing, through unit costs and the profit rate, determines the price level in this sector. Thus cost inflation is an important ingredient of overall inflationary pressures. The flex-price sector, on the other hand, obeys a Walrasian adjustment mechanism whereby excess demand correction is sought through price adjustments. Output supply depends principally on technology (and fixed factors such as land or capital), while price inflation is motivated by demand.

The traditional structuralist literature labeled these two dichotomous sectors as manufacture and agriculture. A wider classification could distinguish between urban or rural sectors or between large-scale and small-scale producers of goods. The crucial distinction is the ability--in terms of cost, technology, and profitability--to hold inventories. Small peasant farmers fall within the flex-price sector, since they are forced to

sell their marketable surplus as quickly as possible; (paradoxically, these 'subsistence' farmers are generally also the largest suppliers of agricultural produce in the market due to their large numbers, financial vulnerability, and the necessity to pay usurious interest rates in the unorganized money market). The same may also be true for small-scale industrial producers. On the other hand, major industries, and even large landholders, can afford to wait (at least in the short term) until demand picks up.

Within this framework, the role of military expenditure in the economy becomes complex. It is not simply a vehicle of aggregate demand; nor is it just an agent of crowding out. If it creates demand in the fix-price sector (say through arms production), then employment and income here will rise. This creates additional demand for the flex-price sector's output (food, basic consumption), which in turn will accelerate inflation there. The feedback through worker's higher wage demands (due to increases in the cost of living) also produces inflationary pressures in the fix-price sector. If workers are strong enough (as they usually are in the modern sectors of less developed countries), then there even may be a rise in real wages in the fix-price sector. Thus it is possible to have a decline in the relative price of the flex-price sector. If the latter is defined (predominantly) as agriculture, then we witness a decline in the agricultural terms of trade and a fall in agricultural supply. But a real wage increase may also, along the factor price frontier, erode the profit rate. A possible decline in profitability will cause a fall in the growth of capital formation; hence the economy suffers in the long run. These postulated effects can take place under any increases in exogenous demand--say, coming from higher government expenditure. What is so special about defense is its essentially 'unproductive' nature. The structural dilemma arising out of the economic dualism is exacerbated by the expansion of the defense

sector--since its inter-industrial linkages are low, its impact multipliers weak, and its technological spin-offs for growth and investment small.

Many of these foregoing theoretical constructs do not *explicitly* tackle a central issue in the military expenditure process: the predominantly *political* nature of this category of government spending. Such political contamination of economic relations makes it difficult to analyze the purely economic cost-benefit aspects of the problem. The politics of defense can be explicitly integrated into the economics of defense in a number of ways, not all of which are mutually exclusive.

First, there must be an explicit recognition that defense spending is done to enhance security. Its use as a fiscal stabilizer, or to provide an economic multiplier effect, is not very important in less developed countries, which tend to be generally supply-constrained. Thus any estimated growth equation will have a parameter showing the effect of defense on growth that will be heavily influenced by the fact that security can influence the environment within which the economy is operating. When this parameter is positive, this does not necessarily mean that military spending has direct economic benefits: possibly the impact is indirect--through a better security climate. Alternatively, non-military means, rather than defense capability alone, could have been used to enhance security.

Second, it may be useful in empirical analysis to consider the causes and effects of defense spending together, preferably in a simultaneous equation system. The former will emphasize the political aspects, while the latter will underline the economic costs and benefits. There is certainly a need to have a joint estimation model, with economic and military variables analyzed together.

Third, just as countries are classified by economic characteristics (high or low incomes), they should be classified by political characteristics (high or low government legitimacy, etc.). In analyzing the causes of military expenditure in less developed countries, Maizels and Nissanke (1987) distinguish between military influence, political factors, and economic linkages at the domestic, regional, and international levels--a matrix of nine elements. Rothstein (1987) makes a distinction between high, medium, and low legitimacy of governments on the one hand, and internal, external, and mixed threats on the other. Such characterizations can be integrated with purely economic ones to get a finer distinction between countries and to create more disaggregated cross-sections.

The Econometric Evidence

We now turn to a select survey of the empirical literature in the light of the three approaches discussed in the previous section: growth models, non-linear relationships arising out of specific characteristics, and structuralist analysis.

For the first approach, both the theoretical model and the multiplicity of channels analyzed imply that a simultaneous equation model is called for. The problem with econometric modeling of this complex relationship is partly data unavailability, but partly also the fact that for identification we need a large number of exogenous variables which are unavailable. For most less developed countries, outside planning ministries, and central statistical offices, the required volume of consistent long-run time series data simply is not available. Cross-section data is therefore the most preferred vehicle of analysis. But even here, most of the post-Benoit studies tend to use single-equation estimates--once again to prove or disprove the claimed positive effect of MILEX

on growth. This is unfortunate, since it goes against the theory, calls for an undesired simplification, leaves out some important avenues through which the relation works, and can also lead to specification errors. As we have shown in our earlier work (Deger, Deger and Sen, *passim*) where the data is available (on a cross-section basis), one should use a more complex model and use a systems method such as 3-stage least squares (3SLS) for estimation. But unfortunately, serious Third World data problems partly explain the paucity of time-series analysis.

It may be argued that a single equation with growth rate regressed on the appropriate military variable (usually the burden), plus other exogenous variables, is adequate, since it provides the reduced form of the appropriate structural form given by the simultaneous model. However, a number of problems surface in the literature that relies on single equation estimates. Quite often, variables are used as independent regressors (such as saving rate affecting growth) that should have been dependent variables in a more general model. In addition, even if the growth equation is properly specified, it should be at least jointly estimated with a military equation to ensure that the Zellner problem of seemingly unrelated regressions does not appear.

Avoidance of a simultaneity bias through the use of systems estimation is desirable. However, the researcher is still faced with the problem of specification errors inherent in 3SLS methods, whereby the parameter estimates of the system can be affected by a specification problem in any one equation. This is particularly true for the military expenditure equation, where the exogenous variables that explain defense resource allocation are not easy to specify. In particular, the contamination of economic variables with political factors, and the added difficulty of empirically specifying

satisfactorily such factors as 'threat', 'security', 'stability,' etc., means that specification errors are likely. Careful researchers must therefore conduct extensive sensitivity tests and detailed diagnostics checks, including 'data-mining,' and report only robust results.

The so-called Cowles Foundation approach to testing the military expenditure-growth relationship by using cross-section data and simultaneous equation models as given by economic theory has yielded useful conclusions. To strengthen the approach, one should utilize explicit tests for exogeneity of variables where the relevant equation is over-identified. I have used the Hausman (1978) tests in the context of the model presented in Deger (1986) and find that the military expenditure variable can indeed be treated as exogenous for the growth equation per se, even though the 4-equation systems method treats both as endogenous.

The problem of simultaneity and exogeneity is a recurring theme in the literature. Joerding (1986) questions single-equation estimations of the military expenditure-growth relation by asking whether defense spending is exogenous, statistically, with respect to growth of GDP. Applying Granger causality tests, he finds that the hypothesis of Granger non-causality from MILEX to growth cannot be rejected by his sample observations. Alternatively, Granger non-causality from growth to MILEX is rejected by the data (see also Chan, Hsiao, and Keng 1982). However, such 'a-theoretical macroeconometrics' (see Cooley and LeRoy 1985) cannot analyze the form in which structural macro models should be estimated. Rather, this type of causality analysis should be constructed as a critique of single-equation modeling and a recognition of the necessity of simultaneous and/or dynamic systems.

Another factor that needs to be explicitly accounted for is the impact of lagged effects. If military spending does reduce growth and create distortions, it probably does so over extended periods of time. Moreover, the adverse impact of defense on development becomes stronger with time, since there is an element of cumulation involved. Thus empirical models should analyze 'delayed' impacts. The current belief is that cross-section studies across countries with widely diverse socio-economic features tend to estimate long-term parameters. However, the need for explicitly lagged models--preferably with some dynamic structures involved--could be more fruitful.

Finally, there is a great need for time series modeling for individual countries. This would face the problem of exogeneity variables involved, particularly military expenditure and growth. It would also allow explicit modeling of truly exogenous variables (such as conflict), which affect both defense and development. Such models also allow for dynamics and the appropriate testing for the error terms. Much research remains to be done in terms of appropriate modeling of individual less developed countries--specifically those whose data base is relatively strong.

A comprehensive econometric model is provided in Deger (1986) to which the reader should turn for more details. It is a cross-section empirical model with four equations, each identified with a particular channel discussed earlier. Using data for fifty countries and time series averages for 1965-73, the following model is estimated by three-stage least squares, which emphasizes the structural simultaneity of all the relationships. (Here g is the growth rate, s is the saving-income ratio, m is the military burden, and B the trade balance (as a ratio of GDP) to

identify foreign saving; Z_i are a set of exogenous variables chosen through data specification.)

$$g = a_0 + a_1s + a_2m + a_3B + a_4Z_1 \quad (1)$$

$$s = b_0 + b_1m + b_2g + b_3B + b_4Z_2 \quad (2)$$

$$B = c_0 + c_1m + c_2g + c_3Z_3 \quad (3)$$

$$m = d_0 + d_1Z_4 \quad (4)$$

The fourth equation for 'm' is a function of strategic, security, and wealth variables--all represented by the vector Z_4 .

Considering m as an autonomous variable, the three interdependent equations can be solved simultaneously to get the impact of the military burden on growth, the saving ratio, and the trade balance. In each case, the negative effects are predominant and significantly high. For example, it was found that $(dg/dm) = -0.36$; thus, if the average military burden for these countries were reduced by one percentage point, then growth would be increased by over one-third of a percentage point--a not insignificant amount. The results for savings behavior and trade performance are even stronger and show that high improvements in both spheres are possible with disarmament. Overall, the results from this more complicated model suggest that military spending is strongly detrimental to growth, investment (saving), and the trade balance when all direct and indirect effects are taken together.

The econometric results for the second group of studies are more mixed. Frederiksen and Looney (1983) claim that resource-abundant countries tend to have positive effects of military expenditures on growth, whereas resource-poor countries tend to have negative effects. Similar results are obtained for arms-producing countries (positive impact

of defense spending) and countries that do not produce weapons (negative impact). An alternative test within this class of models--proposed by Deger and Smith (1983), is to classify countries according to high-, low- and middle-income ranges and then observe the effects for each group. The results from the threefold classification show that all groups--high-, low-, and middle-income, tend to demonstrate a negative impact.

The best structuralist models in the field emanate from the Massachusetts Institute of Technology, and a good representative paper is by Faini, Annez, and Taylor (1984). The authors take a series of variables that reflect the disaggregated concerns of structuralism: investment, imports, industrial production, agricultural output, and tax receipts--all as ratios of GDP. These ratios are regressed, individually, on the military burden as well as a number of basic developmental indicators (GDP per capita, population, etc.) Non-linearities are tackled by taking logs and squares of these economic variables. Using pooled time-series/cross-section data for a large sample, they find that the coefficient for the defense burden is generally negative and statistically significant in the regressions where investment and agriculture (as GDP shares) are the relevant dependent variables. Since investment is a major structural bottleneck and agriculture the main lagging sector (the flex-price part of the economy subject to stagflationary fluctuations), the negative effect of defense here is all the more striking. Their estimated equation is of the following type: (X stands for the ratio in GDP of (in turn) investment, imports, industrial production, agricultural output, and tax receipts; y is per capita income; N is population; KI is capital inflow; and m is military burden):

$$X = a_0 + a_1(\log y) + a_2(\log y)^2 + a_3(\log N) + a_4(\log N)^2 + a_5(KI) + a_6m \quad (5)$$

More generally, Faini, Annez, and Taylor construct a theoretical structuralist model where the growth of national output is related to the growth of exports, population, and total capital (reflecting possible shortages in foreign exchange, labor, and capital), change in foreign capital inflows, the level of GDP per capita as well as the *change in the military burden*. The last variable gives the growth effect of defense. What is significant is that this is the only model that uses the *change* rather than the *level* of military expenditure as a share of GDP. This coefficient, representing the impact of defense on growth, is consistently negative for less developed countries as a whole as well as for regional sub-groupings of these countries.

Overall, the results are relatively clear-cut. There can be no doubt that for some countries, at some times, military spending might have a positive impact on the economy's growth rate. The guns and butter trade-off is not an obvious one. However, as soon as one considers more complex models and looks at both direct and indirect effects, it becomes clear that military expenditure is a major economic burden and liability. The empirical and econometrics evidence for simple models is rather ambiguous. But the message from more complex models seems to be clear: defense spending tends to reduce growth--and in significant fashion.

What about time-series analysis for single countries? Here the familiar data problems mentioned earlier become critical. There are very few aggregate studies to match the complexity and estimation simultaneity of the cross-section ones. Faini, Annez, and Taylor have done some empirical work on India, 1950-72. In this case study, the empirical results of equation (5) show interesting effects. The authors find evidence that military spending seems to have helped certain areas of Indian economic performance. For example, the investment/GDP ratio seems to rise with

the military burden--almost one to one. In the same way, industrial production is affected positively by the military burden. However, there is a sizable, and quantitatively the largest, negative impact on agriculture. Why investment and industrial production are positively affected by the military spending process is not made clear in the paper. It could be because of arms production, since from around 1960 India emphasized domestic weapons industrialization (a military version of import-substituting industrialization, ISI). However, a disaggregated microeconomic analysis for India (Deger and Sen 1983) on the industrial effects of military expenditure shows that the inter-industrial spin-off of defense on the output of major industrial sectors has been negligible. The impact of defense spending on the value added in five manufacturing sectors is examined separately, and only for one--metal products--is there a modest positive impact of military expenditure.

Another recent study of the military expenditure process in the Indian subcontinent (Deger and Sen 1990) also tries to estimate the growth effects of defense spending in the context of an arms-race model for India and Pakistan. The implicit assumption of the economic model is that military spending affects growth in two ways. The first is the direct effect embodying the whole host of spin-off effects, including that of security on the economy. The second is indirect; this works through defense spending, affecting investment. Investment in any economy is the sum of the savings emanating from the private sector, the government, and the foreign sector (negative trade balance). Insofar as military spending affects each of these elements, it is bound to have a major role in the investment process. In addition, greater security due to defense often impacts more directly on investment through increased confidence and optimistic expectations. Investment, in turn, will influence growth.

The postulated empirical model therefore assumes that growth is a function of investment and military spending--both as ratios of GDP. In addition, investment itself is affected by the military burden. Three additional points are utilized in the empirical model. First, due to life cycle effects as well as the assumptions of the Metzlerian target-saving hypothesis, we assume that savings, and therefore investment, is also a function of growth. An accelerator type of investment function will also give the postulated relation between investment and growth. Second, structural rigidity may preclude investment being productive at the period at which it is done; the installation and use of capital in poor countries takes time, principally due to the lack of cooperative factors--the so-called absorptive capacity constraint. Hence the effect of investment on growth might come after a lag. Finally, due to considerable interest in analyzing inflationary effects on growth, this term is also included for the empirical analysis (see Sen 1991).

The empirical results for India and Pakistan, using the two equations for growth and investment, are based on (6) and (7). (Here g is growth, m is the military burden, i is the investment share in GDP, and P/P is the rate of inflation).

$$g = a_0 + a_1m + a_2i(-1) + a_3(P/P) \quad (6)$$

$$i = b_0 + b_1m + b_2g \quad (7)$$

Taking both equations together, the impact multiplier of m on g is given by a_1 ; the long-run, steady-state multiplier is derived from:

$$(a_1 + a_2b_1) / (1 - a_2b_2).$$

The empirical results show that the two countries vary quite dramatically in terms of the economic effects of the military burden on growth (Table 1). For India, the impact multiplier from (6) is positive, though not

highly significant. The long-run multiplier, using both (6) and (7), is slightly higher. Overall, the results imply that defense could have a positive effect on the aggregate performance of the economy. Once again, it may be thought that the positive impact of defense arises because of substantial arms production, which has a strongly positive impact on domestic industrialization and R&D as well as other forms of spin-offs. However, as mentioned earlier, previous work with inter-industrial data (Deger and Sen 1983) at a disaggregate level for India shows that the claims for spin-off are not supported by the econometrics. A more plausible explanation may be the one given earlier: with a relatively low defense burden, the adverse effects do not particularly bite--since the industrial and investment base itself is very large.

For Pakistan, the case is potentially different; a much larger burden superimposed on a smaller investment base can have detrimental effects. The actual empirical results for Pakistan are also more clear-cut. Defense has a small positive impact on growth; but the coefficient is statistically insignificant, so that positive and negative direct effects are cancelling each other out. But the indirect effect, through investment crowding out, is strongly negative. The final, steady-state, impact of defense on growth is *negative*. The tank and tractor trade-off for the Pakistan economy is quite crucial. Even though the military expenditure process is not subservient to the demands of the economy, given the autonomous character of the military institutions, the feed-back is important. The cumulation of growth retardation may make a long-run arms race untenable, through economic constraints, although in the intermediate term it is a major security issue in the region.

In another study, Scheetz (1990), using his own data set from the national accounts directly, estimates the impact of defense on

Table 1. Military Burden and the Economy: Empirical Results

	India		Pakistan	
	(1) g	(2) i	(3) g	(4) i
Constant	-0.06	0.23	-0.07	0.21
m	1.84 (1.17)	0.67 (2.35)	0.05 (0.07)	-0.80 (-2.51)
i(-1)	0.35 (1.56)		0.65 (1.64)	
P/P	0.35 (4.02)		0.16 (1.67)	
g		-0.001 (-0.014)		-0.05 (-0.42)
R ²	0.5157	0.9365	0.5376	0.7087
rho	-0.30 (-0.50)	0.98 (2.50)	0.60 (2.85)	0.40 (5.18)
Impact Multiplier	1.84		0.05	
Long-Run Multiplier	2.07		-0.46	

Note: The t values are provided in brackets.
Source: Deger and Sen (1990a).

growth for Chile, Argentina, Paraguay, and Peru. The model used is exactly the same as in equations (1) to (4) except for a few changes in exogenous variables. A pooled time-series/cross-section study is also done for these countries taken together; it yields strong evidence that the impact multiplier (the direct effect of the military burden on growth rates) and the systems multiplier (direct and indirect effects combined) are both statistically significant and negative.

This country study for Latin America gives mixed results. Evidence that defense spending has had a major negative impact on economic growth is strongest for Chile (during 1969-87). There is some evidence that the military expenditure-growth relationship is negative in the cases of Argentina and Paraguay. Only for Peru were the results indeterminate, with both of the multipliers statistically insignificant. The equations were also not well specified for Peru, and

specification and diagnostic checks were unsatisfactory.

Economic Development and Military Expenditure

The focus here, following the literature in the field, has been on economic growth; this is primarily because growth is subject to quantification, and this is the minimum necessary condition for empirical analysis. Clearly, the resulting picture is only partial—since economic development in the broadest sense must include many other attributes. The objective of development in less developed countries was never meant to be growth *per se*; development was expected to improve the physical and social quality of life, and growth was a means towards that end.

Alternative paradigms to growth have abounded in the area of development studies. The 'basic needs' approach, for example, emphasizes the minimum levels of well-being that are required as the *sine qua non* of development. The 'physical quality of life' indicators are another way of measuring socio-economic improvements over and above the standard measure of per capita income. A broader approach—almost an 'umbrella' to all of the models—has been proposed by Amartya Sen. He has argued forcefully for a shift in focus towards the study of 'entitlements' of individuals and groups of people in developing countries, as well as the 'capabilities' that these entitlements can produce. Sen (1983) states:

Entitlement refers to the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunity that he or she faces. On the basis of this entitlement, a person can acquire some capabilities, i.e., the ability to do this or that (e.g., be well nourished), and fail to acquire some other capabilities. The process of economic

development can be seen as a process of expanding the capabilities of people. Given the functional relation between entitlements of persons over goods and their capabilities, an useful—though derivative—characterization of economic development is in terms of expansion of entitlements.

Economic development therefore implies the acquisition of entitlements (food, medicine, education, etc.), which give rise to better capabilities (well nourished, healthy, educationally qualified, etc.). The problem that arises in empirical models is defining this rather amorphous concept of entitlement more precisely. We have looked at two types of indicators: inequality of income distribution, which gives a good indication of relative deprivation and possible loss of entitlements that can be acquired through the market; and the quality of life as measured by socio-economic and physical welfare.

Table 2 gives data for ten countries on these measures in the form of ranks, which avoids the problem of wide disparity and non-comparable units. The first column gives a ranking in terms of these countries' performance in an aggregate socio-economic index (SEI). The SEI is constructed from the following information: (a) percentage of school age population in school; (b) percentage of women among university students; (c) literacy rate; (d) physicians per head of population; (e) hospital beds per person; (f) infant mortality rate; (g) life expectancy at birth; (h) per capita calorie and protein intake; and (i) percentage of total population with access to safe drinking water. The combination measure SEI therefore represents, in principle, an aggregation over entitlements (and capabilities where relevant) to basic education, literacy, women's educational rights, health care, longevity, nutrition, and basic sanitation. The best performer gets a rank 1, and so forth. The second column of

**Table 2. Rank Order for Aggregate Socio-Economic Index (SEI),
Income Distribution, Military Burden,
and Growth of Real Per Capita Income**

Countries	Aggregate SEI	Income Distribution	Military Burden	Growth of Real Per Capita Income
Argentina	1	3	5	10
Costa Rica	2	5	10	7
Venezuela	3	7	6	8
South Korea	4	2	2	1
Sri Lanka	5	1	8	6
Malaysia	6	8	3	3
Mexico	7	6	9	4
Brazil	8	10	7	2
Philippines	9	4	4	4
Peru	10	9	1	9

Source: Sivard (1983); Sen (1981); SIPRI data base; and World Bank (1983).

Table 2 ranks the countries according to simple measures of income distribution (Sri Lanka is the best and Brazil the worst). The two together give a general view of economic development in the broadest possible sense. Clearly, the lower the rank, the better the situation in terms of development. The third column gives ranks for the military burden. To control for growth performance, which may favorably affect entitlements, we also have a fourth column reporting real per capita income growth. Here lower ranks mean higher levels of the two variables. All basic data pertain to some periods in the late 1970s

and early 1980s; the military burden data is for 1975-80; growth data is for 1970-81. It should be noted that the positions can change dramatically if there are major security shocks, such as for Sri Lanka and Argentina; but the fundamental rankings for most countries under normal situations remain similar.

The relationship between economic development and the military expenditure process can be appreciated by looking at the ranks. Sri Lanka does very well indeed in terms of economic development in spite of

having relatively low growth rates. The same is true for Argentina; it has the lowest growth rate and the best performance in SEI and income distribution combined. Brazil, on the other hand, fails to utilize its growth potential to improve its low status in socio-economic development. Similar statements can be made about Malaysia.

When it comes to looking at the military burden, we observe that the top five countries in the first two categories tend to have a low military burden. The only exception is South Korea; a high quality of life and more equitable income distribution coexist with the second highest military burden. For the other five countries—Malaysia, Mexico, Brazil, Philippines, and Peru—the relation works, generally, in opposite fashion. Peru, for example, has the highest military burden and the worst position in terms of entitlements. Mexico is an ‘outlier’—with a low military burden failing to compensate for entitlement losses.

The author is currently conducting further econometric analysis, with cross-section data, to further the qualitative results presented above. The basic structure is similar to the four-equation empirical model discussed earlier. An additional equation, with a measure of entitlements (essentially the Borda measure—a joint index of SEI and income distribution by adding ranks), is used to get a system of five equations which are estimated jointly. Preliminary estimates of the multipliers show that military spending significantly lowers the entitlement index. Hence, higher defense expenditure, for a given GDP, lowers the socio-economic developmental levels of developing countries.

The central reason for this negative relationship is the crucial role that governments in less developed countries play in providing a higher quality of life and greater entitlements. As Sen (1981) has so

strongly emphasized, the role of the state, ‘public action,’ is probably the most important ingredient in entitlement enhancement for most developing countries. With the exception of certain countries such as South Korea, the ‘trickle down’ effects take a long time to appear. Aggregate growth and the market mechanism by themselves cannot break down, rapidly, the barriers of the poverty trap and ensure a higher quality of life and egalitarian incomes for the deprived. Government intervention is vital, at least in the short run. But one of the central trade-offs occurs in the budgetary process between defense spending and expenditure for social and economic services. Governments in less developed countries, enmeshed in regional security problems, must give first priority to national security when the need arises. The essential crowding out that occurs here between defense expenditure and other spending on health, education, welfare, and social security provisions, is a barrier to development. A specific case study for child development in Sub-Saharan Africa shows that low defense spending was associated with a reduction in infant mortality rates, while rapid growth of defense expenditure was linked with a slowing of the rate of decline of infant mortality (see Deger and Sen 1990). Incidentally, the history of the Reagan era shows that the problem is not unique to less developed countries. But for poor societies, the choices are more stark and the trade-off more tragic.

Concluding Remarks

Military expenditure does have some positive effects on economic growth in developing countries. Aggregate demand expansion may produce beneficial multipliers. Certain types of spin-off may operate. The ‘modernizing’ role of a benevolent military, if it exists, may help in nation-building. The tractor-tank trade-off is not obvious; nor is the problem a vacuous one. However, when all direct and indirect effects are taken together, defense

spending, on average, has a serious impact on growth and development. The aggregate effect is undeniably negative, and this conclusion is strongly supported by more complex econometric models.

The empirical literature has claimed that three alternative types of effects, from defense to growth, can be identified: zero, negative, and positive. In the first case, defense either does not affect growth at all, or the contrary effects cancel each other out. However, this also implies that resource savings and judicious re-allocation away from military spending will have a positive impact on the economy in terms of both growth and development. In the second case, the justification for resource diversion from the military is very strong indeed, for structural features show that defense reduction will stimulate growth. For the countries in the third case, the arguments for military spending reductions are diluted, even though it may be argued that alternative public expenditures will have much greater growth multipliers than defense spending.

The days of estimating single-equation military/growth estimations and debating about

positive and negative parameters are over. Cross-sectional studies must have more homogeneous data sets (specific region, common economic characteristics, similar security perceptions) and need to be based on simultaneous-equation systems estimation. Specific country studies are probably more important. Where data problems do not allow adequate coverage, the possibility of pooled time-series/cross-section estimation of a few countries over time should be attempted.

As long as developing nations perceive genuine security problems, they will continue to spend on the military. What is really needed is a proper cost-benefit analysis, so that the economic costs are starkly presented as opposed to security gains. The military--like Caesar's wife--is often beyond question. This is unfortunate, since the economics of military expenditure is too important to be left to the military alone. Arms control and disarmament measures have a greater chance of success if the costs are highlighted and put in perspective. Country and regional analyses are now essential to demonstrate the massive opportunity costs of militarism. They could demonstrate that disarmament is a worthwhile and a major economic alternative.

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ADJUSTING TO REDUCTIONS IN MILITARY EXPENDITURE AND DEFENSE PROCUREMENT

Nicole Ball

Introduction

Armed forces and military industries face reductions in military expenditure or arms procurement for a variety of reasons. Changes in political conditions at the global, regional, and national level affect the amount of expenditure on weapon procurement, both in general and on specific categories of weapons. Rapprochement between East and West, the termination of regional conflicts, and the reassessment of threats by individual governments have caused at least some countries to start to re-examine the allocation of resources to their military sectors.

Purely economic factors also play an important role. A major impetus behind the

changes in Soviet foreign policy that have significantly reduced the likelihood of East-West conflict derives from the urgent need of the Soviet government to reduce military-related outlays of all kinds, both at home and abroad. To the extent that the events set in motion by the new Soviet policy reduce major-power intervention in the developing countries and encourage the peaceful resolution of conflicts, the perceived need on the part of a large number of developing countries to maintain military expenditure and arms procurement at current levels may be eroded. The ability to finance these outlays may also be affected if, as currently seems likely, the major powers become less inclined to provide financial support to the military sectors of "friendly" countries (the Gulf War notwithstanding) and if markets for weapons produced in the developing world contract. Some developing countries may identify pressing domestic economic needs and seek to shift resources from the military sector, as China did during the 1980s.

Another important economic consideration—at least in Western Europe and the United States—has been the constant increase in the sophistication and hence the cost of arms since the end of World War II. Over

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Table 1. Arms Production Capabilities of 54 Developing Countries, early 1980s

Country	Ammunition	Small Arms	Aircraft	Armored Vehicles	Missiles	Ships
Algeria	X					X
Argentina	X	X	X	X	X	X
Bangladesh						X
Bolivia	X					
Brazil	X	X	X	X	X	X
Burma	X	X				X
Cameroon	X					
Chile	X	X	X	X		X
Colombia	X		X			(X)
Congo	X					
Cuba	(X)					
Dominican Republic	X					X
Ecuador	(X)					
Egypt	X	X	X	X	X	X
Ethiopia	X					
Gabon						X
Ghana	(X)					
Guatemala	(X)	(X)				
Guinea		(X)				
Honduras						X
Hong Kong						X
India	X	X	X	X	X	X
Indonesia	X	X	X			X
Iran	X	X	(X)			
Iraq	X	X				
Israel	X	X	X	X	X	X
Ivory Coast						X
Jordan	(X)					
Korea, North	X	X		X		X
Korea, South	X	X	X	X		X
Madagascar						X
Malaysia	X	X				X
Mexico	X	X		X		X
Morocco	X	X	X			
Nepal	X					
Nigeria	X	X				
Pakistan	X	X	X		(X)	
Panama						X
Peru	X	X				X
Philippines	X	X	X			X
Saudi Arabia	X	X				
Senegal						X
Singapore	X	X				
South Africa	X	X	X	X	X	X
Sri Lanka						X
Sudan	X					
Syria	X					
Taiwan	X	X	X	X	X	X
Thailand	X	X	X			X
Trinidad & Tobago						X
Tunisia	(X)					
Upper Volta	X					
Uruguay						X
Venezuela	X	X				X
Total:	42	27	16	11	8	33

Source: Michael Brzoska and Thomas Ohlson, eds., *Arms Production in the Third World* (London: Taylor & Francis, 1986), pp. 16-17.

employment has been generated per unit of expenditure. In addition, where procurement budgets have not risen as rapidly as weapon costs, progressively fewer of any given weapon system have been procured. Smaller producers (that is, all those except the United States and the Soviet Union) have frequently found that it is more economical to purchase sub-systems and components from abroad than to produce them domestically. This further reduces the employment generated by local production. As costs have risen, the life span of weapons has been extended through modification and repair, which has meant that entire weapon systems are purchased less frequently. Increased military expenditure, often including rising shares of procurement, and declining defense-industry employment have occurred simultaneously. The defense sector has become less and less able to support more than a handful of producers for each kind of weapon. Although some of the slack has at times been taken up by exports, considerable resources nonetheless have been released from the defense sector of the industrialized countries over the last 35 years.¹

This paper examines a series of issues surrounding the process of adjusting to decreased military expenditure and weapon procurement in the developing countries. It begins by identifying the major producers of military equipment in the developing world and summarizing the use of manpower by developing-country security forces (military and paramilitary). It then examines the two main strategies for adjusting to decreases in defense procurement--conversion and diversification--and considers the transferability to the civilian sector of skills acquired in the course of military service. The core of the paper is a review of the most important factors affecting the ease or difficulty that countries, enterprises, and manpower experience in adjusting to cutbacks in military expenditure and defense

procurement. Finally, the availability of data pertaining to these issues for the developing countries is assessed.

The Need for Adjustment

Industrial Production

The Stockholm International Peace Research Institute (SIPRI) has identified fifty-four developing countries that possessed some domestic arms production capacity in the early 1980s, but over half of these produce only ammunition, small arms (under license), and/or simple surface vessels (Table 1). The ability to manufacture major weapon systems is highly concentrated among developing countries. According to SIPRI figures, only the first nine countries listed in Table 2 possess a broad-based military industry. Two of these, India and Israel, accounted for over half of the value of major weapons produced by the developing world (excluding China) between 1950 and 1984. Altogether, SIPRI identified fourteen developing countries (excluding China) as the main producers of major weapon systems in the early 1980s. Another twelve had a much more limited capacity to produce major weapons.²

The more complicated the technology involved, the fewer the number of countries that have been able to use it, even under license. SIPRI figures show that by the mid-1980s, nine or ten developing countries produced fighter aircraft, eight produced helicopters, seven or eight manufactured missiles, five or six produced tanks, and six manufactured major fighting ships.³ While there is little information available on the ability to produce major components for weapon systems such as engines and electronics, it is known that only a few developing countries possess the capability to manufacture these items. Argentina, India, Israel, Indonesia, Egypt, South Africa, and

Table 2. Developing Country Producers of Major Weapons, 1950-84

Country	Percentage	Cumulative Percentage
India	31	31
Israel	23	54
South Africa	9	63
Brazil	9	72
Taiwan	8	80
North Korea	6	86
Argentina	5	91
South Korea	4	95
Egypt	2	97
ASEAN countries ^a	2	99
Others ^b	1	100

^a Indonesia, Malaysia, Thailand, Philippines, Singapore.

^b Bangladesh, Burma, Chile, Colombia, Dominican Republic, Gabon, Madagascar, Mexico, Pakistan, Peru, Senegal, Sri Lanka.

Source: Michael Brzoska and Thomas Ohlson, eds., *Arms Production in the Third World* (London: Taylor & Francis for SIPRI, 1986), p. 10.

Brazil have limited capacity.⁴ China has for many years produced aircraft and vehicle engines as well as electronic components for its various weapon systems. Reverse engineering of Soviet equipment has been important in building this capability. More recently, Western licenses have been procured. The items designed in China tend to be less sophisticated than their Western counterparts, and serious questions have arisen about the reliability of some of this equipment.⁵

Manpower

Precise figures for defense-industry employment in developing countries are difficult to obtain. Nonetheless, the proportion of the *industrial* labor force

employed by the defense sector in most of these countries is (with the exception of Israel) extremely small (Table 3). While these employment figures may be subject to a relatively wide margin of error, the share of industrial employment they represent is in most cases so small that even a 100-per cent margin of error would still produce quite a small fraction.⁶

Similarly, the armed forces of most developing countries absorb a rather small proportion of the total labor force. Table 4 shows that in about 20 per cent of the countries surveyed, less than 1 per cent of the males in the economically most productive age group (here defined as 15-44 years old) are in the security forces (military and paramilitary

Table 3. Share of Industrial Labor Force Employed in Arms Industry, early 1980s

Country	Employment in Arms Industry as Percentage of Industrial Employment	Estimated Direct Employment in Arms Industry
Israel	10.3	90,000
South Africa	2.0	100,000
Singapore	1.7	11,000
North Korea	1.5	55,000
Argentina	1.2	60,000
Egypt	1.0	75,000
India	0.5	280,000
Brazil	0.4	75,000
Pakistan	0.4	40,000
Indonesia	0.2	26,000
Peru	0.2	5,000
Thailand	0.2	5,000
Chile	0.2	3,000
Malaysia	0.2	3,000
South Korea	0.1	30,000
Philippines	0.1	5,000

Note: The data on which arms industry employment and total industrial employment have been based are frequently quite soft, and the figures presented in this table must be treated as estimates.

Sources: Michael Brzoska and Thomas Ohlson, eds., *Arms Production in the Third World* (London: Taylor & Francis for SIPRI, 1986), p. 22; and World Bank, *World Development Report, 1985* (New York: Oxford University Press, 1985), Annex Tables 1 and 2.

forces). In approximately half the countries, between 1-5 per cent of this group is serving in the security forces. In the remaining countries in the survey, the security forces absorb more than 5 per cent of the men in this age group.

The Middle Eastern countries have the highest ratio of security personnel to

economically active population. Central America and Sub-Saharan Africa have the lowest ratios, although in view of the increase in conflict in several Central American countries during the 1980s, it is likely that the security force participation rate increased during the decade in that region.

Table 4. Security Forces as Percentage of Males in 15-44 Years Age Group, 1980 (percentages and number of countries)

	<1.0%	1.0-5.0%	5.0-10.0%	10.1-15.0%	15.1-20.0%	>20.0%
Armed Forces (101 countries)	33	50	14	2	1	1
Total Security (98 countries)	22	51	18	5	0	2

Sources: For demographic data: United Nations Department of International Economic and Social Affairs, *Demographic Indicators of Countries: Estimates and Projections as Assessed in 1980, ST/ESA/SER.A/82* (New York: United Nations, 1982). For security force data: International Institute for Strategic Studies, *The Military Balance 1981/82* (London: IISS, 1982); *Annuaire de l'Afrique et du Moyen Orient 1980: Les Armées et la Défense* (Paris: Groupe Jeune Afrique, 1980); and *Defence & Foreign Affairs Handbook* (London: Copley, 1980).

Variable Effects

While the effects of adjusting to decreased military procurement would be felt by relatively few developing countries, and in a fairly limited number of industrial sectors and by a rather small proportion of the labor force in most of those countries, some workers, communities, and industrial sectors can be expected to experience difficulty in making the transition. The problems experienced in absorbing some proportion of the manpower currently employed by the security forces depends on several factors, such as the number released, the speed with which the demobilization occurred, the skills possessed by the released servicemen, the availability of jobs, and the match between the skills of released personnel and the available jobs. The transferability of skills acquired in the course of military service will be examined in a subsequent section. Unemployment and underemployment are problems of considerable magnitude in many developing countries, and the addition of what may appear

to be a rather small share of the labor force may produce disproportionately larger problems.

The effect that reduced production of weapons would have on industrial sectors and local economies depends in part on the relative weight of arms production, its concentration, and the link between the major contractors and second-tier suppliers. The more integrated the firms that produce major weapons are into the local economy--that is, the larger the proportion of domestically produced components and materials--the greater the secondary effects of reducing procurement.

Two Paths: Conversion and Diversification

Economies are constantly undergoing change as entire industries rise and decline and new products and production techniques are introduced. Many analysts believe that: "Defense industry conversion in the 20th and 21st centuries does not differ in its basic form

from the other industrial transformations witnessed in the past."⁷ The process by which countries adjust to reduced arms procurement varies according to economic system and derives from the way in which economies are organized and managed. It corresponds to the way in which these economies undertake other structural adjustments.

Conversion

Defense-industry conversion has become a controversial concept in the OECD countries because proponents of reduced military expenditure and lower levels of defense procurement have argued, largely for political reasons, that the defense-industrial sector requires somewhat different treatment than other industrial sectors undergoing structural change. Defense-industry conversion--under which governments mandate advanced planning for the alternative use of defense production facilities, approve plans developed at the local level for their re-use, and provide financial support for the adjustment process--is seen as a tool to promote arms limitation and arms control by undercutting pressure from both labor and management to maintain stability in weapons procurement. Conversion proponents believe that if defense producers plan for lower military expenditure in advance of cutbacks, their support and the support of the communities in which they are located for continued arms expenditure will be reduced. They also seek to assure the defense workforce that lower defense expenditure need not be equated with higher rates of unemployment for defense employees.⁸

Proponents of defense-industry conversion have suggested that central governments create national commissions to oversee the conversion process, provide financial and other forms of assistance to guide that process, and mandate the creation of "alternative use committees" in each defense enterprise. The

latter would be charged with planning, in advance, the transition from military to civilian production--choosing new products and overseeing the retooling of the factory and any necessary retraining of the workforce (including management).

Diversification

In the OECD countries, most of those concerned with adjusting to lower procurement budgets envision a smaller role for central governments--one which does not go beyond the programs and policy tools used by governments to assist economies in making other transitions. For them, the responsibility for diversifying into new products and markets rests largely with individual enterprises. While it is recognized that diversification requires advance planning, particularly to identify marketable products, proponents of diversification (including the defense producers themselves) strongly object to a government role in funding or otherwise facilitating the planning process.

Diversification can take several forms. In its simplest and most commonly practiced form, it involves the acquisition of a company or division already established in the civil sector. The company or division that produced for the military sector may be sold, closed or drastically reduced in size. The plant and equipment of divisions that have been closed are typically sold or dismantled. Employees must seek work elsewhere if they are not transferred to another position within the company. This option is clearly not one that is available to very small companies without sufficient financial resources to enable them to acquire other firms.

Alternatively, an enterprise manufacturing military equipment, sub-systems, or components can identify new markets for closely related civilian products (such as civil aircraft for a military aircraft producer). Or,

if these do not appear to exist, new products can be produced using as many as possible of the facilities, processes, equipment, and skills that were used to manufacture defense material (such as railroad locomotives for a tank producer). At the micro-level, there is essentially no difference between this type of diversification and defense-industry conversion. Where these two strategies differ is in the degree to which government mandates advanced planning, approves conversion strategies, and funds the transition.⁹

Conversion versus Diversification

Defense-industry conversion is not likely to be adopted in any country at the present moment. In the Soviet Union, the one country in which conversion has recently been widely debated, the concept has diametrically opposed meanings for the participants in that debate and has become part of the battle surrounding the adoption of market-oriented reforms.¹⁰ Irrespective of which side prevails, it does not seem likely that reductions in arms procurement will be addressed in a significantly different manner from other structural changes facing the Soviet economy.

In the OECD countries, diversification will be the strategy of choice. The more mobile labor and other industrial resources are (whether by choice or by default) and the more flexibility economic managers have, the more likely it is that diversification will take the form of acquiring new research or production facilities, as in the United States. In many European countries (where labor tends to be less mobile than in the United States) and among the larger Japanese corporations, diversification at the enterprise level will be the preferred strategy.¹¹ Exactly where on this spectrum individual developing countries fit depends on their general approach to structural change in the economy.

Transferability of Security Force Personnel¹²

In the 1960s, the earliest theorists of the role of the armed forces in the development process posited that one of the most important channels through which the security forces could contribute to the economic process was human capital formation—specifically, training of administrative and technical personnel.¹³ The empirical base upon which these assertions were founded was modest at best and in many cases non-existent. Although more research still needs to be carried out to determine exactly which skills are acquired in the course of military service and the degree to which these benefit the civilian economy, it is now possible to make a preliminary evaluation of the transferability of technical skills from the armed forces to civilian life.

Transferability of Technical Skills

Most soldiers in the army (traditionally the largest service) are trained in artillery, armored, and infantry activities, all of which are highly military-specific. Relatively few receive more specialized technical training. Most of the very few available detailed studies of developing-country military manpower pertain to South Korea. One of these found that only about 20 per cent of the servicemen discharged from the armed forces each year at the beginning of the 1970s could be considered "technically skilled manpower" (Table 5).

Some analysts have looked at statistics such as these and have concluded that the armed forces have made a significant contribution to the supply of technical manpower in countries like South Korea.¹⁴ Before reaching any conclusions about the transferability of skills, however, it is necessary to examine in more detail the nature of the skills possessed by the 20-25 per cent of Korean servicemen discharged each year who

Table 5. Technically Skilled Manpower Released from South Korean Armed Forces, by Service, early 1970s

Total Discharged	Total	%	Army	Navy	Air Force	Marines
180,000-190,000	35,567	19-20	30,500	551	2,609	1,907

Source: Labor Education and Research Institute, *Economic Development and Military Technical Manpower of Korea. A Study of Manpower Development in the Military in Korea* (Seoul: Korea University, 1976), p. 321.

are classified as "technically skilled manpower." There is no doubt that some skills are transferable. Many civil airline pilots, sailors in the merchant marine, aircraft mechanics and radiomen, and skilled workers in the electronics, automotive, shipbuilding, heavy construction, and civil engineering industries received their initial training in the armed forces.¹⁵ At the same time, much of

the training provided to Korean soldiers is of no benefit whatsoever to the civilian economy. The Korean Army Military Occupational Areas listed in Table 6 are subdivided into 144 Military Occupational Specialties (MOS) of which 55 (or 40 per cent) have no civil-sector counterparts, probably including a high proportion of the jobs in the combat and electronics areas.¹⁶

Table 6. Distribution of Servicemen in South Korean Army, According to Military Occupational Areas, 1968

Combat	Electronics	Electricity	Repairing	Mechanics	Vehicles
45.2 ^a	0.6	3.7	1.0	3.5	12.6
Adminis- tration	Public Health	Survey and Drawing	Special	Others	
11.2	4.0	0.3	2.5	15.4	

Note: It is not known what the category "Others" includes.

^a This estimate may be low. A 1972 study suggested that somewhat over 50 per-cent of all men serving in the army belong to occupational area 1.

Source: Labor Education and Research Institute, *Economic Development and Military Technical Manpower of Korea. A Study of Manpower Development in the Military in Korea* (Seoul: Korea University, 1976), p. 294.

Even where technical training that might be applicable to the civilian sector has been received, its actual use is in some doubt.¹⁷ Surveys suggest that over 90 per cent of former South Korean enlisted men were holding jobs entirely unrelated to the military occupational specialties in which they had received training in the early 1970s. More striking yet was the finding of the 1972 survey that 92.8 per cent of the South Korean servicemen who had undergone specialty training at branch schools were employed outside the technical fields in which they had been trained.¹⁸

A survey of 11,600 members of the Korean Army Reserve conducted in March 1975 found that some 26 per cent identified at least some relationship between their current occupations and their MOS while in the regular Army. (Of these, only 10 per cent found a "close" relationship.) Over 20 per cent of those who said that they were working in the same fields in which they had been trained by the Army were employed in "mechanical operation"--presumably vehicle operation. Another 9 per cent were in "management" and 3 per cent in "communications."¹⁹

While it would be unwise to draw hard and fast conclusions based on 20-year old data for one country, the South Korean case strongly suggests that there is far from a close or automatic relationship between training received in the military and an individual's subsequent career. Available information from other countries such as Iran and China supports this assumption.²⁰

Pre-release vocational training programs in place in developing countries also suggest that military training transfers poorly. South Korea inaugurated the Saemaul, or "New Village," program in 1970. Under this program, Army personnel are given a course in farming techniques just prior to their release

from the armed forces, and men who have served in the Navy learn fishing techniques. While this training has been described as "a general education for culture rather than for vocational coordination with civilian enterprises," a 1975 study found that pre-release training had been useful to some 34 per cent of nearly 10,000 former servicemen surveyed, either in their current job or in a previous position. A survey of nearly 2.3 million ex-servicemen conducted at the end of the 1960s found that nearly 60 per cent were engaged in agriculture and just under 5 per cent held positions as manual laborers.²¹

Limited Spin-off

In general, one must conclude that the armed forces are not a significant source of technical manpower for developing economies. Many of the skills taught in the course of normal training are military/weapon-specific. In many developing countries, the armed forces have access to relatively few sophisticated weapons and thus have much less of an opportunity to receive technical training than in a country such as South Korea. If all of the technically trained personnel in these countries were able to use their skills in the civilian economy once they left the armed forces, they would still account for only an extremely small proportion of the civilian workforce. Even in countries such as South Korea and China, which have procured large amounts of sophisticated military equipment, only a small proportion of the armed forces can be defined as technically skilled.

Furthermore, even when skills that can be used in the civilian economy may be learned in the course of military training, their transfer to the civil sector is far from automatic. Time and money are necessary to match the skills acquired by servicemen with available jobs in particular firms, and further training may be necessary, as indicated by a description of a mid-1970s South Korean plan to upgrade pre-

release vocational training.²² In short, considerably more resources need to be applied--both by government and by private industry--before former servicemen can make a full contribution to the civil sector.

Factors Conditioning the Success of Adjustment Programs²³

With the possible exception of the Soviet Union, no country currently producing military equipment would suffer serious economic disruption if its military industries experienced a sharp decline in orders. The U.S.S.R. must be viewed as an exception in view of the extensive dislocation that currently characterizes all sectors of its economy. Macroeconomic analyses of the likely economic effects of reductions in defense budgets in several Western industrialized countries demonstrate that reductions compensated by increased government outlays in the civil sector, by lower taxes, and/or by an expansionary monetary policy would have a minor effect on the economy as a whole. Other studies suggest that even uncompensated reductions would have relatively little effect at the national level.²⁴ A decline in military procurement can, however, be expected to create dislocations within particular geographic regions and industrial sectors, for individual enterprises and for some members of the labor force in those enterprises.

The Economy

It is easier for enterprises and labor to adjust to change when the economies in which they operate are characterized by a high level of economic growth and high rates of employment. The economic situation in the Soviet Union, Eastern Europe, and the developing countries appears, on the surface, to provide substantial opportunities for redirecting resources currently employed in the defense-industrial sector. There are serious shortages of consumer goods as well as

basic commodities such as food, housing, and health services. At the same time, there are serious political and economic factors that will constrain adjustment efforts.²⁵ The developing countries may, for example, experience severe demand constraints, both domestic and foreign. Many of the civil-sector products that the military industries in these countries are already producing are destined for export.²⁶ In periods when export markets are contracting, this strategy will prove less successful. In some cases, domestic markets can take up a portion of the slack. In others they cannot, either because they are too small to support certain industries (Singapore or Israel) or because demand is artificially constrained (India).

Dependence on the Defense Sector

Dependence on military production varies among regions, industrial branches, and enterprises. As in industrialized countries, arms production in Israel, India, Brazil, South Africa, and Taiwan--which together accounted for 70 per cent of all major weapons produced by the developing countries (excluding China) between 1950 and 1984²⁷--is concentrated in the aircraft, shipbuilding, motor vehicle, electronics, and small arms and ammunition industries. Changes in defense policies and weapon technologies can cause shifting reliance by the defense establishment on various industrial sectors.

The relatively poor integration between the military and civil industrial sectors in many developing countries and the resultant heavy reliance on imported components, sub-systems, and materials, means that the pattern of defense dependence in the developing countries may be somewhat different from that in the industrialized countries. Some countries (notably Brazil) have traditionally relied rather heavily on external suppliers. Others (for example, India) have sought to incorporate

domestically designed and produced components in their weapons.

Within industrial branches, both those heavily reliant on defense orders and those minimally involved with the military, defense-related production tends to be concentrated in a relatively few firms.²⁸ Although a relatively few companies produce the bulk of the military equipment manufactured in the developing countries, enterprise dependence on defense orders varies considerably. At the beginning of the 1980s, approximately half the output of India's nine defense public-sector companies was sold to the civilian market. Several companies, Bharat Earth Movers, Garden Reach Shipbuilders & Engineers, and Mazagon Dock sell well over half of their output in the civilian market. Some Israeli firms that were originally set up to serve the defense market--Israeli Aircraft Industries, Elron, Israel Electro-Optics, Elscint, and Elta--have increasingly moved into the civilian market. In South Africa and Brazil, both of which have built up much of their defense production capacity on the basis of existing civil-sector firms, the military-related sales of arms producers have increased over time. Some developing-country producers would, therefore, have a civil-sector base on which to rely if defense procurement were to decline. Others would find adjustment more difficult.²⁹

Defense Specificity of Product or Technology

There are those who argue that military and civilian technologies have diverged from each other so much since the end of World War II that only minimal transfer can be anticipated between the sectors.³⁰ It is clear that investing in military production is not the most efficient way to obtain technological advance in the civil sector. The question confronting enterprises that are forced to adjust to reductions in military orders, however, is not

what the optimal method of entering the civilian market may be, but whether the products they manufacture can be modified for the civilian market and, if not, what use can be made of their technology, processes, plant, and equipment.

The more specialized a piece of defense equipment or the technology used to produce it, the more difficult it will be for an enterprise to move into the civil sector. The degree of specialization varies among industrial sectors. The machinery and plant, in the ammunition industry tends to be highly specific, while that used by the military electronics, vehicles, and aerospace industries can often be used to produce for both markets.³¹ The plant and machinery used by Swedish defense producers tend to be less specialized than those employed by producers in other countries, particularly the United States. To the extent that defense firms in the developing countries employ more standard machinery and less specialized technologies, they will find it easier to transfer production to the civil sector (on this point, see also the Appendix to this chapter, pp. 70-73).

Nonetheless the fact remains that many of the branches of civil-sector industry most likely to benefit from products and processes developed in the military sector are those which are the most technologically sophisticated. One of the complaints heard from producers of military equipment in the Soviet Union is that they are being asked to go from producing missiles to producing "pots and pans." In many developing countries, the problem is the same. The technology needed to meet the most urgent requirements of the population is less sophisticated than that used to produce military equipment. This is one reason why many of the civilian products manufactured by defense companies are exported. It is therefore extremely important to reduce the defense production process to its basic elements--pieces of equipment,

processes, technologies--and identify alternative uses for them.³² The products that are ultimately produced may bear no or only a slight resemblance to the original military end-item. It should be incumbent upon developing-country defense producers and governments, having made substantial investments in military industries, to identify new uses for as many of the resources contained in these industries as possible.

However, because so much military production in the developing countries occurs under license, reproduction and adaptation of weapons technology may not be legally possible. Furthermore, reproduction and adaptation imply mastery of the technology, and it is by no means certain that defense technologies have been mastered in many developing countries.³³

Nature of the Military Market

One of the major constraints facing defense producers seeking to enter the civil sector is their lack of experience in producing and marketing non-military goods. Defense contractors are familiar with a well-defined, generally uncompetitive market--a market dominated by one customer having a clear idea of the characteristics of the desired product and frequently willing to pay a large portion of its development costs. Price tends to be less important than in the commercial world. Technical capability is frequently the key element in arms production agreements. Competition, which increased during the 1980s in at least some OECD countries, is generally not as extensive in the military as in the civil sector.³⁴ In the civilian market, there are many customers and little product guidance. Firms must use their own resources to develop a product that may not suit the market and may become a commercial failure.³⁵

In view of these considerations, it is not at all surprising that the most successful

conversions and diversifications in the OECD countries have been in the area of high-technology products sold to government agencies and other large entities with reasonably well defined requirements, such as airlines, postal and other communications systems, and railways.³⁶ This also helps to explain why diversification through the acquisition of new companies has been a favored method of decreasing the reliance of defense orders in the United States.

To the extent that enterprises producing military equipment in the developing countries share the characteristics described above, they will experience similar difficulty in expanding into the civilian market. Companies that began in the civil sector (such as India's Praga Tools and South Korea's Hyundai) and continue to sell to the civil sector, or that produce weapons using components that can also be used in producing civilian equipment (such as Brazil's Engesa and Embraer), should have an advantage in finding alternative uses for their military divisions should defense orders decline.³⁷ This does not mean, however, that these divisions will not experience many of the market problems discussed elsewhere in this paper.

To the extent that public-sector enterprises play an important role in the economies of these countries, and that companies moving out of the military sector can sell their new products to these enterprises and government agencies, problems associated with moving into a highly competitive commercial market will be mitigated. Recent movement toward a reduced role for the public sector in the economies of developing countries could exacerbate the conversion problem, at least in the short term. Privatization has, for example, been identified as one likely constraint on the ability of Brazilian policy makers responsible for the defense-industrial sector to influence overall government policies.³⁸ At the same time, it will limit the support defense

producers can expect from the Brazilian government.

Marketability of Alternative Products

While it is easier for companies to transfer production from the military to the civil sector during a period of economic growth, it is equally important that markets exist for the items chosen to replace military equipment. Because the defense market generally does not require firms to develop their commercial marketing capabilities, one of the major constraints experienced by defense producers in moving into the civilian market is their inability to identify, produce, and market goods and services in a commercial setting.³⁹

Companies that are serious about moving into the civilian market make a special effort to instill in their designers an understanding of the different needs of products developed for the civilian market. This can best be accomplished by absorbing former weapon design personnel slowly into an enterprise already producing for the commercial sector. Successful product diversification thus may require the addition of personnel with commercial experience from outside the company or division.

Flexibility of Company and Manpower

Even under favorable economic conditions, individual workers may experience difficulty in transferring from military to civilian production. Problems can derive from the defense dependency of particular jobs (aero-astroengineers, for example), from differences between the skills and other characteristics (such as age and salary expectations) of defense workers and those required by the new jobs in the civil sector, and from worker immobility (voluntary or involuntary). These

problems are likely to arise in all arms-producing countries.⁴⁰

Most clerical and unskilled support staff and skilled and semi-skilled production workers experience no trouble transferring to positions in the civilian economy.⁴¹ The availability of retraining programs greatly facilitates the adjustment process. Engineers, scientists, other technical personnel, managers, and administrators experience the greatest difficulties in adjusting to civil-sector production. Defense firms tend to employ a higher proportion of these categories of personnel than manufacturing industry as a whole, although proportions vary from country to country. A 1978 U.S. study reported that the two main reasons why administrators and managers experience difficulty in moving between sectors is the lack of familiarity with civil-sector marketing practices and the higher salaries prevalent in military industries.⁴²

For scientists and technical personnel, the "main barriers to transfer to commercial work" include:

- (1) The lack of cost-consciousness among defense engineers;
- (2) The view of commercial managers that defense engineers are not well suited to commercial work; and
- (3) The belief among engineers that the defense environment requires more specialists and the commercial environment more generalists.⁴³

Not only do these sorts of attitudes encourage defense employees to lobby against cuts in procurement. They can also cause serious problems when companies attempt to diversify production.

Technical and managerial staff must exhibit considerable flexibility and willingness

to acquire new skills if conversion or diversification efforts are to succeed. Management in particular must be willing to discover what it does not know about producing for and selling to the civilian market. And it must be prepared to spend several years, perhaps as many as ten to fifteen, in moving into new product areas.⁴⁴

There is no reason to believe that the staff and management of companies producing for the military market in developing countries will not face the same conditions. What is lacking, however, is even the most basic empirical evidence about the defense-sector workforce in these countries. Very little is known about the nature of the workforce at the corporate level (let alone the enterprise level). What proportion consists of managers, of technical personnel, of scientists, or of production workers? How specialized are the skills they possess? How mobile are they? Thus, when a company such as Engesa is forced to cut its workforce by two-thirds, it is impossible to anticipate what the experience of the employees who have been made redundant might be.

Role of Governments

The role played by governments in assisting defense contractors to adjust to decreases in orders for military goods and services varies among countries and mirrors their role in facilitating other kinds of structural adjustments. In the United States and Western Europe, programs are in place that provide subsidies, tax rebates, or retraining to facilitate restructuring and maintain employment; stimulate certain sectors through public procurement; provide government assistance to displaced workers wishing to start their own firms; and promote the introduction of new processes and products, among other objectives.⁴⁵ Local and regional governments, which are most likely to feel the greatest effects of reduced defense orders,

frequently play a role in channeling economic adjustment assistance to areas in need. They can also provide training, assist firms moving into the civilian market, and procure new products produced by former defense contractors.⁴⁶

Central governments obviously must play the leading role in the conversion of government-owned production facilities. The U.S. government, for example, supervised the closure of two biological warfare facilities in the early 1970s, following President Richard Nixon's decision in November 1969 to cease producing "lethal biological agents and other methods of biological warfare."⁴⁷

The roles played by governments in developing countries with a domestic arms-production capacity to help enterprises and employees adjust to reductions in defense procurement will similarly mirror the policies of these governments to cope with economic change in general. It stands to reason that governments should seek to preserve as much as possible of the very costly investment in plant, equipment, technology, and trained manpower that had been made in the military-industrial sector, often with government resources, and to encourage their reutilization. To the extent that developing-country governments lack the necessary funding to support the kinds of adjustment programs available at all levels in the OECD countries, adjustment will be more difficult and available resources will not be fully utilized.

Conclusion

The 1990s promise to be a decade in which much greater attention will be given to the economic effects of reductions in military expenditure and arms procurement than at any time since the end of World War II. There is a considerable body of literature that describes and analyzes previous adjustment experiences in the defense-industrial sector in the United

States and Western Europe. This is now being supplemented by a growing number of studies and articles on the current situation in the Soviet Union and Eastern Europe. For the developing world, much less information is available. There are few detailed profiles of developing-country arms producers and, with the exception of China, little has been written about previous experiences with procurement cutbacks or project cancellations.

The broad outlines of the situation are nonetheless discernible. The effects of reducing the size of military and security forces depend on the number demobilized, the speed with which the demobilization occurs, the existing level of unemployment, the skills possessed by the former servicemen, and the match between those skills and the requirements of the civilian economy. Available evidence suggests that a large proportion of the training received in the armed forces does not provide servicemen with skills that are in demand in the civilian economy. Where usable skills have been acquired, their transfer from the military sector to the civilian economy frequently does not occur automatically.

As in the industrialized countries, the macroeconomic effects of reductions in domestic arms production will be limited in the developing world. Problems can be expected, however, at the local level. The way in which countries adjust to reduced domestic arms procurement depends in large part on the way in which they adjust to other structural changes.⁴⁸ In order to devise a strategy for adjusting to cutbacks in procurement, it is necessary to have some basic information about defense-industrial sectors: the companies belonging to it, the proportion of corporate turnover generated by defense sales, the share of the corporate labor force producing for the military market, the nature of the technology employed, the skills possessed by employees, the geographic

distribution of defense industries, and so on. Some of this information is available and a systematic effort should be made to collect it.

Once that is done, research can be undertaken to fill in the gaps in existing knowledge, many of which will be quite substantial. Given the sensitive nature of the industries involved, it may prove to be difficult--as it has been with defense industries in many OECD countries, not to mention the U.S.S.R. and Eastern Europe--to obtain high-quality information on all the desired topics. It is likely, however, that a sufficient amount of information can be gathered on major defense contractors in most of the developing-country arms producers (China, Israel, India, South Africa, Brazil, Taiwan, Argentina, South Korea, and Egypt) to begin evaluating the likely impact of reduced output in the defense-industrial sector.⁴⁹

This body of information can then be applied to the issues raised in the preceding section of this paper in order to evaluate the likely implications of reductions in defense orders for the economy, domestic arms producers, and the defense-industrial workforce. To evaluate the impact of the end of the Iran-Iraq War on the Brazilian economy, for example, it will be important to know, among other factors, what firms are affected; their dependence on the defense sector and their ability to support a transition to civil-sector production from corporate resources; their geographic distribution; the strength of local economies; the ability of the domestic (private and public sector) market to purchase any new products these firms might manufacture; and economic adjustment support available from governments at the national, state, and local levels.

To evaluate what is likely to happen to the more than 2,000 workers released during 1990 by Engesa, the Brazilian manufacturer of military vehicles, one needs to know, for

example, their geographic distribution; the skills they possess; the need for re-training for each category of employee; the condition of the local economy; personal characteristics (such as age, mobility, and willingness to accept reduced income) that affect the speed with which individuals are rehired; and the availability of employee adjustment assistance, such as retraining and placement programs, moving credits, or small business credits.

In order to evaluate what will happen to Engesa itself, one needs to know, among other things, management's interest in seeking to develop alternative products, the company's ability to find new applications for the technology used to produce military vehicles should the "easy" product diversifications into various civilian vehicles not prove profitable, the existence of government subsidies or credits to facilitate this process, and the ability of management to understand the differences between the defense market and civilian markets (such as increased risk, relative importance of cost) and to adjust to them.

More research also needs to be done on the transferability of the skills acquired in the course of military training to the civil sector. As shown in the section on Transferability of Security Force Personnel, some interesting and suggestive work has been done on South Korea. This needs to be expanded, first of all by identifying any other studies that may have been completed for other countries. If there is

rather little available information, a series of case studies could be undertaken. It would be advisable to study countries at different levels of development with armed forces at different technological levels. For each country, the first step would be to catalog the skills acquired by each category of military manpower. (This paper has examined only technical manpower, but it would be useful to consider the transfer of managerial and administrative skills as well.) The second step would be to consider whether the skills identified have civil-sector counterparts. For those that do, the degree to which former servicemen possessing these skills actually make use of their training once they leave the armed forces would need to be evaluated. If it turned out that the experience of South Korea could be generalized, it would be helpful to consider how the transferability of skills acquired in the course of military service could be enhanced.

In view of the changed international situation that has been evolving since the end of the 1980s and the amount of resources devoted to the military sector in the developing countries, there is every reason to build up a body of knowledge that will enable governments and those advising them to make well-informed, realistic decisions about re-allocating resources from the military to the civilian economy should the opportunity arise. \triangle

Appendix

Recent Adjustments in China's Defense Sector

In the second half of the 1970s, the conjunction of several political-strategic and economic trends caused the Chinese leadership to re-evaluate China's defense requirements, and the decision was taken to transfer resources from the production of weapons to civilian-sector industry. This decision was facilitated by the fact that much of the existing plant, machinery, and technology in the defense industry was unsuited for producing the modern weaponry with which the military was to be equipped in the future. It was also clear that the defense industry was operating at well below capacity.⁵⁰ Reductions in the level of procurement would only exacerbate that problem.

The process of transferring resources from the military-industrial sector to civilian industry proceeded slowly until the Third Plenary Session of the Twelfth Party Congress in October 1984.⁵¹ During the 1980s, it was also decided to reduce the size of the People's Liberation Army (PLA) by nearly 40 per cent. While enough information has become available to describe in a general way the conversion process, there is virtually no information available about the experience of individual enterprises, the processes by which new products are chosen, the problems faced in retooling production lines and retraining the labor force, the resettlement and re-employment experiences of demobilized soldiers, and so on. What follows therefore is just an outline of the changes that have occurred in China over the last decade.

Industrial Adjustment

Prior to the reforms inaugurated at the end of the 1970s, the links between the military-industrial sector and the civilian economy were

minimal. Only a very small proportion of Chinese defense-industrial output consisted of products for the civilian market in the mid-1970s (Table A-1). Defense enterprises therefore had virtually no familiarity with the civilian market. What is more, individual defense enterprises and the ministries to which they belonged all sought to be self-sufficient. This was both a legacy of the Soviet defense-industrial model that had been adopted by the Chinese and an outgrowth of China's attempt to reduce the scope of the task confronting the central planners in organizing the flow of goods and services between sectors and geographical regions. This autarkic behavior was intensified during the Cultural Revolution.⁵²

One of the major problems confronting Chinese policy makers in the early 1980s was the unwillingness of defense managers to believe that there really was a need to begin producing for the civilian market. As in all other arms-producing countries, the level of procurement in China had expanded and contracted over the preceding three decades. It took several years for defense producers to understand that procurement levels would not rebound this time, even though they received fairly frequent and explicit messages from the government to this effect.⁵³

Once the message was received, however, defense producers faced serious constraints on their ability to adapt, which derived to a large extent from the preferential treatment they had previously been accorded in terms of the availability of financial, human, and material resources.⁵⁴ The economy-wide reforms introduced in 1984—which were designed to increase enterprise profitability, the efficient use of resources, integration of the economy,

Table A-1
Proportion of China's Defense-Industrial Output Destined for the Civilian Market
(percentages)

Year	Civilian Output
1975	6.9
1976	n.a.
1977	n.a.
1978	10
1979	10
1980	16-18
1981	n.a.
1982	20
1983	20
1984	30
1985	45-50
1986	50-60
1987	n.a.
1988	60
1989	66

n.a. = Data not available

Source: Arthur J. Alexander, "National Experiences in the Field of Conversion: A Comparative Analysis," Paper prepared for the United Nations Conference on Conversion, "Economic Adjustments in an Era of Arms Reductions," (Moscow, August 13-17, 1990), p. 17.

and an awareness of consumer requirements--greatly facilitated the entry of defense producers into the civilian market. This process was further assisted by the significant change in government policy in 1984, which enabled technology to be sold at a profit, and by the implementation of other incentives designed to move technology from the military to the civilian sector.

The creation of corporations from production enterprises and research institutes in the military sector was important in integrating production and R&D activities.⁵⁵ It also reduced the power of the bureaucrats in

the ministries that had previously controlled these functions, since much of the ministries' responsibilities and authority were now vested in the new entities. These corporations could export their goods--both military and civilian--and retain their hard-currency earnings.⁵⁶ This both provided the corporations with much-needed foreign exchange to enable them to upgrade their production technology and equipment and made foreign investment in such entities more attractive. By 1987, over 1,000 new enterprises had been created in the coastal regions of China and the Special Economic Zones, using the resources of military producers that had previously been

located deep in the Chinese interior, the so-called "Third Front."⁵⁷ It has been suggested that a not-inconsiderable proportion of the funds allocated to conversion in recent years has been used to facilitate this relocation.

The proportion of defense-industry output sold in the civilian market has increased substantially over the last decade. By 1989, some 16 per cent of all defense producers had converted completely to civilian production. Another 74 per cent were engaged in both military and civilian production, while only 10 per cent produced wholly for the military market. The products sold by these enterprises are extremely diverse.⁵⁸ Yet problems remain.

Enterprises--both civilian and military--have had to continue to operate in a semi-planned system. While efforts have been made to encourage the freer movement of some resources, others, notably labor, remain relatively immobile. This means, among other things, that the government will not close inefficient producers or withdraw all subsidies from enterprises, losing some of the more powerful sanctions at its disposal to alter the behavior of defense producers. Enterprises have also been forced to employ as much of their existing technology, plant, and equipment as possible when it might have been more economical to build a new plant or acquire new technology or equipment.

Other problems include low capacity utilization, an outmoded technological base, failure to employ fully the imported production machinery available, a relatively high level of unprofitable production, unmarketable output, high-cost products, poor marketing skills, shortage of skilled manpower, and a tendency to reproduce autarkic patterns of behavior in the civil sector.⁵⁹

What is more, the data for defense-industry conversion in China in the 1980s must be reconciled with the substantial increase in Chinese weapon exports that occurred during the decade. To a large degree, Chinese defense industry took advantage of the ready market created by the Iran-Iraq war (which ended in August 1988). If domestic Chinese defense procurement only declined by 10 per cent between 1978 and 1988,⁶⁰ this surge in the export of weapons certainly would have utilized the spare capacity created, giving rise to questions about the number of weapon-production lines that were available for conversion.

Some Western analysts suspect that very little actual conversion has occurred. Rather, now that export orders have dropped, Chinese defense producers may be maintaining or mothballing military production lines, just as Soviet defense producers have done. According to Chinese sources, very little mothballing has occurred. Defense producers definitely have been urged by the government to re-employ as many of their resources as possible. Official pronouncements indicate that the diversification of defense enterprises into new product lines has produced significant savings compared to the cost of building up production capability from scratch.⁶¹

The deputy minister in charge of conversion, Huai Guomo, has said privately that his staff has carried out an evaluation of the conversion potential of each kind of machinery in plants in which it was no longer needed to meet military contract requirements. According to Huai, only a small percentage have been mothballed--presumably those which were the most defense-specific. The remainder reportedly have been converted to the production of civilian goods. Given the relatively unsophisticated nature of the machinery employed by the Chinese defense industry, it is plausible that a high proportion is general-purpose machinery. And given the

unwillingness of the Chinese government to sanction plant closures, the pressure to convert is great.

Military Manpower

In the 1980s, the People's Liberation Army (PLA) reduced its manpower by some 1.75 million. During this period, the PLA released approximately one million conscripts each year following the completion of their period of military service. Many former servicemen were clearly ill-equipped for civilian life, having received little more than infantry training and political education. As a result, "few enterprises would accept ex-soldiers because they didn't have the necessary production and management knowledge."⁶²

At some point in the early 1980s, perhaps around 1983, the PLA began to provide servicemen with marketable skills. In early 1985, some two million PLA soldiers were reportedly undergoing training in agronomy, aquaculture, catering, carpentry, architectural design, plumbing, bricklaying, machinery and electric appliance repair, economic management, mechanics, transport, food processing, and other civilian occupations. In an unspecified number of PLA units, six months of their three-year period of service was reportedly devoted to "learning scientific and general knowledge and civilian job skills."⁶³

These demobilizations occurred at a time when unemployment was high. Youths who had been sent to the countryside during the Cultural Revolution were being allowed to return to the cities, and the economic reforms of 1983/1984 were reducing the amount of underemployment in production enterprises. Troops were demobilized to their hometowns or the towns in which they had enlisted in an attempt to spread the adjustment burden. The responsibility for finding jobs for these servicemen had been transferred from the PLA

to the Ministry of Civil Affairs in 1979. Local authorities signed contracts with enterprises, administrative units, and other entities that agreed to absorb a given number of returning servicemen each year. Other forms of assistance, such as subsidized building materials for houses, have also been made available. Former soldiers have also been offered incentives (higher salaries, housing) to relocate in remote areas and contribute to economic construction there.⁶⁴

Western analysts have suggested that a large portion of the demobilization was achieved by "transferring various non-combatant units of the PLA to civilian control," such as the Railway Corps and the Capital Construction Corps. Security units became part of the newly created People's Armed Police Force. Well over 500,000 men could have been transferred to the civilian sector in this way.⁶⁵ During 1986, some 1.2 million soldiers and 21,000 officers were reportedly resettled. Of these, 250,000 were given cadre posts in village, township, and country administration. Some 260,000 found employment in rural factories; 110,000 were placed as laborers (farm and non-farm).

Such statistics tell us nothing about the success these former servicemen meet in carrying out these jobs or about their productivity. Given the high rates of unemployment in China during the 1980s, some of the returning soldiers may have displaced civilians seeking employment, and it would be interesting to know if former servicemen were given priority for the available jobs. In view of previous Chinese policy regarding employment in remote areas, it is legitimate to wonder how much choice former servicemen who accepted employment in these areas actually had. These are but some of the questions it is necessary to answer in order to evaluate the success of the Chinese in assisting former servicemen to adjust to civilian life.

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Notes

¹ For example, between 1963 and 1981, direct and indirect employment in the British defense industry fell by approximately 30 per cent. In 1950, there were 21 aircraft producers in the United Kingdom. By 1980, there were only three. See Nicole Ball, *Converting Military Facilities: Shared Responsibilities and the Need for Planning*, WEP2-41/WP.1 (Geneva: International Labour Office, October 1985).

² These twelve are Bangladesh, Burma, Chile, Colombia, the Dominican Republic, Gabon, Madagascar, Mexico, Pakistan, Peru, Senegal, and Sri Lanka. See Michael Brzoska and Thomas Ohlson, eds., *Arms Production in the Third World* (London and Philadelphia: Taylor & Francis for SIPRI, 1986), p. 15 and Appendices 1 and 2.

³ *Ibid.*, p. 23.

⁴ *Ibid.*, pp. 21, 42-43, 60, 86-87, 116, 134-135, 138-139, 168, 176.

⁵ Stuart Slade, "Chinese Armoured Vehicles: You Get What You Pay For," *International Defense Review*, January 1990, p. 167.

⁶ For example, it has been suggested that, by 1987, employment in the Brazilian defense industry had reached 150,000, rather than the 75,000 reported in Table 3 for the early 1980s. This still accounts for less than 1 per cent of the Brazilian industrial labor force. The 1987 figure is reported in Raul de Gouvea Neto, *How Brazil Competes in the Global Defense Industry*, ACDIS Occasional Paper (Urbana-Champaign, Ill.: Program in Arms Control, Disarmament, and International Security, University of Illinois, October 1990), p. 4.

The share of arms-industry employment in total manufacturing employment has not been calculated because of data constraints. These ratios would, of course, be higher than those presented in Table 3.

⁷ Arthur J. Alexander, "National Experiences in the Field of Conversion: A Comparative Analysis," Paper prepared for the United Nations Conference on Conversion, "Economic Adjustments in an Era of Arms Reductions," Moscow, August 13-17, 1990, p. 1. In the United States, the proportion of the labor force employed in the manufacturing sector dropped from 22.3 per cent in 1980 to 17.6 per cent in 1990. Steven Pearlstein, "Slump in Services

Threatens Recession," *Washington Post*, November 4, 1990, p. H1.

⁸ See, for example, *In Pursuit of Disarmament: Conversion from Military to Civil Production in Sweden. Report by the Special Expert Inga Thorsson. Volume 1B: Summary, Appraisals, Recommendations* (Stockholm: Liber, 1984), pp. 50-51. The purpose of this report, written under the guidance of former Swedish Under-Secretary of State for Disarmament Inga Thorsson, was to counter the arguments set forward by Swedish defense producers that a domestic defense-industrial capacity must be maintained for military and economic reasons.

Conversion advocates include Suzanne Gordon and Dave McFadden, eds., *Economic Conversion: Revitalizing America's Economy* (Cambridge, Mass.: Ballinger, 1984); and Robert W. DeGrasse, *Military Expansion, Economic Decline* (New York: Council on Economic Priorities, 1983).

⁹ See John E. Lynch, ed., *Economic Adjustment and Conversion of Defense Industries* (Boulder, Colo. and London: Westview Press, 1987); President's Economic Adjustment Committee and Office of Economic Adjustment, *Economic Adjustment/Conversion*, Washington, D.C.: U.S. Department of Defense, July 1985; and "Testimony of Dr. Gordon Adams before the Senate Armed Services Committee Subcommittee on Defense Industry and Technology on Economic Adjustment to Lower Defense Spending," Washington, D.C.: Defense Budget Project, May 4, 1990.

One issue not addressed here due to space limitations is that of converting military bases. Considerable information on the U.S. experience is available. See, for example, Chapter 4 in Lynch, *Economic Adjustment*, *op. cit.*, and Office of Economic Adjustment, *Civilian Reuse of Former Military Bases: Summary of Completed Military Base Economic Adjustment Projects, 1961-1990*, Washington, D.C.: U.S. Department of Defense, April-June 1990.

¹⁰ Thus far, very little production has been removed from the military sector. Rather, some diversification has occurred, and the resources and production responsibilities of the (civilian) Ministry of Machine Building for Light and Food Industries and Home Appliances were transferred to the Ministry of the Defense Industry in early 1988. See Judyth L. Twigg, "Balancing the Soviet Military and Civilian Economies," in Eric Arnett, ed., *Science and International Security: Responding to a*

Changing World (Washington, D.C.: AAAS Program on Science and International Security, 1990).

- ¹¹ See the discussion in Alexander, "National Experiences," *op. cit.*, pp. 1-12.
- ¹² The discussion in this section draws on Chapter 8, "Military Manpower and Human Capital Formation," in Nicole Ball, *Security and Economy in the Third World* (Princeton, N.J.: Princeton University Press, 1988), pp. 295-334.
- ¹³ See, for example, Lucien W. Pye, "Armies in the Process of Political Modernization," in John J. Johnson, ed., *The Role of the Military in Underdeveloped Countries* (Princeton, N.J.: Princeton University Press, 1962); and Morris Janowitz, *The Military in the Political Development of New Nations* (Chicago and London: Phoenix Books, 1964).
- ¹⁴ Changsoo Lee, "Civil-Military Relations and the Emergence of Civilian Bureaucrats in Korea," p. 91, in Changsoo Lee, ed., *Modernization of Korea and the Impact of the West* (Los Angeles: East Asian Studies Center, University of Southern California, 1981), p. 91.
- ¹⁵ John P. Lovell, "The Military and Politics in Postwar Korea," in Edward Reynolds Wright, ed., *Korean Politics in Transition* (Seattle and London: University of Washington Press, 1975), p. 190; and Lee, "Civil-Military Relations," *op. cit.*
- ¹⁶ A study using data from 1973 reported that 60 per cent of the MOS have no civil-sector counterparts. See Jong-chun Baek, "The Role of the Republic of Korean Armed Forces in National Development: Past and Future," *The Journal of East Asian Affairs*, Vol. 3, No. 2 (Fall/Winter 1983), p. 302.
- ¹⁷ Labor Education and Research Institute, *Economic Development and Military Technical Manpower of Korea: A Study of Manpower Development in the Military in Korea* (Seoul: Korea University, 1976), pp. 328-29.
- ¹⁸ *Ibid.*, pp. 327-28 and p. 73.
- ¹⁹ *Ibid.*, pp. 368-72. An August 1981 survey of 360 of the 12,230 men employed as engineers, craftsmen, and office workers by the Hyundai Ship Construction Company found that "more than 39 percent of the respondents learned their skills and knowledge in the service, which they are now exploiting in civilian occupations." Given the extremely small sample size, it is not clear if these findings are representative, whether of the firm as a whole, the shipbuilding industry or former servicemen in general. See Baek, "The Role," *op. cit.*, p. 304.
- ²⁰ Ann Tibbitts Schulz, *Buying Security: Iran Under the Monarchy* (Boulder, Colo: Westview Press, 1989), pp. 138-40; and Ball, *Security and Economy*, *op. cit.*, pp. 315-16, 319-21. The Chinese case is examined in the Appendix to this chapter, pp. 70-73.
- ²¹ Labor Education and Research Institute, *Economic Development*, *op. cit.*, pp. 322, 329-30. Interestingly, some 300,000 ex-servicemen were unemployed in 1967, accounting for just over half the 590,000 registered unemployed.
- ²² *Ibid.*, pp. 330-31.
- ²³ The discussion in this section draws on Ball, *Converting Military Facilities*, *op. cit.*, and Nicole Ball, "Disarmament and Industries," in J. Fontanel and J.-F. Gilhaudis, eds., *Le Désarmement pour le Développement: La Course aux Armements et le Désarmement* (Grenoble: Centre d'Etudes de Défenses et de Sécurité Internationale, 1986), pp. 141-58.
- ²⁴ On the United States, see David Gold, *The Impact of Defense Spending on Investment, Productivity and Economic Growth* (Washington, D.C.: Defense Budget Project, February 1990). On Norway, West Germany, the United Kingdom and Sweden, see Ball, *Converting Military Facilities*, *op. cit.*
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- ²⁷ Brzoska and Ohlson, ed., *Arms Production*, *op. cit.*, p. 10. See also Herbert Wulf, "Developing Countries," pp. 310-43, in Ball and Leitenberg, eds., *The Structure*, *op. cit.*
- ²⁸ On Western Europe, see, for example, Ian Anthony, Agnes Courades Allebeck, and Herbert Wulf, *West European Production: Structural Changes in the New Political Environment* (Stockholm: Stockholm International Peace Research Institute, 1990).
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- ³⁰ The relationship between military and civilian R&D is complex. Basic R&D can have both civilian and military applications, but this category often does not receive a large share of military R&D budgets. In 1988, "Technology Base" R&D accounted for only 10 per cent of U.S. military R&D. Certain civilian sectors, such as aerospace and computers, have benefited from early support from the military as purchaser, promoter of process engineering, and developer of applications technology. At the same time, "In spite of the reasonably good effectiveness of technology interdiffusion of DOD civil R&D in the few industrial sectors in which there are sufficiently similar product and process requirements, there is no reason to believe that spin-off from defence R&D can be as effective in meeting civil needs as R&D directed specifically at civil sector requirements." Alexander H. Flax, "Interdiffusion of Military and Civilian Technology in the United States of America," pp. 117-37, in Philip Gummett and Judith Reppy, eds., *The Relations between Defence and Civil Technologies* (Boston: Kluwer Academic Publishers, 1988). The citation is from page 135.
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- ³² See, for example, President's Economic Adjustment Committee and Office of Economic Adjustment, *Economic Adjustment*, *op. cit.*, p. 48.
- ³³ On the reliance of Egyptian and Argentinian defense producers on foreign personnel, see Brzoska and Ohlson, *Arms Production*, *op. cit.*, p. 284.
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- ³⁵ Udis, *Adjustment of High Technology*, *op. cit.*, p. 326, for example, found that a major theme among defense producers "was that most of the civil sectors are unable to describe their research needs."
- ³⁶ For a description of the problems British electronics firms identified in entering the civilian market, see Sir Ieuan Maddock, *Civil Exploitation of Defence Technology, Report to the Electronics ECD* (London: National Economic Development Office, 1983), especially pp. 4-5.
- ³⁷ Despite their civilian origins, Engesa and Embraer have followed different strategies concerning civilian applications of their military technology. By the late 1980s, a substantial portion of Embraer's turnover was generated by sales of civil aircraft. In 1989, for example, Embraer reportedly exported 187 civil aircraft (Piper models and Brasilias) and 52 military aircraft. In contrast, Engesa has concentrated very heavily on the military market. De Gouvea, "From Tanks to Butter," *op. cit.*
- ³⁸ *Ibid.*, p. 27.
- ³⁹ See, for example, the Swedish study *Civil produktion i försvarsindustrin: Betänkande från försvarsindustrikommitén* [Civilian production in the defense industry: Report from the Defense Industry Committee], Ds I 1982:1 (Stockholm: Ministry of Industry, 1982), p. 210; Melman, *Barriers to Conversion*, *op. cit.*, pp. D-14, D-23; and Udis, *Adjustment of High Technology*, *op. cit.*, pp. 311-63.
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- ⁴¹ Udis, *Adjustment of High Technology*, *op. cit.*, pp. 479-91 *passim*, 505, 513; and "Military Job Skills: Will They Transfer," *SLECP Briefing*, No. 8, St. Louis Economic Conversion Project, August 1981, p. 5.
- ⁴² *Ibid.*
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- ⁴⁴ See Philip Gummert and Michael Gibbons, "Redeployment and Diversification at Harwell," Manchester: Department of Liberal Studies in Science, University of Manchester, mimeographed, June 1977, pp. 7-8; and Udis, *Adjustment of High Technology*, *op. cit.*, p. 416, 500-01. A description of a ten-year program at the German aerospace producer Dornier is found in President's Economic Adjustment Committee and Office of Economic Adjustment, *Economic Adjustment*, *op. cit.*, pp. 33-34. Similarly, SMA, an Italian radar producer, is following a nearly fifteen-year diversification program to cut its dependence on the defense sector from nearly 100 per cent in 1980 to 50 per cent in 1994.
- ⁴⁵ Lawrence Franko, *European Industrial Policy: Past, Present, and Future* (Brussels: Conference Board in Europe, 1980); Douglas Yuill and Kevin Allen, eds., *European Regional Incentives, 1984* (Glasgow: European Regional Monitoring Unit, Centre for the Study of Public Policy, University of Strathclyde, 1984); and President's Economic Adjustment Committee and the Office of Economic Adjustment, *Economic Adjustment*, *op. cit.*, pp. 67-77 and Appendices Q and R.
- ⁴⁶ On options available to local and regional governments in the United States, see, for example, Jean Prial Gordus, Paul Jarley, and Louis A. Ferman, *Plant Closings and Economic Dislocation* (Kalamazoo, Mich.: W.E. Upjohn Institute for Employment Research, 1981); "Deindustrialization: Restructuring the Economy" [Special Issue], *The Annals of the American Academy of Political and Social Science*, No. 475 (September 1984); and Miles Friedman and Deborah Culbertson, "State-Local Economic Development Programs," in Lynch, ed., *Economic Adjustment*, *op. cit.* pp. 175-90.
- ⁴⁷ Milton Leitenberg, "Research and Development in (C)BW," *Studies on Military R&D and Weapons Development* (Stockholm: Ministry for Foreign Affairs, 1984). Mimeographed.
- ⁴⁸ The development literature contains case studies of structural adjustment in developing countries. See, for example, World Bank, *Korea: Managing the Industrial Transition—Volume II: Selected Topics and Case Studies*, Washington, D.C., 1987.
- ⁴⁹ Information on North Korea will be extremely difficult to obtain.

Appendix Notes

- ⁵⁰ In the early 1980s, labor productivity in Chinese defense industries was 38 per cent lower than in civilian industries. Metal-cutting machinery in the defense sector was half as productive as similar machinery in the civilian sector. Profits on every 100 yuan of output generated by the defense-industrial sector were some 50 per cent lower than those found in civilian enterprises. Richard J. Latham, "People's Republic of China: The Restructuring of Defense-Industrial Policies," in James Everett Katz, ed., *Arms Production in Developing Countries* (Lexington, Mass.: Lexington Books, 1984), pp. 103-22 .
- ⁵¹ Richard J. Latham, "The People's Republic of China: Profits, Consumerism, and Arms Sales," in James Everett Katz, ed., *The Implications of Third World Military Industrialization: Sowing the Serpents' Teeth* (Lexington, Mass.: Lexington Books, 1986); pp. 187-88; and Arthur J. Alexander, "National Experiences," *op. cit.*, pp. 13-16.
- ⁵² C.Z. Lin, *Employment Implications of Defence Cutbacks in China*, WEP2-41/WP.14 (Geneva: International Labour Office, November 1989, pp. 18-19); and Alexander, "National Experiences," *op. cit.*, p. 17.
- ⁵³ Alexander, "National Experiences," *op. cit.*, p. 20. Norinco, for example, experienced a 60 per cent drop in Chinese defense orders in 1986. Bai Si Yeng, "Understanding the Chinese Defence Industry," *Military Technology*, March 1987, pp. 36-53.
- ⁵⁴ Alexander, "National Experiences," *op. cit.*, pp. 21-22.
- ⁵⁵ The seven major corporations in existence by early 1987 are described in Bai Si Yeng, "Understanding," *op. cit.*
- ⁵⁶ Alexander, "National Experiences," *op. cit.*, p. 29.
- ⁵⁷ *Ibid.*, pp. 19-27, and Latham, "Profits, Consumerism," *op. cit.*, pp. 192-94.
- ⁵⁸ Jin Zhude and Chai Muliang, "China's Experience: A Case Study," Paper prepared for the United Nations Conference on Conversion, "Economic Adjustments in an Era of Arms Reductions," Moscow, August 13-17, 1990, pp. 7-10, and Alexander, "National Experiences," *op. cit.*, p. 21.
- ⁵⁹ *Ibid.*, pp. 26-29. In 1989, some one-third of the aviation and space enterprises were reportedly producing unmarketable products. Another third were unable to produce products that were competitive on the civilian market.
- ⁶⁰ *Ibid.*, p. 13.
- ⁶¹ Jin and Chai, "China's Experience," *op. cit.*, pp. 7-8.
- ⁶² Wang Gangyi, "Science Studies Make Better Soldiers," *China Daily*, March 1, 1985. See also Zheng She, "Two-way Training in China's Army," *China Reconstructs*, November 1983, pp. 28-29, and "Soldiers Urged to Learn Skills," *Beijing Review*, August 20, 1984, p. 9. Numerous articles appeared in the English-language *China Daily* during the 1980s discussing the demobilization of one million soldiers and their reintegration into civilian society.
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- ⁶⁴ Lin, *Employment Implications*, *op. cit.*, pp. 8-14.
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MILITARY TRADE, AID, AND DEVELOPING-COUNTRY DEBT

Michael Brzoska

Introduction

Analyses of military and economic phenomena in Third World¹ countries have long been kept rather strictly separate. The military sector often has been viewed as exogenous to the economy and economic factors simply as constraints on military efforts. This separation has its value, since both sectors must ultimately be judged on their own merits. It also has a disadvantage, however, in that public discussions and political decisions should be based on *all* the relevant information about costs and benefits.

Stimulated by the expansion of military sectors in the 1970s and the counter-intuitive findings of the late Emile Benoit, a substantial number of studies on the relationship between military expenditures and the economies of developing countries were published in the 1980s.²

Note: The author would like to thank participants in the World Bank Symposium for helpful critical suggestions. Marc Vogel skillfully assisted in the preparation of debt data.

Less work has been done to try to establish the effects of components of military efforts, including the importation of armaments.³ This may seem somewhat surprising, since much attention is given both by the public and by decision makers to the international trade in arms. But the interest focuses on the political issues connected with the arms trade. With respect to economic effects, there seems to be a strong presumption that they are overwhelmingly negative whenever they are noticed—for example, Benoit (1978) made it clear that he expected negative effects from capital-intensive arms imports (although he expected positive economic effects from large military forces).

One reason why fairly little work has been done on the economics of the transfer of arms is that no data series lend themselves directly to economic analysis. A main point in this report is that available arms transfer statistics are ill-suited for economic impact analysis—not only because of their inherent quality problems but also because of their neglect of the timing aspect.⁴ Arms transferred are often not paid for or paid for only later. Another reason is that it is not self-evident how the importation of arms could affect Third World economies. One important way in which arms transfers could exert influence on Third World

economies is by way of their financing. Arms imports compete with other imports in the use of foreign exchange. They are also an obvious possible source of the indebtedness of Third World countries.

The aim of this paper is a) to describe some of the difficulties surrounding the economic analysis of arms transfers and related phenomena, and b) to propose and test some ideas about the economic aspects of arms imports. Emphasis is placed on consideration of the financing of arms by importers because, it is proposed here, this is a crucial matter in the evaluation of the effects of arms transfers.

The paper starts with a section highlighting the problems of arms transfer data and then provides an overview of magnitudes and trends in the international trade in weapons. It then addresses the issue of aid and discusses the various ways of financing weapon imports by Third World states. Special attention is given to the question of indebtedness in financing weapon imports. Available estimates of the military-related debt are reviewed and examined. The paper closes with some thoughts about the future of the international arms trade and its financing.

The Data Problem

Foreign Trade Data

Arms transfers, like all transfers of goods, should be registered in trade statistics. In international trade classification schemes, there are special categories for some weapons, such as guns, tanks, and warships, while other relevant goods, for example most types of aircraft and electronics, are lumped together with civilian goods. It is of course possible--and done in some countries--to separate civilian and military goods in sub-categories to such categories.

Surveys have shown that the large majority of countries in the world does not publish complete and detailed data on arms imports (or arms exports, for that matter) (SIPRI 1971; Arbeitsgruppe 1980). In some cases, arms transfers are specifically *trade* statistics. (This creates an accounting problem for balance-of-payments statistics that will be mentioned later). In other cases, transactions connected to armaments are not reported in the appropriate categories but in one or a few figures at the end of the trade statistics. In many cases, it is not clear from the available statistics whether and where arms transactions are included. Often there are figures in special categories (such as SITC class 9) and in those which lump civilian and military goods together that may or may not be correct; in these cases, however, it sometimes is possible to compare this data with information from other sources and to come up with some idea of the extent to which arms transfers may have been included in trade statistics.

Reporting of arms exports is probably more complete than that of arms imports. At minimum, there are single figures for arms exports in the trade statistics of several of the largest arms exporters--including the United States, France, Great Britain, and West Germany. It is also generally assumed that published trade statistics for the Soviet Union include arms transfers, though there is no special category for such transfers.⁵ These figures are not of much use for analysis of their economic effects in recipient countries, since they are highly aggregated.

In some cases, for example the People's Republic of China, it can be assumed that arms exports are excluded from export statistics, but most arms exports to Third World countries probably are reported in trade statistics. Since the same is not true for importing countries, the arms trade is one source for the observed divergencies between

export and import figures in bilateral and global comparisons of trade data (Yeats 1978).

Financial Data

There is little reason to expect to find data specifically pertaining to arms imports or related data in financial data series, since such data generally is not functionally categorized. Still, some central banks--for example, those of Brazil and of Israel--do publish separate data on military-related transactions. Such data seems to be based on the evaluation of standard forms that importers and exporters have to fill out in many countries in connection with foreign financial transactions. It is not known to this author whether such questionnaire requirements in any other countries similarly reveal arms transfers.

In cases where arms transfers are deliberately excluded from trade statistics, and thereby from the trade balance, it is necessary to manipulate the capital balance accordingly. This can be done passively, by letting the category of errors and omissions take care of the problem, or actively, by excluding relevant parts of financial transactions from the balance of payments. In practice, this means keeping a second set of books parallel to the official data. It is not known to this author how widespread such practices are.

A related matter is that of indebtedness. It is not altogether clear to what extent indebtedness resulting from military transactions is included in statistics of the external debt. A number of creditors seem expressly to separate military-related debt from the rest of debt and not to report it to the relevant authorities. The OECD Secretariat used to specify in the technical notes to its annual report on developing-country debt that statistics did not cover official military credits; it estimated that, for non-OECD developing countries as a whole, official military debt was about 10 per cent of total reported long-term

debt, and well under 10 per cent of total reported debt service.⁶ In the mid-1980s, when more information on military-related debt became available (e.g., by comparing data sets and during debt reschedulings), the OECD dropped this note. Now the OECD Secretariat simply states that some information on military debt is considered to be insufficiently supported by firm data to be included in the statistics (OECD 1990, p. 22), implying that other military credits are included.

Other Sources

There is a large difference between what is recorded in trade and finance statistics on the one hand and what is known about arms transfers on the other. Political, military, and economic interests combine to put a quite considerable amount of information into the public sphere. One set of sources available to the public is based on the confidential data base on arms transfers of the U.S. government. Various U.S. government agencies contribute to this data base. Parts of it are regularly reported in an aggregate way by the U.S. Arms Control and Disarmament Agency (U.S. ACDA) and the Congressional Research Service of the U.S. Congress (Grimmett). There are indications that the data base is somewhat skewed, since the U.S. government's agencies' interest in finding out about arms transfers is not equally distributed over all suppliers. In addition, prices for suppliers other than the United States are sometimes difficult to estimate (see below).

Another set of sources originates from the economic interests of the sellers of arms and the military strategic interests of many recipients to make public what has been transferred. Such information is regularly published in a large number of trade journals and special sales publications as well as in the international press. Because of the diversity of the sources, it is a considerable effort to

collect all the relevant data into one data base. This is currently done only by the Stockholm International Peace Research Institute (SIPRI). SIPRI data is, however, limited to major weapons,⁷ since considerably less information is available on small arms, components of weapons, etc. (while the U.S. government's figures do attempt to cover all transfers of military technology, including components and equipment for arms production facilities). The SIPRI data is also problematic because there are large gaps in public reporting of individual arms deals. The Soviet Union, for example, did not make any information public until recently, which probably resulted in under-reporting of transfers from the U.S.S.R. There is also a strategic-military interest among recipients of weapons in concealing the availability of certain weapon systems.

Both U.S. government and SIPRI data are collected in the form of registers of what types of weapon systems are transferred from one country to another. While SIPRI publishes this kind of detailed information, the U.S. government does not. The raw data is prepared for publication in various formats in both sources by multiplying quantities by prices. Quite often, actual prices are not known or do not reflect the military use value of the weapons transferred. In such cases, prices have to be estimated on the basis of the information available. The most difficult pricing problems concern Soviet arms transfers. Thus, in 1986, the U.S. government decided to substantially increase its estimate of Soviet weapons transfers because it had changed its assumptions about the amount of support material that was supplied alongside weapons; it commented that these revisions, "generally do not affect underlying estimates of the number, type or value of major military equipment deliveries, but rather the estimated dollar value of supporting material deliveries, particularly those to countries engaged in ongoing hostilities" (U.S. ACDA 1987, p. 145).

Through this change alone, the estimate of total Soviet exports of arms for the period 1981-85 increased from US \$56.8 million to \$86.2 million (in constant prices of 1983), or almost 52 per cent (U.S. ACDA, 1986, 1987).

The gaps in the original data and the difficulties in pricing place *severe* limits on the data kept by both the U.S. government and SIPRI. Consequently, the data from both sources is better suited for trend analysis than for inter-country comparisons. It is even less suitable for comparison with economic data such as trade and financial data. Until better data is available—an Expert Group appointed by the United Nations is currently studying a proposal to create an arms trade register—these data series are the only ones available. They will be used here with due consideration of their limitations.

International Trade in Arms: An Overview

Trend

Figure 1 shows that from the early 1960s to the early 1980s, there was rapid growth in the transfer of arms to countries in the Third World. This growth is put in perspective by measuring it against other indicators, for instance the growth in total imports. Such a comparison shows that the trend growth of arms imports by Third World countries over this period was sharply higher than for imports as a whole. In the late 1980s, the decline in general trade was not reflected in a similar decline in the import of weapons.

Phases and Structure⁸

Until the early 1960s, most arms were transferred within military alliances—from patrons to clients. Weapons transferred, mostly for free, were mainly surplus weapons—many from World War II. Arms transfers were part of the construction of military alliances,

**Figure 1. Developing Countries' Imports of Arms and All Goods
(Index, 1985=100)**



Sources: SIPRI Yearbook, various years; U.S. Arms Control and Disarmament Agency (ACDA), various years; International Monetary Fund, *International Financial Statistics*, various issues (for data on all imports).

including the ring of containment built by the United States on the southern borders of the Soviet Union and Soviet efforts to destroy that ring. Thus the first transfer of Soviet weaponry outside its bloc after World War II was to Egypt in 1956.

The emergence of many new nations in Africa and Asia in the early 1960s, balance-of-payments problems in the United States, and the economic revival of Western Europe slowly changed this structure. The United States began to ask its allies to pay for the arms they received. This further motivated the larger Western European states to broaden their arms production activities. In parallel, they expanded their efforts to sell weapons. The Soviet Union tried to woo many nations into its camp through its own continued *free* transfer of arms, and in the mid-1960s, it became the most important supplier of

weapons to the Third World—for the first time surpassing the United States. The position of the importers of weapons got better and worse at the same time: with more suppliers from both East and West, they had more choice, but at the same time they had to pay either in money or with political allegiance.

During the 1960s, the ground was laid for the large expansion of the arms trade during the 1970s. But it took other factors to enable the arms trade to increase by a factor of 5 within a single decade. First, there was the rise in the prices of oil and some other raw materials, which gave some states in the Third World unprecedented amounts of financial resources. Second, with lots of money available in some Third World states that could only invest part of it, and with uncertain economic prospects in the industrialized countries, great amounts of financing on cheap

terms--in the form of credits on international financial markets--became available to other Third World countries that were not originally favored by increases in raw material prices. A good part of the debt incurred in the 1970s was used to buy weapons (see below). Third, the 1973 October War in the Middle East provided a strong stimulus for rearmament throughout that conflict-torn and newly enriched region. In many Third World countries, arms transfers were riding the crest of a procurement cycle. The armed forces of countries that had received World War II weapons in the 1950s and early 1960s were in dire need of replacements. The economic crisis that in many industrialized countries paralleled the oil price rises increased commercial eagerness to make money from arms transfers. "Arms for oil" became a catchphrase not only in Western Europe but also in the Soviet Union, which greatly increased its sales of weapons for hard currency. In the United States, the situation was also affected by the end of the Vietnam War, which left some production capacity unoccupied. The companies looked for work abroad. Finally, both the United States and the Soviet Union changed their attitudes towards arms transfers as a policy instrument. The United States, influenced by the Vietnam experience, formulated a policy--often called the Nixon Doctrine--of arms transfers to friendly regionally dominant states in preference to direct military involvement. The Soviet Union also raised the importance of arms transfers as an instrument of its foreign policy.

In addition to the large volume increase in the arms trade, important structural changes in this trade became manifest in the 1970s. First, the Third World segment of the arms market became much more important as transfers to the Third World grew rapidly while trade among industrialized countries stagnated. Second, used or outdated weapons were hardly traded any more. States that

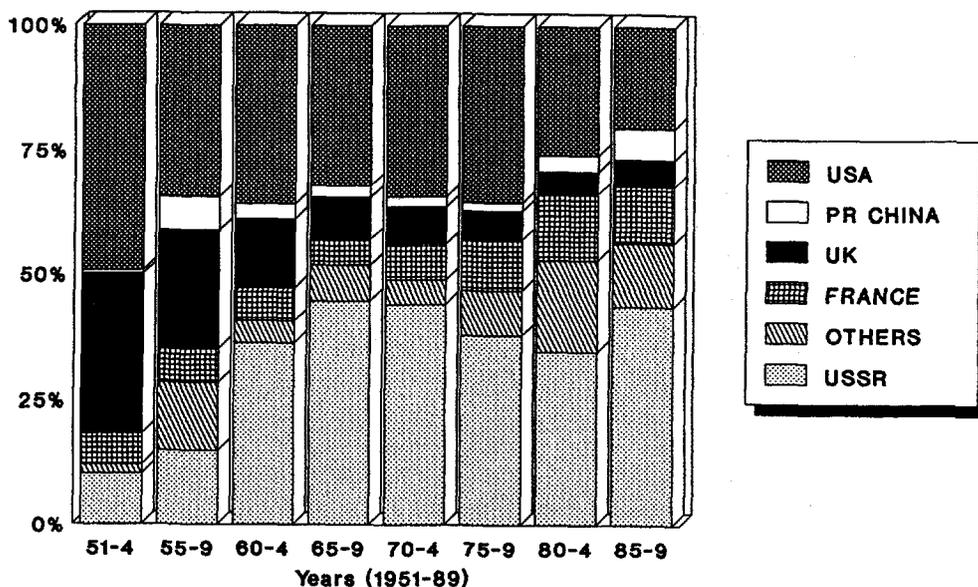
could pay for more sophisticated weapons demanded them--in some cases even contributing financially to the development of new weaponry (as when Iran partly financed the development of the F-14 aircraft in the United States). Third, more and more customers demanded arms production *technology* in addition to weapon systems. Many of them wanted to build up domestic arms industries with foreign help so that they could become more independent in the long run. Fourth, as will be reviewed in more detail below, financing of the arms trade also changed.

In the early 1970s, the postwar structure of the arms market--a seller's market dominated by the United States and the Soviet Union as suppliers with mainly political aims in their arms transfer policies--reached its apex. As the 1970s moved along, some elements became visible that later came to dominate the different structure of the arms market in the 1980s: for example, increased production in the Third World, increased competition among producers, and a less hierarchical structure.

Since the early 1980s, the arms trade has stagnated. Several factors have contributed to this trend. First, raw material prices, including those for oil, fell drastically. Second, the accumulated debt became a heavy burden in many Third World countries. Third, government deficits that were allowed to rise in the 1970s--partly to finance increasing arms budgets--had to be cut in order to stabilize economies that had gotten out of fiscal and monetary control. In addition, domestic arms production in Third World countries became a factor to be reckoned with.

Effective demand nevertheless remained high in the 1980s. It was fueled by several conflicts, for example the Iraq-Iran War. In some countries, for example Saudi Arabia,

Figure 2. Exporters' Shares of Major Weapons Exports to the Third World, 1951-89 (percentages of total)



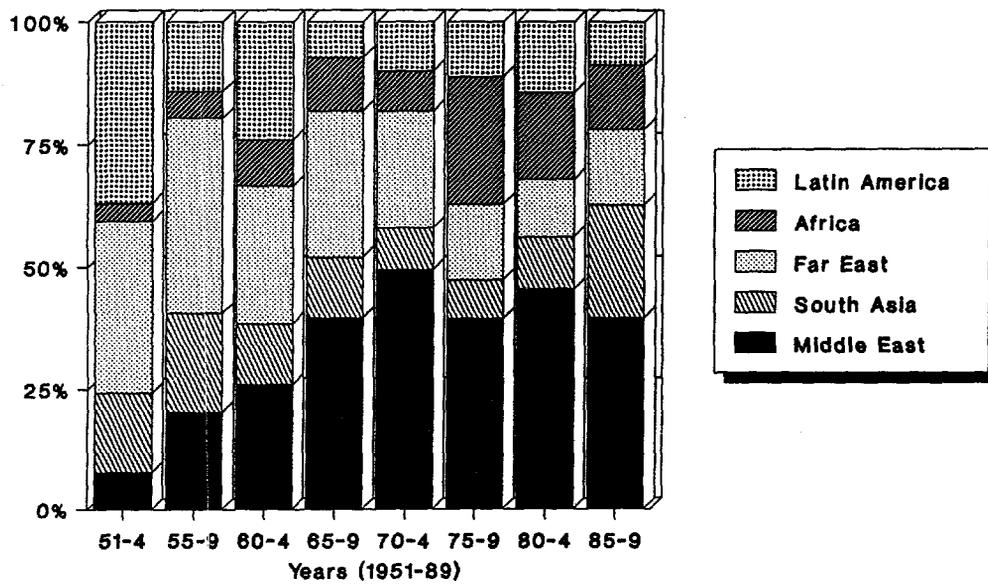
Sources: SIPRI Yearbook, various years.

buildup of the armed forces had been initiated in the 1970s and was moving into its hardware-expensive phases. The United States and the Soviet Union, faced with clients who could not pay for weapons, were again more willing to increase their military aid. To some degree, the trend towards commercialization was undercut. Moreover, while demand slowed, supply increased. In the 1980s, tough competition among suppliers marked the arms trade as new suppliers entered the market in both Europe (Spain, Greece) and the Third World.

Some structural changes were also notable. First, the United States and the Soviet Union, which were not willing to fully enter the race for orders and to abandon their political

approach to arms transfers, lost market shares—although the Soviets had largely regained about 45 per cent of the market by the late 1980s after a drop over the previous decade (see Figure 2). Whereas in the late 1970s their combined share in arms transfers to the Third World had stood at over 70 per cent, by the mid-1980s it was less than 60 per cent. This trend was reinforced by the desire of many recipients to obtain weapons without political strings attached—and therefore preferably not from the United States or the Soviet Union. Second, two tiers of the market for complete weapon systems developed: in one of these, new weapon systems are bought by rich Third World states; in the other, poor states are buying old or simple weapons, often

**Figure 3. Regional Shares of Major Weapon Imports, 1951-89
(percentages of total)**



Sources: SIPRI Yearbook, various years.

from other Third World countries or from private arms dealers.

The business of updating weapons has also gained in importance. The Chinese arms industry specialized in offering its Soviet-type armored vehicles and aircraft integrated with Western (British, Israeli, U.S.) electronics. Third, arms production technology partly substituted for the trade in complete weapon systems. Third World customers are demanding and receiving *work shares* in the production of weapon systems they purchase and *licenses and components* for the weapons they want to produce. Fourth, more recipients are demanding large "offsets" in order to lessen the economic burdens of arms imports; these often take the form of civilian or

military goods that have to be imported by the weapon exporter.⁹ Fifth, the grey and black markets became more important—at least during the Iraq/Iran War. Many of the new exporters rely on the services of private dealers to enter the highly competitive market. The same is true for established arms producers who do not want to be caught dealing with problematic customers like Iran, for example, and prefer to have intermediaries.

The stagnation in the arms market in the 1980s is largely explained by short-term economic and long-term procurement factors on the side of the recipients. It is therefore possible that the volume of arms transfers will again increase—an issue that will be discussed in more detail in the last section of this paper.

**Table 1. Magnitude Comparisons of Third World Arms Imports, 1987
(percentages)**

	(\$ millions)	<u>Arms Imports in Relation to:</u>				
		<u>All Imports</u>	<u>SITC Class 7 Imports</u>	<u>Interest Payments on External Public Debt</u>	<u>Net Disbursements of ODA (all sources)</u>	<u>Gross International Reserves</u>
				(percentages)		
Low-Income Economies	8,715	10	33	230	54	26
Middle-Income Economies	19,995	5	15	46	149	16
High-Income Oil Economies	5,115	14	40	-	-	14
All Countries Included	33,825 ^a	6	17	71	115	16

Note: Country groupings according to World Bank.

^a The difference between the total for all developing countries given here and the total of \$38,980 million given in U.S. ACDA (1989), p. 73, is due to the exclusion here of: data for China (ACDA arms export estimate: \$600 million); data for World Bank groupings of Non-Reporting Members—including, among others, Cuba, Angola, and North Korea (ACDA arms export estimate: \$4,480 million); and World Bank Members with populations below 1 million (ACDA arms export estimate: \$75 million).

Sources: World Bank, *World Development Report 1989*; U.S. ACDA, *World Development Indicators* (1989), Table 2.

Comparisons of Current Magnitude

There is some discrepancy—as is to be expected, given the differences in coverage mentioned earlier—between the average figures for arms imports by the Third World in the late 1980s given by the U.S. government and by SIPRI. While the U.S. government's figure is above \$35 billion, SIPRI's is above \$20 billion (U.S. ACDA 1990; Grimmett 1990; SIPRI 1990). The figures can be compared to other data to allow some grasp of the magnitudes involved. As shown in Table 1, there are significant variations in the importance of arms transfers measured against other indicators. The imports of arms by all of the developing countries included, as measured by the U.S. government, are quite sizable—amounting to about 6 per cent of all

imports, and to some 17 per cent of imports of machinery and transport equipment (class 7 of the Standard International Trade Classification, SITC). Arms imports are almost as high as interest payments on external public debt. (This ratio must be interpreted carefully, since arms transfers are financed in various ways—discussed below—while interest payments are flows during a certain year.) On average, arms imports by all developing countries, as measured by the U.S. government, are substantially larger in dollar terms than all net development aid provided by all aid givers. (It should again be noted, however, that arms transfer data does not imply actual financial flows during the year given.) Another possible comparison is to gross international reserves, where again the quite substantial

magnitude of arms imports, as measured by the U.S. government, is visible.

The Changing Fate of Military Aid

Types of Aid

There are two basic conceptions of military aid. One is that any kind of support in the military field should be called military aid. In this understanding, arms transferred are military aid regardless of whether they are paid for or supplied for free. This concept is a *political* one; it starts from the contention that all support in the military field is some kind of "help" or aid. The other conception is closer to the general understanding of development or economic aid. Its basic premise is a *financial* one: the transfer is aid only where there is a substantial grant element. It is this second conception that will be used here, although it is realized that in practice it might be difficult to establish the difference.

Various types of financial support fall under the category of military aid. They can be, as general economic aid, divided in several ways: by extent of the grant element; whether they concern transfers of *capital* goods (weapons, arms production facilities, etc.), *operational* goods (ammunition, logistic material, foodstuffs), or *services*; or whether they are given in exchange for something (base rights, alliance contributions, etc.).

Then there is the question of the fungibility of aid, which has relevance for the military efforts of recipient states. Aid given for civilian use can be a means to increase domestic expenditures for military purposes. Obviously, the reasoning can be reversed: military aid may in fact allow the increase of imports of civilian goods. Differences between intended and actual effects of grants or subsidies are of course a general

phenomenon that has been studied in a substantial body of literature.

What is the actual extent of fungibility? It can be argued that aid given for purposes that the receiving state would not finance out of its own pocket, for instance, is not subject to this kind of reasoning. Such aid does not allow the government to substitute among goods according to its own preferences.

Martin McGuire (1982, 1987, with some additional tables) has built an elaborate model of the Israeli economy in order to study resource allocation in a case where outside military threats and the inflows of both military and economic aid are important. Using data for 1960-79, he tests his model using a number of mathematical formulations and various estimating procedures. Among the results are first-round estimates of the fractions of U.S. loans to Israel used as fungible resources by the Israelis. For military aid, this fraction, the fungibility coefficient, ranges from 4 per cent to 18 per cent; for "economic" aid, the range is from 90 per cent to 100 per cent. McGuire also considers secondary effects of received U.S. assistance, including political and economic decision making in the United States, Israel, and the Arab states. Considering such linkages, McGuire estimates that, on average, 23 per cent of U.S. military assistance has "leaked" to civilian purposes and 40 per cent of economic aid has leaked to "military" purposes.

McGuire's results confirm the abstract argument advanced above. Closer inspection of the aid data to Israel indicates why there are differences in the fungibility of military and economic aid. Military aid has been mostly connected with the subsidized delivery of weapon systems, while economic aid has mostly been budgetary support.

U.S. Military Aid

Much more detailed information is available on U.S. military aid programs than on those of other states.¹⁰ To some extent, the trends in U.S. military aid also seem to be representative of other exporting states.

The largest program in the past has been the one originally instituted in 1949 to help Western European countries, called the Military Assistance Programme (MAP). Under this program, weapons, ammunition, spare parts, and logistical support are supplied as grants. The importance of MAP has decreased since the 1960s, as more and more states were asked to pay for their arms imported from the United States. After reaching a trough in FY 1981, with only \$104.4 million, MAP grants have, however, increased again--to more than \$700 million in FY 1988, with Turkey and Central American states the main recipients (U.S. DoD 1990).

Another relevant program is the Foreign Military Sales Programme (FMS), which is no aid program in the narrow sense discussed above. But since FY 1985, FMS has become an instrument of military grant aid to Israel and Egypt. Within the framework of the FMS, the U.S. Department of Defense organizes the transfer of weapons for recipient states and selling companies, including the financial side of the transfer.

In the past, most of the transfers within the FMS financing program were contracted at an interest rate equal to the cost of credits to the U.S. Treasury plus a small administrative surcharge, usually with 20-year repayment and 10-year grace periods. For governments that have to pay higher premiums for their credits on the open markets, this implies that FMS financing at the Treasury rate carries a grant element--albeit a small one. In the 1980s, interest rates below the Treasury rate were increasingly authorized by the U.S. Congress

and subsidized by the U.S. government. These concessional rates have varied from case to case, in recent years averaging about half the going Treasury rate (U.S. DoD 1989; for concrete examples see Deger 1990; Platias 1990).

For the purposes of Figures 4 and 5, the various military programs are aggregated according to the type of financing arranged. MAP, forgiven FMS, and other programs provided at no cost are added up to the category of "grants" proper; FMS financing is subtracted from FMS and shown as "credit"; while the rest of FMS and commercial arms sales are depicted as "cash." Both Figure 4 and Figure 5 show the decrease of full grant aid in the 1970s, a slow though fluctuating increase in credits, and a recovery of grants in the 1980s.

There are other aid programs with military relevance. U.S. military aid from its beginning has been closely connected to civilian aid. The original rationale of U.S. aid was to strengthen military and economic capabilities simultaneously. This rationale was reiterated in the 1980s by the bipartisan Commission on Economic and Security Assistance (1983). One practical outgrowth of this broad understanding of security was the Defense Support Program of the 1950s that later became the Economic Support Fund. Although administered by the Agency for International Development, these programs provide recipients with money to be used for all kinds of purposes, including military ones. Under the Defense Support Programs, and also the PL 480 Food Aid Program, recipient governments sold goods--delivered to them at no cost--for local currencies to augment their government budgets. The ESF programs, quite sizable for countries like Egypt and Israel, are mostly balance-of-payments subsidies by the U.S. government to recipient governments to provide the time needed to make long-term policy adjustments.

Figure 4. Different Types of Financing in U.S. Arms Sales to the Third World (billions current US\$)

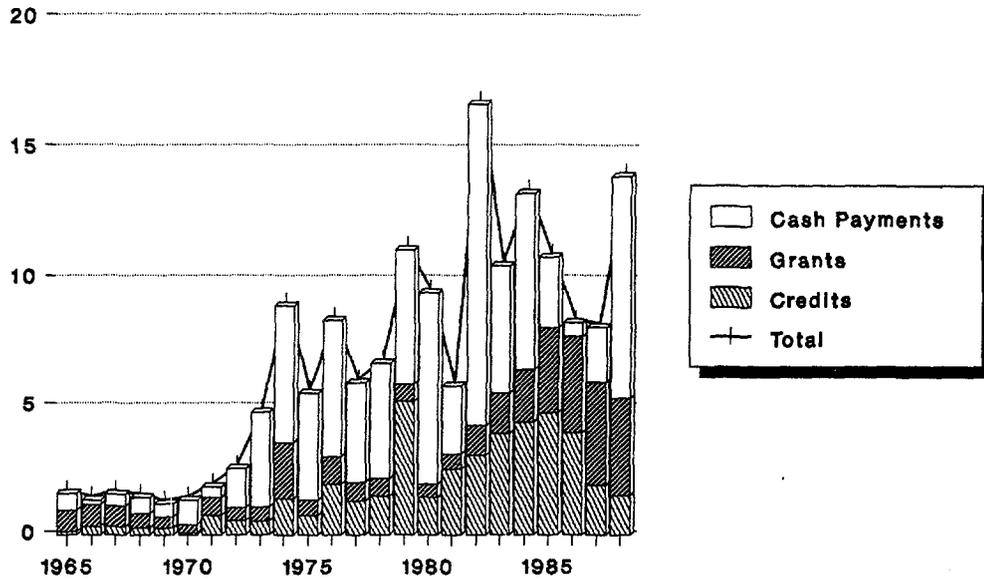
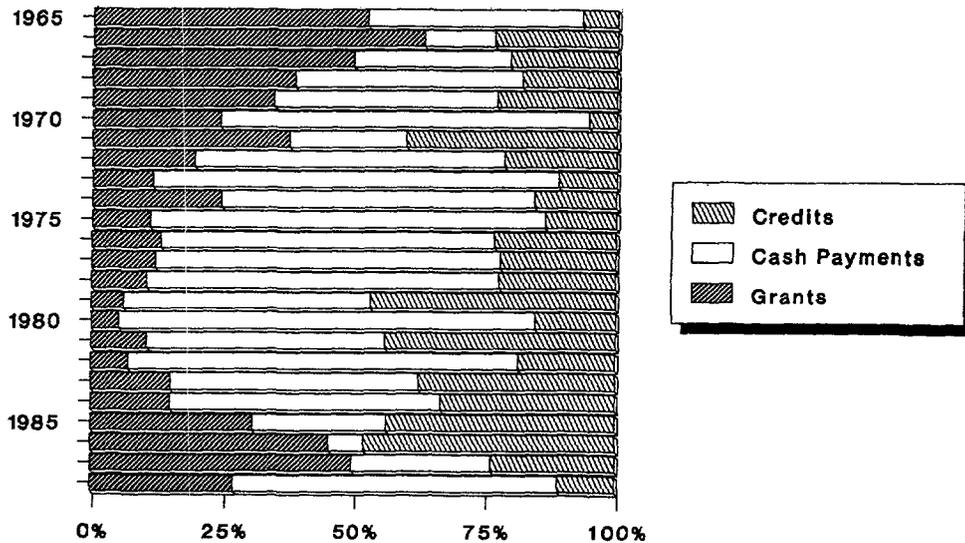


Figure 5. Shares of Different Types of Financing in U.S. Arms Sales to the Third World (percentages of total)



Sources: U.S. DoDSAA Fiscal Year Series (1990).

The money given by the U.S. government under the ESF program is usually not tied to specific projects, so that fungibility is high. These programs are not military aid proper, but they had--and in the case of the ESF continue to have--large military components. The U.S. government regards them as part of its security assistance in the broad sense. The U.S. government reports ESF funds as "development aid" to international organizations such as the OECD, which accordingly includes them in its presentations of ODA.¹¹ Main recipients of ESF funds in the past were Israel, Egypt, and some Central American states.

Soviet Military Aid

Little is known about Soviet military aid programs. They are often assumed to have been large, though such assessments seem to be built upon the broad concept of military aid.

The U.S. government, which is the only source that regularly provides estimates of Soviet arms sales and deliveries, gives no clue as to the distribution among aid and trade. All sales and deliveries are called military assistance--a practice that many authors follow. It is therefore confusing to compare such data with those on Soviet *economic* aid--another frequent practice.

In the past, Soviet authorities rarely used the *concept* of aid or assistance ('pomoshch'). They for long contended that aid was a compensation paid by the former colonial powers for their earlier exploitation; since the Soviet Union was not a former colonial power, there was no reason for it to give aid. The relations of the U.S.S.R. with Third World countries have been portrayed as 'co-operation' with mutual benefits. It follows from this official line of reasoning that outright grants would be rare and that aid would take other forms, e.g., price subsidies

or credits with grant elements. It is very difficult to find much discussion or hard evidence about these issues. Much more research effort has been put into a different, though related question, namely, how important hard-currency earnings from Soviet arms transfers have been. The three issues of price subsidies, concessional credits, and hard-currency earnings will be briefly discussed here.

Some information has been collected of what are taken to be official Soviet weapon prices (Efrat 1983). It seems that Soviet negotiators presented price lists to their counterparts in countries such as Egypt and Syria; but it also seems that these governments received weapons at substantially lower prices--Egypt, for instance, at about 50 per cent discount. The prices quoted by Efrat are substantially higher, by factors of 1 1/2 or more than those used by the U.S. government and SIPRI. It is difficult to substantiate with the information obtained by outside observers whether any of these prices were reflective of the production costs of Soviet weaponry. In fact, it now turns out that Soviet economists--and arms sales negotiators--never knew what individual weapon systems really cost to produce.¹²

Somewhat more is known about credit terms. The Indian government, which has bought weapons from a large number of sources, has preferred Soviet weapons at least partially because of their price--said to be 40-50 per cent lower than those for comparable Western equipment. Duncan reports that arms were usually delivered on credit terms that had a grant element. It seems that while they were often denoted in hard currency, they could be repaid in goods rather than in hard currency. Interest rates were 2-2.5 per cent, with credits repayable over 15-30 years (Duncan 1990, pp. 79-81). These credit terms seem to have been fairly universal, although individual customers might

have been told that they were the best offers ever made by the Soviet Union.¹³ Denoted in hard currencies, these credit terms imply a large grant element for most of the time since the 1950s; if the notations in hard currencies were only nominal and the credits could in fact be paid back without the use of hard currency, the grant element might have been even higher, depending on the circumstances of such repayments.

In addition to making credits concessional, the Soviet Union has also forgiven debt. One such case concerned Egypt. Moshe Efrat (1983, p. 450) reports that according to various Egyptian sources, all Egyptian military debt to the Soviet Union incurred before 1960 was cancelled in 1965. Of the debt incurred later--Efrat's estimate is 1,500-1,800 million Egyptian pounds (\$4-5 billion) by the mid-1970s--about 25 per cent had been repaid by Egypt before its break with the Soviet Union.

The question of Soviet hard-currency income from weapon exports has attracted considerable attention. Richard Portes has calculated data that gives a figure of \$18.7 billion for 1970-81 (quoted in Deger 1986, p. 167), corresponding to about 40 per cent of Soviet arms exports as measured by the U.S. government. David Holloway has stated that hard-currency earnings were about \$21 billion between 1971-80 (Holloway 1983, p. 125), or 60 per cent of total arms exports as estimated by the U.S. government and published by the Central Intelligence Agency (quoted here from Becker 1986, p. 6). Ericsson and Miller (1979) of the U.S. Central Intelligence Agency have estimated hard-currency earnings of more than \$6 billion for 1974-79, or about 43 per cent of arms exports as estimated by the U.S. government. Joan Parpart Zoeter (1982) of the same organization has estimated hard-currency income at \$25.8 billion for 1973-81, or 75-96 per cent of total estimated Soviet arms exports in individual years.

Roger Kanet (1983) has collected information giving hard-currency earnings shares between 50 per cent and 75 per cent from various U.S. government sources. Wharton Econometric Forecasting Associates have estimated hard-currency sales of \$22 billion for 1980-83, or 74 per cent of total Soviet arms exports during the same period.

All of these estimates are based on a number of assumptions about trade volumes, weapon prices, and payment methods. Ericson and Miller extrapolated from a detailed CIA estimate for hard-currency earnings for 1977 of 43 per cent in all CIA-recorded Soviet arms exports. Zoeter does not give much background on the estimation methods that resulted in her very high shares; her figures are not easily squared with other information on Soviet balance-of-payments items during the same period. They would, together with information about other hard-currency incomes, suggest a *surplus* in hard currency earnings--although at the same time the Soviet Union incurred substantial hard-currency *debt*. Allan Smith has suggested that in fact much of the hard-currency income estimated by the CIA was credit to be repaid with hard currency (or commodities that could be exported for hard currency). In this interpretation, the CIA's figures would cover credits denominated in hard currencies as well as actual cash payments (Smith 1986, pp. 153-54). Robin Laird and colleagues of the Wharton Econometrics Forecasting Associates have estimated that around 70 per cent of hard-currency sales were on a credit basis.

What can be made of these patches of information? The Soviet Union has probably supplied weapons for free to a number of countries with which it had special political relations or which it considered strategically important. On many occasions, weapons were supplied to these and other countries on credit but without much hope of payment. The

Soviet Union probably also has aided recipient states by supplying weapons at prices below production costs. Credits have been on concessional terms. On the other hand, hard-currency income seems to have been substantial--at least since the 1970s, although it is not clear how much of this was actual cash *income* and how much was hard-currency *credit*.¹⁴

Other Military Aid

While extensive military aid is an obvious policy instrument for arms suppliers with strong political motives, where commercial considerations dominate, suppliers can be expected to ask for full payment of the arms supplied. Suppliers other than the United States and the Soviet Union have also provided military aid for various reasons--though at much lower levels. One of these reasons is that many other suppliers also have used arms transfers as political instruments--e.g., the French government in the cases of some African states, or China and some other communist states in the cases of liberation movements. Another reason is that, given the tough competition among arms exporters since the early 1980s, customers have successfully negotiated for package deals--including grant military aid. Direct French military aid has been on the scale of about \$50 million per year in the 1980s, with two-thirds of this being equipment aid and one-third, training assistance¹⁵ (Chipman 1989, pp. 114-67); West German equipment aid was less than half that level.

Since the oil crisis of 1973, some of the oil-rich states of the Middle East also have become important donors of military aid. Detailed data is not available.¹⁶ But it seems that Iraq, Egypt, and Afghan mujahedeen were the main recipients of such aid in the 1980s. One source puts financial aid by Arab countries to Iraq in the 1980s on the order of

U.S. \$ 50 billion (an amount equal to more than half of Iraq's arms imports in this period).¹⁷

Summary

Although its exact level is not known, military aid is quite substantial and probably accounts for a good part of arms imports. A realistic estimate could start by taking the available U.S. data, a 40 per cent grant element in Soviet arms transfers,¹⁸ another 10 per cent grant element in the transfers of the other suppliers, and a 10 per cent deduction for arms subsidies by Arab states. This implies that about one-third to one-half of arms exported are in effect delivered as grants. The importance of arms aid decreased in the 1970s and increased again in the 1980s. (All this leaves aside consideration of the fungibility of non-military aid.)

Financing of Arms Imports and Indebtedness

Simply put, there are two ways to finance arms imports if weapons are not supplied for free or financed by some third country giving military aid: either they are paid for immediately, in cash or kind, or later, via credit.

In some of the supplier countries, special credits are available for the foreign purchasers of arms. The United States, for instance, has the FMS Financing Program mentioned above. In other countries, weapon exports can be financed through government owned or regulated agencies set up to finance exports of all kinds, including arms. Thus the Federal Republic of Germany, for example, has the Kreditanstalt für Wiederaufbau (KfW), which has been involved in the financing of arms exports--of Tornado aircraft to Jordan, for instance.

Table 2. Military Debt Owed to United States, Compared to Total Debt Owed, Selected Countries (end 1988)

	FMS Debt (\$ millions)	Total Debt (\$ millions)	Ratio of EMS Debt to Total Debt
Israel	8,945	25,990	34
Lebanon	83	497	17
Egypt	5,981	49,890	12
Greece	2,595	23,914	11
Pakistan	1,475	16,692	9
Turkey	2,936	40,932	7
Jordan	343	5,360	6
El Salvador	89	1,755	5
Tunisia	306	6,747	5
Somalia	91	2,006	5
Oman	89	2,850	3
Botswana	11	511	2
Zaire	150	8,571	2
Thailand	346	20,707	2
Morocco	334	20,094	2
Sudan	148	11,516	1
Liberia	18	1,629	1
Korea, South	393	40,459	1
Honduras	28	3,322	1
Kenya	50	5,967	1
Philippines	225	30,052	1
Dominican Republic	16	3,843	0
Ecuador	37	10,500	0
Niger	5	1,696	0
Indonesia	123	52,668	0
Panama	12	5,302	0
Senegal	9	3,711	0
Cameroon	9	4,039	0
Peru	29	18,118	0
Malaysia	30	22,680	0
Bolivia	6	5,631	0
Gabon	3	2,549	0
Colombia	13	17,008	0
Jamaica	3	4,537	0
Haiti	1	846	0
Sri Lanka	2	4,732	0
Total	25,171	1,174,180	2

Sources: U.S. GAO (1989); World Bank, *World Debt Tables, 1989*; OECD, *Financing and External Debt of Developing Countries: A Survey, 1990*.

Available circumstantial evidence suggests, however, that commercial banks have been the most important source of credit financing of arms imports since the 1970s. Hard data on the involvement of commercial banks is not available. Commercial banks are generally unwilling to discuss business details; and in many cases not even the lending banks were aware of the final destination of the money they transferred to governments. Thus commercial bank credits, often in the form of credits to governments, point towards another fungibility issue (discussed above).

The following section will focus first on direct military credits and then present an approach to calculating the maximum use of credits for military purposes.

Debt to the U.S. Government Due to Arms Imports

The U.S. government not only publishes the most detailed data on arms transfers and military aid but has also released data on debt owed due to FMS financing programs.

Compared with total debt, FMS debt is low, except for a few countries with which the United States has some type of political or strategic alliance (Table 2). Some of the FMS debt to these countries has been rescheduled and even forgiven--e.g., in late 1990, the Egyptian FMS debt of \$7.2 billion accumulated by that time was substantially eased in reward of the Egyptian support against the Iraqi invasion of Kuwait (Fadil 1990).

Estimating Debt to the U.S.S.R. Due to Arms Imports

There is no comparable data for the U.S.S.R., the largest exporter of arms in past decades. In fact, Soviet debt data of any kind has only become available recently (*Izvestiya* 1990), and it is not clear how good this data is--for

instance, whether or not military credits are included.¹⁹ Since, according to Western estimates, arms exports have accounted for 40-50 per cent of all Soviet exports to Third World countries, credits to finance imports of Soviet arms should be a large share of all credits.

In Table 3, available data on developing-country debt owed to the Soviet Union, as reported by the Soviet government, is compared with various trade data series; some correlations were calculated between these data series and debt data (Table 4). The data in the second column of Table 3 (and the first of Table 4) is the SIPRI estimate of Soviet exports of major weapons for 1951-89. The third column of Table 3 is based on the same data, but here it is assumed that these transfers were made on a credit basis with a 10-year grace period and 20 equal yearly payments thereafter (SIPRI Weighted). The fourth column is the U.S. government's estimate of Soviet arms transfers for 1983-87 (ACDA). The last column of Table 3 shows transfers of all goods for the same time period as given by official Soviet trade statistics--although this data in all probability does not include arms. The strongest bivariate association exists between the export and debt series--with an r^2 of .82--indicating that most of the debt in the official statistics is related to civilian trade agreements. The correlation coefficients between the arms transfer and the debt series are also fairly large: .34 for SIPRI Unweighted, .32 for SIPRI Weighted, and .47 for ACDA.²⁰ Higher regression coefficients result from a multivariate analysis, including both trade and arms transfer series. Standardized coefficients for trade are about twice the size of coefficients for the arms transfer series. If the official debt data were complete, these correlations would indicate that about twice as much of the debt resulted from civilian as from military trade. Given the higher share of arms exports in total trade, this would imply that the share of arms

Table 3. Estimating Soviet Arms Exports and Developing-Country Debt

Countries	Debt of Developing Countries to Soviet Union (USSR data) ^a	Arms Exports from Soviet Union			Soviet Exports to Developing Countries (USSR data) ^b
		Major Weapons Exported (SIPRI) ^c	Arms Transfers, 1983-87 (ACDA) ^d	Weighted by Assumed Credit Terms ^e	
		Unweighted			
			(percentage)		
Afghanistan	3.9	1.7	1.6	5.2	4.7
Algeria	3.2	4.0	4.7	3.2	1.0
Angola	2.6	2.0	2.9	7.5	1.2
Bangladesh	0.0	0.1	0.1	0.1	0.4
Benin	0.0	0.0	0.0	0.0	0.0
Burkina Faso	0.0	0.0	0.0	0.0	0.0
Burundi	0.0	0.0	0.1	0.1	0.0
Cambodia	0.0	0.0	0.0	1.4	1.0
Cameroon	0.0	0.0	0.0	0.0	0.1
Cape Verde	0.0	0.0	0.0	0.0	0.0
CAR	0.0	0.0	0.0	0.0	0.0
Chad	0.0	0.0	0.0	0.0	0.0
Congo	0.3	0.0	0.0	0.3	0.0
Cuba	19.7	4.4	4.0	9.0	33.8
EGYPT	2.2	10.9	3.2	0.4	2.5
Equatorial Guinea	0.0	0.0	0.0	0.0	0.0
Ethiopia	3.6	2.0	2.9	5.4	1.3
Ghana	0.0	0.4	0.6	0.0	0.0
Grenada	0.0	0.0	0.0	0.0	0.0
Guyana	0.0	0.0	0.1	0.0	0.0
Guinea	0.3	0.1	0.3	0.3	0.0
Guinea-Bissau	0.1	0.0	0.1	0.1	0.0
India	11.3	15.2	17.3	9.8	9.9
Indonesia	0.5	1.6	1.5	0.0	0.1
Iran	0.0	0.4	0.2	0.1	0.7
Iraq	4.8	11.8	14.4	17.9	2.7
Jordan	0.5	0.2	0.3	1.1	0.0
Korea, North	3.0	3.8	2.4	1.5	6.8
Kuwait	0.0	0.0	0.0	0.3	0.0
Laos	1.0	0.2	0.3	0.7	0.6
Libya	2.2	10.8	13.5	5.0	0.2
Madagascar	0.1	0.0	0.1	0.2	0.3
Mali	0.4	0.1	0.1	0.2	0.0
Mongolia	12.1	0.2	0.1	0.1	10.0
Morocco	0.0	0.0	0.0	0.0	0.6
Mozambique	1.0	0.7	1.0	1.7	0.6
Nepal	0.0	0.0	0.0	0.0	0.0
Nicaragua	1.2	0.2	0.3	2.3	2.1
Nigeria	0.0	0.2	0.2	0.1	0.9
Pakistan	0.2	0.1	0.0	0.0	0.4
Peru	0.7	0.9	1.3	0.6	0.3
Sao Tome	0.9	0.0	0.0	0.0	0.0
Senegal	0.0	0.0	0.0	0.0	0.0
Seychelles	0.0	0.0	0.0	0.0	0.0
Somalia	0.3	0.4	0.1	0.0	0.0
Sri Lanka	0.0	0.0	0.0	0.0	0.1
Sudan	0.0	0.2	0.0	0.0	0.0
Syria	8.6	16.4	16.8	11.5	2.4
Tanzania	0.4	0.3	0.5	0.3	0.1
Tunisia	0.0	0.0	0.0	0.2	0.2
Turkey	0.1	0.0	0.0	0.0	1.6
Uganda	0.0	0.2	0.1	0.0	0.0
Vietnam	11.6	8.3	6.6	11.0	12.1
Yemen, North	1.2	0.6	0.7	1.7	0.0
Yemen, South	2.4	1.4	1.8	2.5	0.9
Zambia	0.3	0.1	0.1	0.0	0.0
Zimbabwe	0.0	0.0	0.0	0.0	0.0
	\$130,454 ^f	\$133,077	\$89,417	\$77,505	\$94,670 ^g

^a Zvezdye, March 2, 1990, p. 3.

^b SIPRI data base.

^c U.S. ACDA (1990).

^d Memorandum . . . (1986, 1989) [Secretary of Foreign Economic Relations]. Probably exclusive of arms.

^e Calculated on assumption that all deliveries were made on terms of: 10 years gross, 20 annual payments, 2 per cent interest.

^f Calculated as October 31, 1989 official exchange rate (\$1.66 = R1).

^g Calculated as October 31, 1989 official exchange rate (\$1.66 = R1).

Table 4. Correlates of Developing-Country Debt to the Soviet Union (end 1989)

	SIPRI Unweighted	SIPRI Weighted	ACDA
Arms Transfer Data	0.30	0.30	0.32
Soviet Exports	0.59	0.60	0.56
R ²	0.90	0.91	0.89

Sources: See Table 3.

transfers financed by means other than credits--through grants or cash payments--was higher than that share for civilian exports. Of course, official debt data may not correctly reflect the military debt--though it seems unlikely, given the calculated regression coefficients, that military debt is totally excluded from the official debt data.

Other Suppliers' Direct Military Credit

What little information we have on other countries is circumstantial. It suggests a trend rather similar to the U.S. case: credits assumed an important place in financing arms imports beginning in the 1970s. In the case of Western European suppliers, however, credits seem to have come mostly from commercial banks and not directly from governments.

Estimates of Total Direct Military Credit

Although not enough data is available to actually calculate the total direct military debt, there are various ways to estimate its size. One can simply assume that there is not much difference between the extent to which the exports of all goods on the one hand and arms

on the other are financed through credits. The share of direct military debt in total debt can then be assumed to be about 6 per cent for the last two decades--the same as arms imports in total imports. Considering that some countries with large foreign-exchange income, such as the oil-rich countries of the Middle East, had over-proportionally large arms imports, there is good reason to put the estimate somewhat lower (Krause 1985b).

Another estimate of total military credit, made by Walter Kitchenman, is based on the extrapolation of the share of credits in U.S. arms transfers over the period 1961-79. This percentage is applied to total arms exports from all suppliers. The result is a share of approximately 12 per cent of direct military credit in all credit and about 9 per cent of directly military-related debt service in total average yearly debt service over the period studied (Kitchenman, 1983, p. 14). For another estimate, detailed statistics on military aid and military credits were compiled for the 1970s and early 1980s. The estimate is biased for several years by rather high assumptions about U.S. military aid. For years in which this does not play a role, the estimated share of military credit in new debt is close to the figure estimated by Kitchenman.

As mentioned earlier, in the early 1980s, the OECD used to state in its surveys on external debt that military credit amounted to about 10 per cent of total debt and debt service for military credits to less than 10 per cent of total debt service.

Compared to the U.S. government's data on arms imports, the reported estimates of direct military debt correspond to 8-16 per cent of the volume of arms transfers.

Opportunity-Cost Estimates of the Military Debt

Estimates of total direct military credit are one answer to the question of how much of the total debt is debt for the purpose of arms imports. There is, however, another way to look at the matter: how much lower could the debt have been with lower or no arms imports?

The starting point for estimating maximum military debt is the assumption of full fungibility of credit. The important consideration then becomes whether a country's debt increased through its arms imports. The same kind of reasoning of course can be applied to all other imports into a capital-importing country. Arms imports are here singled out for analytical purposes only.

The simplest way to obtain an opportunity-cost estimate is to compare military expenditure data with debt data for a particular year. The Kreditanstalt für Wiederaufbau calculated a share of military expenditures in the gross inflow of external resources for 1979 for a number of countries. The calculated shares ranged from 19 per cent for Sierra Leone to 103 per cent for Pakistan. All Third World military expenditure was estimated to be on the order of 90 per cent of all net external financial flows in 1980 (KfW 1983, pp. 66-67).

But it is misleading to use military expenditure data. Although there is a high correlation between arms imports and military expenditures (Deger 1986, p. 145; McKinlay 1989, pp. 52-3), military expenditures are predominantly spent domestically. The usual and better starting point for opportunity-cost estimates of the military debt is country-specific data on arms imports.²¹ Three ways of financing such imports must be considered: direct outside subsidies in the form of military aid, cash payments, and credit payments. Direct military aid has to be subtracted from the arms import data. Arms that are given for free do not increase credits, capital imports, and indebtedness. True cash sales in the opportunity-cost sense discussed above can only be made to countries that have the means to import arms without increasing their net debtor position. The rest of arms imports can then be called credit-financed arms imports.

The calculation of the opportunity cost of arms imports can be made for individual years or for a longer period and using different financial aggregates. Helmut Maneval and Pasi Rautsola used various financial aggregates for a simple opportunity-cost calculation, and they used major weapons imports for 1971-85 (as measured by SIPRI) to make some simple opportunity-cost estimates for a number of highly indebted countries (see Table 5). They assumed that capital imports in all countries were higher than arms imports throughout the period measured and that there was no military aid, and they ignored accumulation of debt. The first assumption (which was not true in the case of Venezuela, for instance) tends to overstate the opportunity-cost of arms imports, as does the second (which, for instance, was wrong in the case of Peru, which obtained large amounts of Soviet weapons on concessional terms in the period considered). The final assumption tends to understate the total opportunity cost of debt.

Table 5. Maneval and Rautsola's Country Estimates of the Opportunity Cost of Arms Imports, 1971-85 (percentage shares)

	Major Weapon Imports as Percentage of:			
	Public External Debt	Total Exports	Total Imports	Current Account Deficits
Argentina	21	12	9	46
Bolivia	15	5	5	20
Brazil	7	3	4	5
Chile	26	9	8	16
Ecuador	32	12	11	44
Colombia	21	4	5	15
Morocco	41	8	16	30
Mexico	1	1	1	2
Nigeria	25	2	2	30
Peru	56	17	16	65
Philippines	10	2	3	8
Venezuela	26	4	3	-23
Unweighted average	23	7	7	22

Sources: Maneval/Rautsola 1990; Brzoska/Ohlson 1987; IMF 1987; World Bank, *World Development Report 1987*.

The ratios calculated by Maneval and Rautsola vary greatly among countries, but their unweighted averages come close to averages for all Third World arms importers determined by other authors (Brzoska 1983, Tullberg 1985). All ratios can be interpreted in an opportunity-cost way. With all other things being equal, for instance, without the observed expenditure on arms imports, the highly indebted countries' debt could on average have been 25 per cent lower by 1985.

Table 6 is calculated using a procedure developed earlier (Brzoska 1983): estimates of military aid are subtracted from the total of arms transfers, as given by the U.S.

government. True cash payments are assumed for those countries which imported weapons without producing an increase in their net debt position. In cases where there was some increase--but one amounting to less than total arms imports--it was assumed that the difference between reported arms imports and net debt increase was cash-financed. The rest of the arms imports that were not accounted for by aid or cash sales were assumed to be credit-financed in an opportunity-cost sense.

The estimated maximum share of credits associated with arms imports (imports by countries increasing their indebtedness) grows in the second half of the 1970s--mostly

Table 6. Estimates of Military-Related Debt, 1970-87
(millions current dollars)

	Arms Transfer to Third World Countries	U.S. Military Aid	Soviet Military Aid	Estimates of Payments from:	
				Countries Not Increasing Indebtedness	Countries Increasing Indebtedness
1970	4,205	1,434	900	800	1,070
1971	4,735	1,370	960	240	2,165
1972	7,430	2,440	2,630	880	1,480
1973	9,745	3,485	3,180	440	2,640
1974	8,430	1,590	2,460	1,690	2,690
1975	9,190	1,580	2,400	3,250	1,960
1976	12,340	270	3,200	2,300	6,590
1977	15,380	240	3,900	2,960	8,280
1978	17,545	215	4,400	4,050	8,880
1979	19,285	225	6,200	3,840	9,020
1980	39,520	610	11,530	7,860	19,520
1981	43,654	610	10,830	12,200	20,194
1982	45,616	1,194	11,183	13,990	18,850
1983	45,273	1,587	11,059	13,680	20,947
1984	44,422	2,013	10,600	15,850	15,979
1985	34,974	3,333	8,659	7,230	15,752
1986	32,822	3,758	8,915	8,630	11,519
1987	35,954	4,031	11,040	6,680	14,203

Sources: Author's calculations (see text) based on Brzoska 1983 (for 1970-79); ACDA, various years; Grimmett, *Trends in Conventional Arms Transfers, 1988 and 1989*; World Bank, *World Debt Tables, 1989*; and (for 1980-87), OECD, *Financing and Debt of Developing Countries, 1990*.

because the increase in total imports was not accompanied by increases in military aid. It reaches a high level in the early 1980s, and it decreases later in the 1980s, due both to an increase in military aid and to smaller increases in net debt for a number of arms-importing countries. Nonetheless, the share of total arms imports is rather high (about 31 per cent for 1985 to 1987, based on U.S. ACDA data.)

We can extend this discussion of debt related to arms transfers, defined as above, to interest and amortization. Assumptions have to be made about appropriate interest rates and debt-repayment schedules. For the sake of the argument, very low interest rates are chosen: a fixed 5 per cent and one-half the Libor rate for one-year credits. Average interest rates on military credits are lower than the one for commercial credits because of U.S.

Table 7. Estimates of Accumulation of Maximum Debt Due to Arms Imports, Under Various Assumptions, 1970-87 (billions current dollars)

	Equal Repayments Over:											
	10 years				20 years				30 years			
	A	B	C	D	A	B	C	D	A	B	C	D
1970	1	0	0	0	1	0	0	0	1	0	0	0
1971	3	0	0	0	3	0	0	0	3	0	0	0
1972	4	0	0	0	4	0	0	0	5	0	0	0
1973	6	0	0	0	7	0	0	0	7	0	0	0
1974	8	0	0	1	9	0	1	0	9	0	1	0
1975	9	0	0	1	11	1	0	1	11	1	0	0
1976	15	1	0	1	17	1	0	1	17	1	0	0
1977	21	1	1	2	24	1	1	1	25	1	1	1
1978	27	1	1	3	32	2	1	1	33	2	2	1
1979	33	2	2	4	39	2	2	2	41	2	2	1
1980	48	2	3	4	56	3	4	2	59	3	4	1
1981	62	3	5	6	73	4	6	3	77	4	6	2
1982	72	4	5	8	88	4	6	4	93	5	6	3
1983	83	4	4	10	103	5	5	5	110	6	6	3
1984	87	4	5	12	113	6	7	6	122	6	7	4
1985	88	4	4	14	122	6	6	7	133	7	6	5
1986	84	4	3	15	126	6	4	8	140	7	5	5
1987	82	4	3	<u>17</u>	132	7	5	<u>8</u>	148	7	6	<u>6</u>
Sum of D				100				50				33

A: Maximum cumulated debt at year end due to arms transfers after deduction of principal repayment (maximum new annual debt, taken from Table 6).

B: Interest on A at fixed 5 per cent interest rate.

C: Interest on A at half Libor rate for US \$, one year.

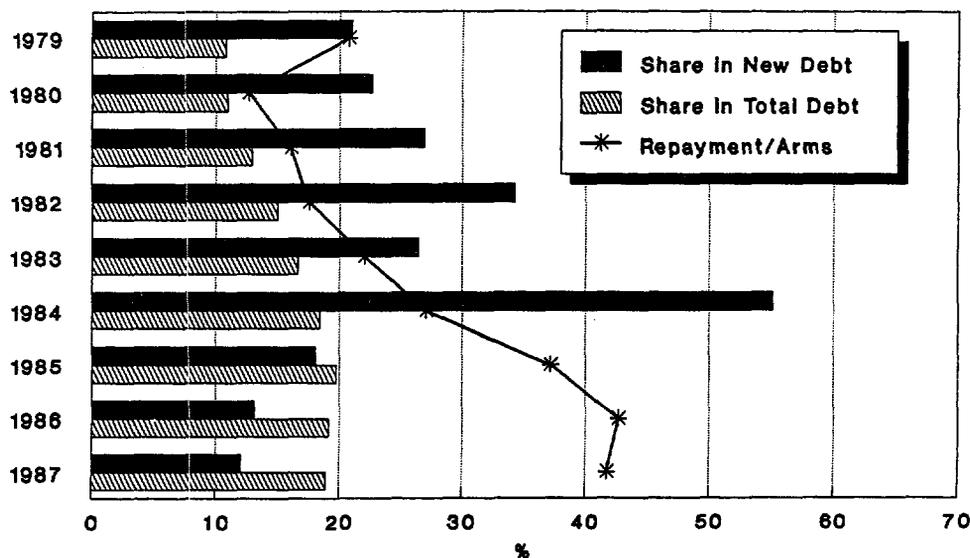
D: Principal.

Sources: Author's calculations based on Table 6. For Libor: IMF.

concessional FMS financing and the low interest rate for Soviet credits—but the estimates chosen here are still conservative because of the extent of credits at commercial rates. It is further assumed that the debt is

repaid in equal installments over specified periods. Table 7 presents the results for calculations assuming ten, twenty, and thirty equal annual repayments.

Figure 6. Accumulated Military-Related Debt,^a as Share in New and Total Debt



^aHere at 5 per cent fixed interest rate, 20 years repayment in equal installments.
Sources: See Table 6 and text.

Figure 6 provides a further perspective on the magnitude of estimated maximum debt connected with arms imports on the basis of a selected set of debt terms. On these assumptions, new military debt ranged from 22 per cent of total new debt in 1980 to over 50 per cent in 1984, after which it fell back sharply to around 10 per cent by the late 1980s. The share of accumulated direct and indirect military debt (here a 5 per cent fixed interest rate and 20-year repayment in equal installments) slowly increased through the 1980s. The ratio of amortization (interest and principal repayment) to arms imports—using the same assumption as to interest and principal—increased quite dramatically in the 1980s, as did the ratio of repayment to new maximum military debt.²²

Correlates of the Military-Related Debt

Regression analysis is yet another approach to establishing links between military activity and Third World countries' indebtedness. The most prolific author in this domain is Robert Looney, who tested various possible relationships in a number of papers, using basically the same cross-national data for seventy-seven countries based on readily available statistics for 1981 (with some exceptions). Looney uses absolute dollar values for the dependent variable (debt) and many of his independent variables (including, among others, military expenditures and arms imports). This choice of variables raises problems of multicollinearity and autocorrelation, which Looney

notes but does not try to correct. In one paper, Looney (1987) reports results from multiple regression analysis with military expenditures among a number of factors argued to influence indebtedness—including also gross domestic product, merchandise exports, merchandise imports, current-account balance, and gross international reserves. The most important independent variable, explaining almost 70 per cent of variance alone, is gross domestic product (note the possibility of simultaneity, however). Robert Looney finds no statistically significant correlation with public domestic debt for his 77-country sample.

This lack of result is not surprising. Some countries with large debts had very little expenditure on the military. Even more important, a number of countries financed arms imports without creating debt because they had large surpluses in their trade balances. In a mix of both capital-importing and capital-exporting countries, we should not expect to find a correlation between arms imports and indebtedness.

Robert Looney then goes on to distinguish sub-groups of his sample. In one exercise, countries are separated by performing a factor analysis with 34 variables that are all somehow connected to international trade and financial transactions. The factor analysis reduces these to seven major measures of resource scarcity. Using these seven variables, a discriminant analysis puts the countries into two groups: a "restrained" one made up of countries usually smaller, less economically dynamic, and more reliant on foreign external debt²³; and an "unrestrained" group—consisting of several major oil exporters and several of the more dynamic newly industrializing states—characterized as less reliant on external debt (although the group includes large borrowers such as Mexico and Brazil). For the "unrestrained" group, Robert Looney finds no statistically

significant correlation between military expenditures and indebtedness. For the "restrained" group, however, military expenditures seem to be the most important factor among those included in the regression analysis. The coefficient is positive, large, and significant.

Another separation is made between military producers and non-producers, using Stephanie Neuman's dichotomic distinction (Neuman 1984).²⁴ The result here is no significant correlation for producers; and a positive and significant correlation coefficient for non-producers (although t-values in this regression are only half those reported in the regression distinguishing the groups of restrained and unrestrained countries).

There is large overlap between the groups of non-producers and restrained countries (with several exceptions, such as non-producers Saudi Arabia, Kuwait, and Syria; and producers Pakistan, Sri Lanka, and the Dominican Republic).²⁵ Robert Looney concludes that it is not the question of arms producers versus non-arms producers that creates differences; instead, it is the ability to mobilize diversified sources of foreign exchange that determines both arms production and the ability to avoid indebtedness (Looney 1987, p. 26). In another paper, Looney extended this approach to include a test for the relationship between arms transfers and indebtedness (Looney 1989b). He first repeats the results obtained in the paper mentioned earlier, finding a significant positive correlation between military expenditures and public external debt for the constrained countries—but not for the unconstrained, and not for the total sample. He then proceeds to present results of multiple regression analysis with arms imports (ACDA data) in U.S. dollars as a dependent variable and public external debt in U.S. dollars among a number of independent variables. For the group of resource-constrained countries, he reports a

significant, positive coefficient and for the unconstrained countries, a significant negative coefficient. For the total sample, the coefficient is insignificant (p. 228).

Robert Looney has also tried to find out whether type of regime affects the relationship between military factors and indebtedness (Looney 1988b, pp. 25-26). Using data collected by Ruth Sivard for 1982 (Sivard 1983), he separates the countries into two groups, according to civilian or military regime. The dependent variable he chooses for his multiple regression analysis is military expenditures; public external debt is one of his independent variables. This variable carries a significant, positive coefficient for the military regimes group and a significant negative coefficient for the civilian regimes. For the total sample, there is no significant correlation.

Louis Pilandon (1985) also has tried to establish correlations between military variables and indebtedness by using regression analysis. His data consists of various indicators of debt as the dependent variable and total military expenditures and military expenditures per head as independent variables for thirty-seven Third World countries for 1965-80. He also distinguishes two country groups, one called "less industrialized" (having less than 20 per cent of the economically active population in industry) and the other, "intermediate" countries. Pilandon finds rather small correlations between his variables. Only one involving debt data is statistically significant²⁶: the relationship between the total military budget and the bilateral debt for the intermediate countries (1985, p. 79).

Looney's work has been criticized on a number of grounds.²⁷ The most important problem in the context discussed here is that the fundamental difference between capital-importing and capital-exporting countries is

overlooked. For the latter, arms imports reduce the ability to import civilian goods, but probably will not lead to changes in the debt position. It is only in capital-importing countries that we would expect to see effects of arms imports--and only small ones, compared with other factors that were instrumental in building up Third World debt. Louis Pilandon's lack of a range of significant results is therefore plausible.

The Future of Arms Transfers

Some of the factors that contributed to the stagnation of arms imports in the 1980s will most probably also shape the future of arms transfers. Some structural influences on arms transfers--such as domestic arms production, economic differentiation among Third World countries, and political developments within Third World countries--might preclude a continuation in the arms market of the 1990s of the high levels of the 1980s.

An important additional factor that influences future arms transfers is the relationship between the United States and the Soviet Union. There are signs that they will be less willing to provide weapons for free, or on concessional terms, in the future. A U.S.-Soviet agreement on how to handle their rivalry in the Third World, which might put a cap on military aid and thereby lower the supply of weapons, seems closer now than ever. On the other hand, many conflicts are going on in Third World areas, fueling demand. Procurement cycles are producing military pressures to buy new weapon systems.

In addition to such political factors, the economic situation is important. The costs of economic restructuring lower the financial maneuvering space of many governments. Sizable debt repayments are another heavy burden. Somnath Sen has calculated combined burdens of foreign debt interest and principal repayments and military expenditures at the

level of 40-80 per cent of current government revenues in many countries (Sen 1990, pp. 213-4).

A greater awareness of the economic costs of arms transfers, including their contribution to indebtedness, might influence the future course of arms imports. After all, arms imports come about after corresponding decisions have been made by those in power. The high debt burden could in this sense be a "window of opportunity" (Sen 1990, p. 213). Aid and credit-giving agencies and institutions influence the possibility of many governments to buy weapons. Military activity is internally and externally financed, and Louis Pilandon is right when he writes: "In summary, foreign aid and bilateral credit allow countries that get such funds to have larger military sectors than would be possible without them" (1985, p. 86).

But the relationship is not a simple, linear one.²⁸ Arms imports seem to exhibit even more resilience than military expenditures. Currently available statistics do not, however, allow firm statements about the relationships between arms imports and the economic situation--especially concerning external financing.

To be able to make better predictions on the effects of the inflows of various types of foreign financing on arms imports, we need better data--on both arms transfers and the financial arrangements that make them possible. Such data could come from a number of sources, including a special register at the United Nations, better trade and balance-of-payments data, more detailed debt data, and government-backed export insurance agencies.

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Notes

¹ The term "Third World" is used here interchangeably with "developing countries." The preferred geographical coverage is all of the states in Latin America, Africa, and Asia (except Japan). The exact geographical coverage reported in tables and figures follows the sources given. Whenever U.S. government data is used, Portugal, Greece, Turkey, Yugoslavia, Bulgaria, and Romania are also included as developing countries.

² For summaries, see, e.g., Nawaz 1983; Chan 1985; Köllner 1987; Ball 1988; Harris 1988; Grobar and Portes 1989; Frederikson and Looney 1989; Fontanel 1990; West 1990.

³ For exceptions, see Ball 1982, 1988; Deger 1986, pp. 146-8; Portes 1989.

⁴ On lags in the impact of military expenditures, see Joerding (1985); Babin (1989); and Frederiksen (1989).

⁵ There is some debate as to the inclusion of Soviet arms transfers in official statistics (see, e.g., Smith 1986).

⁶ See, e.g., OECD 1984, p. 78. The same remark can be found in later versions of this report.

⁷ Aircraft, missiles, ships above 100t, armored vehicles, electronic equipment such as guidance equipment, and radar.

- ⁸ This section is an abbreviated and updated version of Brzoska (1988). For a review of early post- World War II conventional weapons proliferation, see SIPRI (1971); for accounts of the current status, Klare (1987); Catrina (1989); Neuman (1989); and Anthony (1990).
- ⁹ Neuman 1985; U.S. ITC 1985; U.S. GAO 1986; and Griffin and Rouse 1986.
- ¹⁰ U.S. DoD; U.S. GAO 1982; McKinlay and Muhan 1984, pp. 30-50; U.S. CRS 1985; Grimmatt 1985a; Grimmatt 1985b; Louscher and Salomone 1987; Ball 1988, pp. 244-94.
- ¹¹ For a critique, see Ball 1986, p.251.
- ¹² This lack of oversight became a major problem when Soviet authorities tried to calculate figures for domestic military expenditures that included procurement costs in 1989 (SIPRI 1990, pp. 164-66).
- ¹³ Among the papers captured by the U.S. government after the invasion of Grenada.
- ¹⁴ In later calculations of the opportunity cost of debt, I will assume that, of the deliveries reported in arms trade statistics, 60 per cent was actually or practically granted for free (including price subsidies compared with the prices given by SIPRI and the U.S. government), while 60 per cent had to be paid for in hard-currency, either directly or later.
- ¹⁵ French statistics on military assistance also include the substantial cost of the overseas stationing of French troops, which is not military aid in the sense used here.
- ¹⁶ Official detailed data on grants from Arab countries seems to omit military transactions (Arab National and Regional Development Institutions, 1983). In an OECD study on Arab grants, it is said that some of the reported transfer to frontline states probably was for military purposes; for about one-third of known bilateral aid, the OECD could not determine the geographical distribution (OECD 1983, 12).
- ¹⁷ Figure taken from *Europäische Wehrkunde*, August 1990, p. 459.
- ¹⁸ The Soviet estimate is comparatively high because ACDA data is used for arms transfers, which probably overstates Soviet arms prices. For a different view, see Efrat, 1985.
- ¹⁹ The 1991 "Joint Study" uses very similar data, converted into U.S. dollars. (The total of 28,587 million rubles comes to U.S. \$121,656 million. The one important difference concerns Cameroon. While debt reported by *Izvestiya* is below 200 million rubles, the Joint Study figure is \$1,520 million. IMF, World Bank, OECD, European Bank for Reconstruction and Development, *A Study of the Soviet Economy*, Vol. 1, (Washington, D.C.: IMF, 1991, p. 118).
- ²⁰ Correlations between the arms transfer series are fairly high: .46 in the case of SIPRI Unweighted and ACDA and .62 in the case of ACDA and SIPRI Weighted. Coefficients between arms transfer and exports are small: .11 for SIPRI Unweighted, .9 for SIPRI Weighted, and .24 for ACDA.
- ²¹ Brzoska 1983; Tullberg 1985—slightly different versions: 1987a, 1987 b; Krause 1985; Maneval/Rautsola 1990.
- ²² The share of accumulated debt in total debt is obviously very sensitive to the assumptions about repayment. In an earlier paper, using Libor rates and 10-year repayment, I estimated this share to be 22 per cent already in 1979 (Brzoska 1983, p. 274).
- ²³ The distinction between these two groups of "restrained" and "unrestrained" is a major contribution by Robert Looney (and his frequent co-author Peter Frederiksen) to the general debate on the economic effects of the military sector in Third World countries, which they have used in multiple regression analysis for a large number of variables (see, e.g., Looney 1986, 1988, 1989a; Looney and Frederiksen 1986, 1989; West, Foreword in Looney 1988; West 1990).
- ²⁴ Stephanie Neuman's classification has as its main criterion the ability to produce at least one type of major weapon system (Neuman 1984). This is a highly questionable criterion. It is not very demanding to produce a simple naval craft, or to fabricate a light plane. Her list includes a number of producers with at maximum a few hundred persons working in arms production, like the Dominican Republic, Mexico, and Colombia—alongside countries with very large arms industries employing tens of thousands of workers, like India and Egypt. Neuman's criterion tends to distinguish countries with some industrial base—and thereby almost automatically among arms producers, at least for simple weapons—from countries without any industrial base. The latter ones are mostly in Africa, while in Latin America most states are counted as producers.

²⁵ In another paper, Looney has used multiple discriminant analysis to find what combination of factors can best predict Neuman's two groupings. Several measures of the size of inflow of external resources are, after the size of military expenditures, the most important factors in such an exercise (Looney 1988c, 70-71). Looney has some reservation against the robustness of this result because of the many resource rich non-producers in the non-producer group (p. 77). It might be, as has been suggested by Alexander, Butz, and Mihalka (1981) and Brzoska and Ohlson (1985) that either too much or too little foreign exchange hamper the development of a domestic arms industry. Where there is much foreign exchange available, direct arms imports are a less roundabout way to get implements of war. Where too little foreign exchange is available, the often substantial foreign-exchange cost of domestic arms production cannot be met (Terhal 1982; Brzoska and Ohlson 1986). It may be true, as Robert Looney has stated, that domestic production on average reduces arms imports (one of his estimates implies an average reduction of 8-12 per cent in arms imports for arms producers, Looney 1989c, 23). But there may be a shift from the import of complete weapon systems to the import of pre-products and production technology not properly included in the available arms transfer statistics. A detailed analysis of the Indian case showed the high foreign exchange demand of domestic arms production (Terhal 1982).

²⁶ It may be noted in passing here that the only other significant one he finds is between military expenditures and public development aid for less industrialized countries, p. 79.

²⁷ Robert West has expressed some doubts about the validity of his discriminant analysis in separating country groupings (West 1990). Fontanel finds his econometrics simplistic and without sensitivity to many technical problems (Fontanel 1990). Maneval and Rautsola (1990) find his ad hoc use of data series ingenious and insist on the development of a theoretical model before testing. The use of absolute dollar values for independent and dependent variables instead of some ratio has been criticized by a number of authors, e.g., Pearson (1989). Nicole Ball (1988) has expressed serious criticism on the use of cross-national studies in a field greatly influenced by various kind of specifics—especially with the kind of data that is available. She also questions whether the causality issue—an issue that has been systematically treated by Wayne Joerding (1986; see also Frederikson (1989, p. 382)—can be ignored. To these points should be added the conclusion (reached

earlier in this paper) that arms imports recorded in a specific year do not mean that the corresponding financial transactions occurred in the same year.

²⁸ To give one (somewhat odd) example: It seems that more fiscal control, at least partially stimulated by requests from international financial institutions, raised the importance of arms transfers as an instrument to fill sludge funds for politicians. While such funds can be fed from various sources, under fiscal restraint arms transfers are especially attractive because of the secrecy surrounding them in many cases. Evidence of increased use of arms transfers to collect commissions by politicians is sketchy, though pervasive, and includes Nigeria (Jaguar aircraft and other cases), India (Bofors guns and HDW submarines), and Greece (F-16 and Mirage aircraft).

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**DETERMINANTS OF MILITARY EXPENDITURE
IN DEVELOPING COUNTRIES:
REVIEW OF ACADEMIC RESEARCH**

Robert L. West

Introduction

This paper is both a review and an assessment of recent academic literature on the determinants of military expenditure in developing countries. The objective of the literature review is: a) to identify the theories and hypotheses in recent scholarly research on the causes of military expenditure, and b) to summarize the empirical evidence in the literature on these hypotheses, highlighting areas of consensus and controversy. More specifically, the literature review is intended to do the following:

- Review, analyze, and synthesize the research and empirical evidence on the determinants of military expenditure in developing countries; and
- Assess the important distinctions among country sub-groups with different conditions that are likely to influence the causes of military-sector expenditures.

Recent scholarly literature on these two topics is reviewed in parts II and III of this paper.

The literature reviewed is almost entirely confined to items that have been published in the English language during the past two decades. The purpose is to ensure that the reader will, to the extent possible, find the literature cited to be readily accessible. While a substantial body of writing on these topics has appeared in other languages, for some decades English has quite clearly provided the dominant medium for publication in this area of scholarly research. Distinctive contributions in other languages promptly appear in English translation or interpretation.

Other important criteria of selection are the emphasis in this paper on studies that have systematically evaluated empirical evidence and on the work of researchers who have subjected explicit propositions or hypotheses to empirical tests. Statistical analyses of the causes and consequences of military expenditure have grown rapidly in volume and sophistication over the past several decades; this constitutes a clear and important trend in scholarly research on the relationship of security and development. Nonetheless, in

selecting studies for review, empirical orientation and formal testing procedures have been given more than proportional representation.

A survey of the literature shows that most of the recent statistical work on the determinants of security expenditures in the Third World has been based on analysis of relationships observed in a selection of countries. There are several reasons for this. Researchers have found the cross-country studies to be more useful than case studies and longitudinal investigations in seeking to verify patterns applicable to a broad spectrum of countries. Cross-sectional research has also been encouraged by the development (over the past twenty years) of regular data assembly, editing, and reporting on military-sector activity in a large number of countries--a cooperative international enterprise in data publication that is discussed below.

This emphasis among investigators on the use of macrostatistical and cross-sectional research methods has led to the increased employment of econometric techniques in studying both the causes and the effects of military expenditures. Econometric methods have become increasingly popular among investigators in this subject area because they permit the adoption of familiar techniques to survey simultaneously many countries and multiple explanatory variables.

For both of the topics reviewed in this paper, research employing econometric testing models and a variety of related macrostatistical methods is found to be highly influential in fashioning the body of widely accepted evidence concerning the relationship of security and development in the Third World. This demands attention to the question of the reliability of statistical inferences derived from econometric tests of cross-country experience in this area. In this review of the literature, readers are urged to assess with care the

reliability of findings based upon macrostatistical methods of empirical investigation as these have been used in this subject area. This concern is a reflection of a vigorous and unresolved debate in the literature with respect to the degree of confidence with which readers may accept conclusions about the causes of military expenditures that rest upon evidence obtained from cross-sectional statistical tests. A broad-ranging critique of the reliability of the research methods that have been employed in this literature may be found in Chapters 3 and 4 of Nicole Ball's recent volume, *Security and Economy in the Third World* (Ball 1988, pp. 84-157). The parameters of the debate between the critics and defenders of the disputed research methods were defined more than a decade ago in an exchange in *Orbis* between Stephanie Neuman and Dan and Ron Smith (see Neuman 1978; Smith and Smith 1979).

Questions about the reliability of research findings derive from problems concerning the data employed in the analysis and from problems respecting the research methodology. Both sets of problems--briefly described in the remainder of this Introduction--arise in evaluating the findings reviewed in this paper relating to the determinants of military spending (part II) and how these determinants differ in sub-groups of countries (part III).

Problems of Data

The past two decades have seen a very significant improvement in the availability of quantitative information about the level of military-sector activity in a large number of countries. Key indicators of this activity in virtually all countries of the world--including estimates of military expenditures--are currently assembled, adjusted to improve international comparability, and reported on a regular basis by the International Monetary Fund (IMF), the Stockholm International

Peace Research Institute (SIPRI), and the U.S. Arms Control and Disarmament Agency (ACDA). (See Appendix to this publication, pp. 147-51.¹) The ready availability of this information, and growing confidence in its validity, has spurred the growth of scholarly attention to analysis of the security-development relationship in the Third World; it has contributed importantly to the research emphasis on cross-country analysis and to the trend toward adoption of econometric and other quantitative methods.

Reliability of Expenditure Data

Accuracy of Observations. The scale and persistence of the international effort to assemble information on military expenditures by a large number of countries and to report the data on a comparable basis across countries and over time has been only partially reassuring to users of the data. Skepticism with respect to the reliability of the data is based in large part on the fact that, regardless of the efforts made by international reporting agencies, the primary sources for information on defense spending are the national governments--and governments are believed to have a variety of political and security motives for under-reporting defense spending and to employ a number of mechanisms to disguise the level of their security expenditures. Investigation of the mechanisms used by governments to obscure their security activities and other internal evidence of inaccuracies in reporting has nourished the attitudes of skepticism among researchers in this field but has gained little headway in estimating the magnitude of the reporting errors.²

Composition of Security Expenditures. A second source of serious concern about the reliability of available information on military expenditures by many countries is the highly aggregated nature of the reported data. For many countries, the international reporting agencies provide no more than a single figure

for defense expenditures in a given year. More detailed information on the composition of military expenditures is available for only a limited number of countries, and reporting categories frequently change from year to year.

This weakness has been the particular target of the U.N. Department of Disarmament Affairs, and of a sequence of Expert Groups which, since 1975, have guided United Nations efforts to induce member governments to publish a unified reporting schedule of security expenditures data in a disaggregated form.³ Adoption of the unified security expenditure reporting system by member governments has been very partial, but there has been a gradual increase in the reporting of disaggregated data and in the provision of additional information on the composition of military expenditures.⁴ There is now a sufficient volume of reporting on military expenditures in a disaggregated form to support experimental efforts to compute military expenditure price levels and to estimate the real quantities of military inputs for a substantial cross-section of countries, as described below.

Price Levels and Methods of Conversion. In the absence of information about the composition and the price levels of military expenditures, reliable methods are not available to compare year-to-year changes in real quantities represented by the defense expenditures of a given country, nor to convert local currency data into values expressed in a numeraire or base currency. Data converted to a numeraire are needed to aggregate and compare the various national expenditures in different countries. This inability to present reliable indicators of real quantities corresponding to reported military expenditures that can be compared through time and across countries may be the most serious data problem affecting study of the relationships reviewed in this paper. Gradual

progress is being made to overcome this critical problem of data reliability.

The need to introduce a reliable conversion methodology for military expenditures has long been recognized by scholars as well as by ACDA. A decade ago ACDA included in its annual *World Military Expenditures and Arms Transfers* report a discussion of the use of exchange rates and purchasing-power parities (PPPs) to make international expenditure comparisons. It acknowledged that PPPs are recognized as the most reliable means of converting local currency data into a common denominator in order to make valid expenditure comparisons within countries and among countries for either a particular year or a series of years. Lacking an adequate data base of PPP conversion ratios, ACDA and other reporting agencies have generally used exchange rates, since these have been the only conversion rates available for most countries. For many countries, however, exchange rates do not accurately reflect the relative purchasing power of the currency. Moreover, exchange rates do not readily adjust to varying inflation rates in different countries but tend to move abruptly with currency revaluations or devaluations. Exchange rates are particularly unreliable indicators of purchasing power in *developing* countries; their use introduces very serious distortions in the estimation of "real" quantities for purposes of international comparisons, aggregation across countries, or the study of real changes over time.⁵

The U.N. Department of Disarmament Affairs is also a strong advocate for the construction of military price indexes and the use of purchasing-power parities for the international comparison of military expenditures.⁶ Efforts coordinated by the United Nations have produced a critical mass of disaggregated military expenditure data, as noted above, and this has made possible the computation of an initial set of military price levels and real (PPP) military expenditure

estimates for a large number of countries. But expenditure estimates based on purchasing-power parities have not been widely available for use in the research reviewed in this paper. The distortions introduced by use of exchange-rate converted data in cross-country statistical analyses seriously compromise the reliability of the reported findings.

Testing Methods

In making statistical inferences from econometric tests, a trade-off exists between cross-sectional analysis, which gives general results with little specific applicability, and individual country time-series analysis, which produces highly specific results but little insight into broader principles. Multivariate investigations of the relationship between security and development have pursued both avenues, although the cross-sectional design and use of macrostatistical models has been predominant.

There are serious questions about the appropriate use of econometric methods to evaluate cross-sectional data in some lines of this research, and the reliability of statistical inferences based on these testing methods has been called into question. We will encounter these questions in evaluating the reliability of research results in the review of the determinants of military expenditure and the identification of sub-groups later in this paper. The common criticism of the use of econometric methods in the security-development literature, generally applicable to both topics, is described briefly in this section.

Problems of Econometric Technique

Problems of econometric technique experienced by security and development researchers fall into two categories: (1) the specification of the theoretical regression model, and (2) violations of the Classical

Assumptions of the Ordinary Least Squares (OLS) regression analysis.⁷

Model Specification. Correct specification of a structural model involves choosing independent variables based on theoretical expectations that they are causal determinants of the dependent variable. Regression analysis by itself is only a statistical device providing evidence of correlation. Attempts to uncover relevant variables through step-wise regressions or sequential search based on coefficient t-tests make the results inadmissible as proving causation. These techniques involve recreated regression "runs" that increase the chance of deriving a statistically spurious result. In order to infer economic causation, the *a priori* selection of independent variables must be combined with rigorous hypothesis-testing of the signs of the resulting coefficients.

Two other consequences of poor specification seen in the literature include omission of relevant variables and inclusion of irrelevant ones. The former causes bias in the estimated coefficients of other independent variables correlated with the omitted variable. The latter lowers the significance of the other independent variables.

The choice of functional form for the regression equation must also be based on available theory on an *a priori* expectation presented before the actual estimation. Most econometric work reviewed in this paper is linear in the variables. Deviations without explanation must be scrutinized carefully.

OLS Assumptions. Violations of the Classical Assumptions prevent the OLS regression method from producing minimum-variance, linear, unbiased estimates for the coefficients of the independent variables. Problems of multicollinearity and heteroskedasticity crop up in individual studies reviewed below, but problems of simultaneity

are far more pervasive and have proved to be a major barrier to the attainment of econometric reliability in this field of application.

Simultaneity bias occurs in specifications that fail to account for feed-back effects and dual causality between independent variables and the dependent variable. An independent variable that is jointly determined with the dependent variable is an endogenous variable. If the other half of the causal relationship (*i.e.*, the effect of the dependent variable on the independent variable) is excluded from the structural model specified by the researcher, the coefficients of all variables in the equation are subject to potential bias. A similar result is obtained when the interaction is included in the model, but it is then essentially eliminated by the specification of a reduced form for actual estimation purposes.

In order to allow estimation of multi-equation simultaneous models, regression techniques such as Two- and Three-Stage Least Squares (2SLS and 3SLS) are used. Unfortunately, for a number of reasons--including the continued bias of the coefficients for smaller samples--these techniques do not provide results that are as readily interpretable as OLS.

Two contentious issues involving simultaneity are raised in the literature: (1) the existence of multiple channels through which military expenditures influence economic growth rates, and (2) the endogeneity of military expenditures with respect to economic growth. Most researchers have agreed that defense spending has a direct and significant impact on economic growth. Only a few have undertaken research acknowledging that military expenditures may also have an impact on other macroeconomic variables, such as savings, investment, and the balance of payments--which in turn have their own direct relationship with economic growth.⁸

The omission of structural equations specifying these indirect macroeconomic impacts of military expenditure results in a failure to measure the overall impact of the military burden on growth. Simultaneity bias occurs when single-channel/single-equation models are used, because growth itself is often jointly determined with these macroeconomic variables.

Imperfect multicollinearity (collinearity) occurs when independent variables, such as bilateral aid and the military burden, are highly correlated yet included in the same regression equation. This results in an increase in the variance of the coefficients, lowering their t-statistics and making results very sensitive to specification errors and the nature of the sample.

Heteroskedasticity often occurs in cross-sectional studies such as those reviewed in this paper. If values diverge widely from one observation to the next, error term variances will differ across the sample, and OLS will overstate t-statistics, leading to errors in interpretation of the significance of variables.

Determining Causality. The existence of a causal relationship between growth and military expenditure remains a disputed topic. Some analysts (Joerding 1986) have used methods such as Granger Causality to demonstrate that military spending is not exogenous. Others have estimated significant relationships for the level of development expressed by per capita income but have failed to show the significance of growth rates *per se* (Deger 1986). Again, if the military burden is truly endogenous with respect to growth, an equation specifying the determinants of these expenditures must be included in the structural model, or a simultaneity bias will be introduced.

Another obstacle to reliable econometric estimates related to questions of causality is

the existence of lagged response times in the relationship between the independent and dependent variables. Determining the nature of these relationships using cross-country data averages is extremely difficult. Further research on this topic may have to come from standardized time-series analysis once general agreement on a theoretical framework is reached.

Appropriate Models for Explaining Public Expenditures

A basic question concerning the appropriateness of econometric techniques to provide satisfactory explanations of changes in public expenditures was first raised in 1961 by Peacock and Wiseman. Given the variations in institutional structure and purpose over time, they posited that econometric modeling techniques are inappropriate for the investigation of the determinants of government expenditure. The underlying assumption of econometric analysis is that all other conditioning factors can be held constant. This assumption is violated if significant legal, social, and political discontinuities, called "displacement effects," exist during the sampled time period (Peacock and Wiseman 1961).

One solution to this dilemma is to find consistent groupings of country or time-series data in which the variance in institutional factors is minimized. Statistical techniques such as factor analysis allow the reduction of a large number of potentially determining factors to a few significant explanatory factors. Once underlying structural differences have been removed by successful sub-grouping, econometric analysis can correctly assume that the only factors that are in flux and therefore influencing the dependent variable are the chosen independent variables.

Peacock and Wiseman (1979) present this potential solution to their original problem but

hesitate to endorse it fully. They note that this form of analysis only mechanically constructs a black box. It does not actually provide insight into the social transformation

that turns inputs into outputs, or into the process that determines the growth of public expenditures.

The Determinants of Military Expenditure in Developing Countries

During the past decade, a large quantity of literature has been devoted to explaining differences in military expenditures among the developing states. Various hypotheses and findings have been proposed concerning the determinants of military expenditure behavior, with growing recognition of distinct patterns of military spending behavior with regard to: replacement of weapon stocks that have been depleted during armed conflict; acquisition patterns intrinsic in the replacement of major weapon systems; and resources applied to the development, routine maintenance, and operation of military institutions. Empirical tests of the various hypotheses concerning the determinants of military spending behavior have focused on the level of expenditures for recurrent operations and routine maintenance.

This part of the paper will review the research, key questions, and empirical evidence concerning the determinants of military expenditure in Third World countries. The discussion has been divided according to five different explanatory hypotheses: (1) geostrategic considerations; (2) budgetary politics; (3) the influence of arms suppliers and domestic arms production; (4) financial and economic factors/constraints; and (5) multi-variable explanations of military expenditure.

Geostrategic Considerations and the Security Environment

This literature postulates the existence of linkages between and among national security and threat perceptions (both internal and external), defense expenditures, and economic development. These relationships are complex, and the difficulties of analysis are further complicated by the probable absence of unidirectional causality, which is to say that there may be feedback and reverse effects (Deger and West 1987).

Both internal and external threats (or the *perception* of such threats) are hypothesized to conduce to larger defense expenditures. Defense spending, in turn, may influence economic growth either positively or negatively.

McKinley contends that a variety of studies are limited by their adherence to purely system-level perspectives or simple ideological/political/economic interests. The author argues that interstate conflict is "... a product of a comparative calculation of the rewards and costs accruing to the variety of different means of promoting or protecting some interest" (McKinley 1989, p. 84). This leads to the contention by many authors that,

in order to effectively analyze the causes and effects of military expenditure in developing states, it is important to specify the many different influences affecting resource allocation.

A number of analysts have addressed the hypothesis that military spending is determined by geostrategic considerations. Several of the key questions that have been studied are:

- (1) Does the existence of international conflict/threat perceptions explain levels of military spending? Do military expenditures fluctuate based on different levels of conflict intensity?
- (2) Do Third World states determine their military expenditure levels in response to their neighbors' military spending?
- (3) Is military expenditure a response to interstate conflict and if so, does the response itself stimulate further expenditures?
- (4) Do arms race models indicate trends that can explain systematic variations in military expenditures across Third World countries and over time?

Arms Race Models

One empirically tested approach used in the literature to explain patterns of inter-country variation in military expenditures has been the "arms race model." In accordance with these models, military expenditures are influenced by political, psychological, and international parameters that emphasize each government's perception of its adversaries and the behavior of its allies and neighbors. Although nearly all of the armed conflicts that have occurred since World War II have been fought in the developing world, much of the arms race literature has focused principally on the great powers. Nonetheless, some research has been

conducted on the developing states (Hollist 1977).

Arms race theory can be divided into two broad models, namely the arms-using model and the arms-building model. The arms-using model describes how armaments, military forces, or national resources are consumed in armed conflict. This model addresses the arms race question indirectly by assessing what national resources may be required to assure victory, national survival, stability, or some other purpose requiring the use of arms. The dependent variable in this model is the surviving amount of military forces or resources available following an armed conflict. Moll and Luebbert (1980) criticized this model as being too limited in merely describing how wars are fought rather than how they are prepared for. The arms-building model addresses the latter issue by focusing on the resources and effort that a nation utilizes to develop and maintain its defense forces.

The seminal work in arms-building theory is Richardson's (1960) mathematical model. Richardson argued that a rate of change in a nation's armaments could be explained by three factors: (1) external threats, (2) economic burden and fatigue, and (3) grievance. Richardson's model is based on competitive factors between countries and is known as an "action-reaction" model.

The arms race literature is no longer limited to Richardson-type "action-reaction" models. During the 1970s, the arms-building models became more sophisticated and multivariate. Research also came to focus on the analyses of arms expenditures. During this period, researchers integrated a range of independent variables. Their models included *resource constraints* (among others, Choucri and North 1975; Hollist 1977; and Ferejohn 1976); *budget parameters* (Russett 1970; Lucier 1979); *prior military expenditures as an indicator of future expenditures* (Lucier 1979;

Table 1. Arms Race Models^a and Military Expenditure

Authors	Pub. Date	Time Period	Region ^b	Level of Analysis ^c			Analytical Relationship ^d			
				IS	NS	PB	SOP	PYM	GM	RC
Ostrom	1978	1955-73	US	X	X					
Russett	1970	-	Global				X			
Lucier	1979	1918-38	AS, EUR, NA			X	X			
Choucri and North	1975	1871-1914	EUR	X	X			X	X	X
Wallace and Wilson	1978	1870-1914	EUR	X	X			X	X	
Hollist	1977	c.1976	AS, ME, EUR, NA		X					X
Rattinger	1975	-	Global	X	X			X		X
Ferejohn	1976	-	Global						X	X
Taylor	1979	-	Global		X					

^a All models listed in this table are "arms-building" models except Taylor (1979), who presents an "arms-using" model.

^b AS = Asia; EUR = Europe; ME = Middle East; NA = North America.

^c IS = International System level; NS = Nation-State level; PB = Political/Bureaucratic level.

^d SOP = Changes in budgetary procedures; PYM = Previous year's military expenditure; GM = Growth in military expenditure; RC = Resource constraints.

Choucri and North 1975; Wallace and Wilson 1978; and Rattinger 1975); and *GNP* (Choucri and North 1975; Wallace and Wilson 1978; and Ferejohn 1976). In addition to economic and fiscal variables, these authors and others also incorporated political/bureaucratic and organizational factors on the domestic and international level into arms-building models.

Moll and Luebbert (1980) defined four classifications used to analyze the determinants of an arms race. Three of those classifications are illustrated in Table 1 under the "Level of Analysis" heading. The international system level (IS) focuses on such issues as the presence or absence of arms races, stability of arms races, military aid, and the role of the superpowers. The nation-state level (NS) focuses on national attributes and behavior.

National trends in areas such as arms expenditures, military personnel, and weapon quantities are emphasized. At the political-bureaucratic level (PB), emphasis is placed on domestic bureaucratic institutions and political organizations and their respective influences on defense policy.

Table 1 lists a representative sample of arms race models developed during the 1970s. Each study is identified by the system-level classification as noted by Moll and Luebbert (1980) and the analytical relationships that are central to the working of each model. As Table 1 indicates, the models of the majority of analysts utilizing the arms-building perspective were more sophisticated and multivariate than were the arms-using models, as represented by Taylor (1979). For

example, Choucri and North (1975) and Wallace and Wilson (1978) utilized both the international (IS) and national (NS) levels of analysis while integrating within their models three of the four analytical relationships listed in the table. In contrast to the models of these arms-building analysts, Taylor's (1979) arms-using model lacks substantive empirical support--a common weakness in arms-using models.

Although the arms-building models are more sophisticated than the arms-using ones, many analysts have concluded that the arms race models do not have a high degree of explanatory power with respect to the mobilization of resources over time or across countries. This may be due to the lack of statistical categories matching the concepts of the theories underlying the models.

There is an extensive range of literature investigating arms race models, of which only a few examples have been discussed here. A more comprehensive review of this literature can be found in the Moll and Luebbert (1980) study.

Threat Perception and Inter-State Conflict

An hypothesis concerning national security behavior and one that is linked to arms race behavior is the proposition that inter-state conflict or the perception of a threat is associated with variation in military expenditure levels among Third World countries. In accordance with this approach, the military capabilities of neighboring states often are seen as both the source of and response to a perceived threat.

In a recent influential study, McKinley (1989) conducted a cross-sectional analysis for a large number of Third World countries over the period 1950-82. The author determined that military expenditure rises in response to

an inter-state conflict and decreases following the cessation of the conflict. This would appear to be the expected finding and to confirm the common sense interpretation of behavior in "arms-using" circumstances. It can be interpreted as showing weapons-inventory management: a surge of replacement expenditures occurs when the inventory is drawn down by hostilities. But McKinley's expenditure data is not disaggregated to show categories of expenditure that can be associated with "arms-building" behavior or the routine maintenance of military establishments. It is not clear whether McKinley's analytical results show any association between inter-state conflict and the military expenditures addressed by arms-building models of behavior.

In a similar vein to McKinley, Weede (1986) argued that international competition and threats to national security lead to higher military participation ratios and larger military outlays. Weede supported his conclusion with cross-national regression analysis of data for 31 developing states during the 1970s. Again, the lack of disaggregated military expenditure data makes it difficult to determine whether Weede has demonstrated anything more than the working of inventory replacement and material replenishment cycles. Confirmation of "arms-using" behavior is not trivial, but it leaves without satisfactory explanation the long-term trends in "arms-building" expenditures of the recent past as well as important dimensions of both inter-country and inter-temporal variations in defense spending.

The literature addressing the hypothesis that military spending is determined by geostrategic considerations is inconclusive. Several writers contend that perceived threats or other indicators of the security environment can account for variance in Third World military expenditures, but this has not been conclusively demonstrated empirically. While the arms race models have become more

sophisticated and multivariate, the empirical testing of these models shows ambiguous results.

Many authors have postulated the existence of a correlation between geostrategic factors (domestic or international conflict and threat perceptions) and military spending levels. However, the literature to date has been unable to isolate specific expenditures in such a way as to demonstrate the relationship between security considerations or geostrategic events and their associated segment of military expenditures. Total spending and resource allocation levels need to be disaggregated in order to determine the systematic influences affecting military expenditure levels. It is also necessary to distinguish between arms use and non-use circumstances and how the disaggregated military expenditures are influenced under both conditions.

The Politics of the Budgetary Decision-Making Process

A number of researchers have sought to explain defense spending behavior in terms of bureaucratic and political processes, emphasizing organizational factors and chiefly domestic (economic and political) sources of influence on the scale of defense efforts. This body of research begins with the proposition that the military is a critically important actor in domestic politics in the Third World. Thus the perspectives and activities of the military are seen to be principally domestic, and the most important influences on the military are hypothesized to be domestic bureaucratic and political interactions. They are considered to be bureaucratic in the sense that the military is involved in defending its institutional interests against those of other, usually governmental, organizations. They are considered to be political in the sense that the military is constantly engaged in defining its relationships and power to political institutions and political forces in the country. In this research,

international factors such as conflict, arms races, or arms transfers are considered to the extent that they appear to influence the domestic bureaucratic and political activities of the military. Thus, to understand and explain military expenditures, research needs to assess the domestic political activities, bureaucratic politics, and institutional development of the military (Grindle 1987).

Increasingly, researchers have focused on budget allocations because budgetary data are available and quantifiable. There also has been an assumption that the regime in power has control over government expenditures, and that therefore differences in the patterns of budgetary allocations may be explained by particular regime characteristics or types. Thus, much research has focused on the relationship between types of regimes and levels of military spending.

A familiar intuitive proposition is that, when in power, the military will allocate more to the defense sector--on the assumption that military officers in power will follow their corporate self-interest. Many analysts have studied the spending behavior of military and civilian regimes and have addressed several key issues, including:

- (1) Are there systematic differences in spending patterns between civilian and military regimes? Do military regimes allocate more resources to the military than their civilian counterparts?
- (2) Can regimes be distinguished by the degree of consensus existing between civilian elites and the military?
- (3) Are there systematic differences in budgetary trade-offs that can be attributed to military versus civilian regimes?
- (4) Does military spending increase following a coup d'etat?

- (5) Are *regimes* better units of analysis than *countries* for studying expenditure patterns?

Several studies (as shown in the fourth column of Table 2) have examined defense expenditures following the occurrence of a coup d'etat. These authors have attempted to determine the validity of the hypothesis that military spending is increased following a coup d'etat. No consensus exists among authors about post-coup military spending. Schmitter (1973), for example, concluded that military coups are associated with changes in military expenditures, but that the *direction* of change is indeterminate. This is based on a study of post-coup defense spending of 19 Latin American countries over the period 1950-70. An emphasis on Latin America is characteristic of the majority of the authors who analyze the relationship between regime type and military allocation, as noted in Table 2. This Latin American emphasis also obtains in the studies that investigate the correlation between military and social welfare expenditures, listed in Table 3. The information presented in Tables 2 and 3 is largely drawn from Alexander and Elliot Berg (1991).

In common with other investigators, Zuk and Thompson found no relationship between the occurrence of coups (shown as the military variable in Table 2) and military expenditures as a proportion of central government expenditures as the dependent variable. These authors applied a GLS regression procedure (pooling cross-sectional and time-series observations) to data for 66 developing countries over the time period 1967-76. (For each of the studies listed in Tables 2 and 3, the size of the country sample is shown in brackets in the "Region" column, while the period of observation is shown in the column "Time Period.")

The analytical results of this literature are contradictory concerning the relationship between regime type (civilian vs. military regime) and the level of military spending. These conflicting findings are the result of different methodologies, definitions of military regime, and sources of data. An extensive assessment of the literature on the relationship of military expenditure and regime type appears in the Berg and Berg study.

As indicated in Table 2, several analysts have found a positive correlation between military expenditures and regime type. The majority, however, have concluded that no relationship exists between regime type and patterns of defense spending. In general, these authors were testing the hypothesis that systemic differences exist in spending patterns attributable to regime type.

Two recent studies by Grindle (1986) and Looney (1988a) take a fundamentally different look at the relationship between regime type and defense expenditures.

Looney attributes the lack of evidence concerning the difference between civilian and military regimes in past studies to the problems of measurement in standard indexes used to represent the defense burden. His analysis merges two areas of explanation, economic (*ability* to spend) and political (*willingness* to spend), and concludes that military regimes tend to develop the military to levels not warranted by size of the national economy. This is accomplished through increased foreign borrowing, mobilization of foreign exchange earnings, and price distortions that facilitate increased defense spending.

Utilizing an aggregate cross-national research design for 18 Latin American countries over the period 1967-80, Grindle found that regimes explain more as a unit of analysis than countries do in accounting for

Table 2. Relationship between Regime Type and Defense Expenditure

Authors	Pub. Date	Time Period	Region ^a	Military Variable ^b	Dependent Variable ^c	Findings: Relationship
Nordlinger	1970	1957-62	LDCs (74)	Influence	ME/GNP	Positive
Schmitter	1971	ca. 1960	LA (20)	Influence	ME/CGE+GNP	Weak positive
		1950-67	LA (8)	Influence	ME/GNP	Positive
		1973	1945-70	LA (19)	Influence	ME
Weaver	1973	1960-70	LA (6)	Presence	ME/GDP	Negative
		1961-70	LA (2)	Influence	ME/GDP	Positive
Thompson	1973	1946-66	LDCs (32)	Coups	Change in ME/CGE	Positive
Kennedy	1974	1960-70	LDCs (41)	Presence	ME/CGE	None
Hayes	1975	1950-67	Brazil	Presence	ME/CGE	None
McKinlay and Cohan	1976	1961-70	Global (101)	Presence	ME/GNP and military size	None
Ames and Goff	1975	1948-68	LA (17)	Influence	ME	None
					ME/CGE	
					ME/GNP	
Tannahill	1976	1948-67	LA (10)	Presence	ME/CGE	None
Dickson	1977	1961-70	LA (10)	Presence	ME	Weak positive
Hill	1979	1946-65	LDCs (104)	Influence	ME/GDP	Positive
Whynes	1979	1959-75	LA (10)	Coups	ME	Positive
Pluta	1979	1961-70	LA (10)	Presence	ME and military size	Inconclusive
					ME	None
Ravenhill	1980	1960-73	AF (33)	Presence	ME	None
Zuk and Thompson	1982	1967-76	LDCs (66)	Presence	ME	Weak positive
					ME growth rate	None
					ME/CGE	None
Grindle	1986	1967-80	LA (18)	C-M	ME/CGE	Inconclusive
					ME/CGE	Positive
					ME/CGE	Positive
Looney	1987	1961-82	Argentina	Regime tenure	ME/CGE	Positive
					Regime change	ME/CGE

^a LA = Latin America; AF = Africa. Number of country observations in parenthesis.

^b Influence = High military influence in the political process; Presence = Presence of military in top executive positions; C-M = Civil-military relations; Regime tenure = Duration of rule by a single regime.

^c ME = Military expenditure; CGE = Central government expenditure.

Source: Drawn from Alexander and Elliot Berg (1991).

variations in defense spending. Her analysis incorporates regime change, regime tenure, and civil-military relations. In her assessment, the budgetary process is influenced by the power and bargaining skills of government

competitors who strive to gain a larger share of the budget. The strategies and resources available to the military, which ultimately determine its ability to extract resources for defense purposes, varies due to characteristics

of civil-military relations. These relations are determined by the degree of military institutional exclusiveness and the degree of consensus among civil and military elites about the role of the military. Regime change and civil-military relations, rather than regime type, are found to be more useful explanatory factors for variations in defense expenditures.

Evidence of Budgetary Trade-offs

A number of authors have examined the contention that military expenditures involve opportunity costs, causing reductions in social programs to support military outlays. While several authors contend that a negative correlation exists between military and social expenditures (see last column of Table 3), there remains a paucity of empirical evidence indicating systematic trade-offs.

An inspection of the "social welfare expenditures" column in Table 3 shows that education and health expenditures are often used as indicators of a government's commitment to social welfare. Ames and Goff (1975) compared education and defense expenditures in sixteen Latin American countries for the period 1948-68 and found that both sectors experienced fluctuations in funding based on the level of central government revenues. Verner (1983) concluded that trade-offs are both country- and time-specific and cannot be generalized in cross-country analysis. Verner (1983) and Hess and Mullan (1988) found that both education and military spending have strong constituencies that prevent cuts in either area.

Kennedy (1974) found no significant evidence of budgetary trade-offs between military and non-military regimes in his study of spending patterns in forty-one developing nations during the 1960s. His conclusion that regime *change* rather than regime *type* precipitates a reallocation of budget shares supports Grindle's (1986) findings.

Table 3 summarizes the key findings in selected studies on the correlation between military and social welfare allocations. These studies were testing the hypothesis that systematic budgetary trade-offs can be attributed to regime type. As the findings listed in Table 3 indicate, the majority of these studies were unable to establish a systematic correlation through time or across countries. Only one of the studies (Harris et al 1988) found a positive relationship, meaning that as military expenditures were raised, education and health expenditures also increased. Four of the studies found a negative relationship, but only Deger has significant empirical evidence. Regarding the negative findings of Tannahill, Dickson, and Pluta, Berg and Berg note that ". . . since the methodology of these [three] studies is a simple comparison of means, the results are questionable, and the issue remains open" (Berg and Berg 1991).

Many analysts apparently believed that, by focusing on military expenditures, the relative political clout of the military could be shown in the budgetary process; they expected to find political influence correlated with regime type. The determination of military expenditures through the political-bureaucratic process was thought to be a particularly clear example of interest-group politics and to demonstrate how resources are mobilized by the public sector.

There is insufficient empirical evidence to confirm a systematic effect across countries attributable to military regime influence on the process of budgetary decision making and the allocation of resources. Recent research indicates that defense allocations are probably influenced more by other variables than by the degree of military influence in the government. It appears that changes in regimes over time in individual countries provide more useful insights into the budgetary decision-making process, including the character of systematic trade-offs.

Table 3. Correlation of Military and Social Welfare Expenditures

Authors	Pub. Date	Time Period	Region ^a	Social Welfare Expenditures	Findings: Relationship to Military Expenditures
Deger	1986	1967, 1973	LDCs (34)	Agriculture	Negative
Dabelko and McCormick	1977	1950, 1972	LDCs (76)	Education and health	Weak negative
Lyttkens and Vedovato	1984	1984	(no empirical data presented; authors used production possibility graphs to estimate opportunity costs)		
Ames and Goff	1975	1948-68	LA (16)	Education	None
Kennedy	1974	1960-70	LDCs (30)	Education and health	None
Hess and Mullan	1988	1982-83	LDCs (77)	Education	None
Peroff and Podolak	1979	1929-74	USA	Education	None
Pryor		1950-62	EUR,NA (12)	All welfare	None
Grindle	1987	1970s-80s	LA (3)	All welfare	Mixed
Harris et al	1988	1967-83 1980	AS (12) AF,AS (12)	Health Education and health	Mixed Positive
Tannahill	1976	1948-67	LA (10)	Social spending ratio to CGE	Negative
Dickson	1977	1961-70	LA (10)	Education	Negative
Pluta	1979	1961-70	LA (10)	Education and health	Negative

^a AF = Africa; AS = Asia; EUR = Europe; LA = Latin America; NA = North America.
Source: Drawn from Alexander and Elliot Berg (1991).

There is also some evidence that budgetary trade-offs may have different characteristics depending on the degree of elite consensus concerning the role of the military. In some recent experience in Latin America, what appears to influence the budgetary process in ways affecting the pattern of functional-expenditure trade-offs is not the type of regime (in any variant of the classical

distinction between military and civilian), but rather the strength of civil and military elite agreement on terms of the "contract" defining the role of the military in society and polity. As this elite consensus wanes or increases in strength, the relative success of the military in mobilizing public resources varies, and the pattern of expenditure trade-offs changes.

External Patrons: The Influence of Donors and Suppliers

External or internal threats can propel developing states into the international arms trade, but unless these countries have the capability to produce major weapon systems themselves, they will be forced to purchase the armaments abroad--and indeed all developing states to some extent must so do. If the weapons cannot be obtained through a concessional grant, the recipient will be required to purchase the arms at a cost in use of credit or foreign-exchange earnings that may hinder economic growth. Deger and West state that: "Many LDCs have adopted an import-fed growth strategy (rather than an export-led one). This implies that capital formation and output increase depend crucially on intermediate imported goods such as the latest vintage machinery. If additional defense spending on foreign arms reduces the importation of such intermediates, growth suffers. . . The arms trade is therefore a crucial link between national security, external threat and economic growth" (Deger and West 1987, p.11).

The hypothesis that military spending is influenced by the actions and preferences of patrons--dominant external suppliers of major weapons systems and donors of military assistance--has introduced a number of related questions that have been explored in the literature. These include the following:

- (1) Do arms suppliers exercise a dominating influence over the military sector activity of Third World recipients?
- (2) Are countries with greater arms imports also those with higher domestic defense spending?
- (3) Are wealthier and less dependent developing countries more prone to develop a domestic arms industry than

poorer states? What is the relationship between domestic arms production and the level of military expenditure?

Some observers--for example Harkavy (1975), Arlinghaus (1984), and Brzoska (1987)--suggest that as a result of growing competition in the arms trade, the non-arms-producing nations have increased leverage in bargaining with the suppliers, and their dependency has declined. Conversely, Neuman contends that economic and other constraints among developing states promote dependency upon the suppliers. Although Neuman argues that the superpowers have "substantial" influence on recipients' procurement activities and expenditures, exercised through their control of major arms transfers, she acknowledges that "the evidence is circumstantial" (Neuman 1988, p.55).

Both Neuman (1988) and Brzoska (1987) argue that arms transfer activities significantly influence the military procurement practices of purchasers and recipients. Brzoska contends that arms transfer practices are ". . . largely explained by short-term economic conditions and cyclical procurement factors on the side of the recipients" (Brzoska 1987, p.176). Accordingly, as weapons become outdated and economic conditions improve, many developing states can be expected to increase arms imports. This cyclical procurement pattern is evident in the 'boom' years of the 1970s, followed by the relative decline in arms transfers during the 1980s (Brzoska 1987).

The evidence of empirical studies to date appears to indicate the existence of a binary situation. External patrons can and do have a dominant influence over military-sector activity, and military expenditures, in a few developing countries. But significant external patron influence on the level of defense spending cannot be detected in many other countries. The evidence does not support the

contention that this kind of external influence can be described as having a systematic effect across all developing countries. In those cases where determinant external influence exists, there is evidence that the mechanics of the recipients' decision-making process may be altered by the introduction of special institutional arrangements (such as extraordinary budgets or special accounting procedures). The purpose of these arrangements is to implement the patron's influence over the recipient's budgetary behavior and change the composition of government spending. Further study of these cases is needed to identify reliable indicators of the degree of influence that a supplier is able to exercise over a recipient's planning and budgetary decision-making process.

Brzoska (1987) found a correlation between national income growth and major weapons imports. Countries with a per capita GNP of less than \$440 substitute imported arms for personnel expenditures, while countries at higher GNP levels produce some armaments domestically to substitute for imports (Brzoska relied on data supplied by SIPRI, the IMF, and the World Bank for his analysis).

Increasing domestic arms production does not necessarily lead to a reduction in arms imports, as attested by the large domestic production and importation of arms by India and Israel. Deger and West (1987) note that some developing states may link arms imports and exports by utilizing comparative advantage to produce weapons for export, while relying on the increased foreign-exchange earnings generated by arms sales to import armaments that (for technical or other reasons) their domestic industries are poorly equipped to produce at home.

Looney (1988b) studied 104 developing countries over the period 1961-81 and divided them into arms producers and arms non-

producers based on whether a country was capable of producing a major weapon system. Looney concluded that, for non-producers, arms imports were closely and positively correlated with overall imports and inversely related to total military expenditures. In contrast, arms producers tended to expand arms imports in association with overall increases in military expenditures, with reductions taking place during periods when total imports increased. Further, unlike non-producers, these countries increased arms imports with overall expansion of government consumption relative to GDP. Looney concluded that it appears from this analysis that arms producers do not have to make major sacrifices in socioeconomic expenditures to achieve a desired level of security inputs.

Table 4 depicts the relationship between arms production and military expenditures. The majority of authors describe arms production (AP) as a positive determinant of military expenditures (ME). Generally, these authors view arms production as a means of facilitating industrialization ($AP > ME$). Hence, arms production is considered part of a broader development program and is not determined simply by the level of military expenditure. Political, military, and economic factors interact with the relationship between arms production and military expenditure.

In contrast with this view, several authors focus on the importance of a military power base in facilitating both military expenditure and a growth in arms production ($ME > AP$).

The prevailing view in this area of study emphasizes arms production as a product of the struggle toward self-sufficiency and as a determinant of military expenditure. However, in the view of a majority of investigators, causation is not unilateral but entails feed-backs and interaction with other factors.

Table 4. Relationship Between Regime Arms Production and Military Expenditure

Authors	Pub. Date	Time Period	Region ^a	AP>ME ^b	ME>AP ^b	Findings: Determinants of Arms Production ^b
Ayres	1983	c.1977	Turkey	+	+	Cyclical relation, rise in dependency
Ball	1986	1969-85	LDCs	+		Political, economic factors; threat perception
Ball and Leitenberg	1983	1970-81	Global	+		Domestic economic factors
Brzoska	1989	1968-88	LDCs	+		Drive for independence
Brzoska and Ohlson	1986	1950-84	LDCs	+		Global, regional relations
Clare	1987	1981-85	LDCs	+		Economic security, independence
Deger	1986	c.1983	LDCs	+		Threat perceptions, regional perception
Evans	1986	1960-85	LDCs	+	+	Cyclical relation; ME fuels market for AP, which fuels further ME
Frank	1980	1973-79	LDCs	+		Crises, oil income facilitates ME
Goulet	1976	c.1975	LDCs	+		Desire for development, independence
Katz	1984 and 1986	1963-80	LDCs	+	+	Drive for autonomy coupled with military power bases in LDCs
Looney	1989	1973-88	LDCs	+		Economic factors over threat factors; decline in AP fuels decline in ME
Looney	1988b	1969-81	LDCs	+		ME through AP earnings
Looney	1986	1979-80	LA	+		Domestic political/bureaucratic influence
Moodie	1979	1965-75	LDCs	+		Drive for independence
Neuman	1984	1979-80	LDCs	+		Economies of scale over ME influence
Peleg	1980	1950-77	LDCs	+		ME influence weak
Rosh	1988	1969-78	LDCs	+		Security concerns
Rosh	1990	c.1982	LDCs	+		Political, economic, military mobility
Ross	1987	1973-83	LDCs		+	Exaggerated concern; AP minor activity
Wulf	1983	c.1980	LDCs	+		Economic, political, military motives; drive for self-sufficiency

^a LDCs = Less developed countries; LA = Latin America.

^b AP = Arms production; ME = Military expenditure. AP>ME = Arms production results in growth of military expenditure. ME>AP = Military expenditure facilitates a growth in arms production.

The Influence of Financial and Economic Constraints

Recent research indicates that economic variables may provide further insight into the underlying causes of Third World defense expenditures. Early studies of this subject focused on the role of economic factors as determinants of the size and composition of government expenditures as a whole. Many investigators have adopted a version of Wagner's law, which asserts that the relative size of the public sector in the national economy has an inherent tendency to grow as per capita income increases. One postulate is that the increasingly costly requirements of national security and defense are a contributing factor to the growth of the public sector. By this reasoning, growth in the resources required for national security is driven by social conditions (such as increasing urbanization) associated with progressively higher levels of economic development.

Variants of the Wagner's law hypothesis are frequently found in the current literature. For example, Deger states: "The three major determinants of the defense burden are . . . : (a) long-term developmental factors such as per capita income; (b) the total budget constraint; (c) displacement variables such as wars or structural shifts like an oil price rise for oil-exporting countries. It must also be stressed that these three determinants affect military expenditure as a public good which produces security" (Deger 1980, p.63).

The linkages among economic factors, regime characteristics, and other influences on military expenditures have been explored in the context of a budgetary decision-making model by several authors. Some of the key questions that have been addressed by these scholars are:

- (1) Does the burden (or share) of military expenditures rise with increased per capita

income, as postulated by Wagner's law?

- (2) Are military expenditures in all Third World countries influenced in similar ways by economic and political factors, or is the set of factors influencing military expenditures different in sub-groups of developing states?
- (3) Do resource-constrained nations tend to have a different relationship than resource-abundant countries between defense spending and economic growth?

A variety of different economic indicators have been asserted to influence military expenditure levels and trends. Several of these indicators can be interpreted as corresponding to variables postulated by Wagner's law to be determinants of the size of the public sector. Lotz (1970), for example, conducted a cross-country multiple regression analysis of 37 developing countries. Utilizing military expenditure as a percentage of GNP (the military burden) as the dependent variable, he found a significant negative relationship with per capita income measured in U.S. dollars, and a significant positive relationship with the total government budget as a percentage of GNP (an independent variable that may be taken to measure relative resource constraint). Lotz also found a significant positive relationship with the proportion of urban dwellers--another possible indicator of the level of development.

Contrary to Lotz's findings, Maizels and Nissanke (1986) concluded there is no significant relationship between per capita income levels and military expenditure/GDP ratios. They also determined that the level of urbanization is not significantly related to the level of military spending. The most significant variable was found to be the share of the central government budget in GDP.

The growth of foreign-exchange availability was an important constraint.

Looney and Frederiksen (1988) examined the linkage between the effect and timing of certain economic variables and the effect of past budgets on current defense budgets. The regression analysis, conducted on an individual case-study basis for ten relatively economically homogeneous Latin American countries, indicated the significance of fiscal variables in accounting for fluctuation in military expenditures. A tested lag effect was also significant, indicating that changes in expenditures or revenues affect the military budget over time. The results also suggested that the large regional powers might have a somewhat different set of fiscal linkages than smaller countries.

Looney (1986) examined the influence of external debt on military expenditures among a group of 61 developing states. The author concluded that: a) per capita military expenditure tends to increase in association with increases in per capita income, a finding in support of Wagner's law; b) public external debt is a significant factor in expanding military expenditures per capita; and c) regional differences in military expenditures are not as pronounced as the differences between resource-constrained and resource-unconstrained states.

Looney (1988b) examined the effect that indigenous arms-production capability has on determining the level of military expenditures for a sample of 104 developing states during the period 1961-81. The results showed that differences in military expenditures can be explained by the level of GDP, the current-account balance, and external debt--with distinct differences between arms producers and non-producers.

Looney (1989b) also found that the level of military spending in developing countries is

determined in larger part by economic constraints than by external threat factors. This is qualified by Looney's earlier contention (1988b) that arms producers are less vulnerable to external factors than non-producers.

Table 5 summarizes the relationship between economic/fiscal indicators and military expenditures as found in a number of recent studies. The testing by these authors has proceeded on the hypothesis that the changes in these economic factors over time result in a displacement effect on military spending. As can be seen in Table 5, the results of these analyses are not entirely consistent. This is exemplified by the previously noted studies by Lotz (1970) and Maizels and Nissanke (1986). Both studies used military expenditure as a percentage of GNP as the dependent variable and per capita income as one of the independent variables. Lotz found a significant negative relationship between the two variables, while Maizels and Nissanke concluded that the relationship was not significantly different from zero.

A wide variety of other economic and political variables have been examined in the literature. While a clear consensus has not emerged and the need for further research is evident, some observations about the effect of economic factors on military expenditures appear to be supported by a broad range of empirical studies. For one, the proposition that effects on the level of military expenditures are attributable to many influences--political and economic, domestic and international--has broad support in the literature.

Few analysts would now dissent from Looney's conclusion: "Most importantly, the analysis indicates the usefulness of examining the defense burden from an economic perspective. Despite the wide diversity of political and strategic situations in the sample

Table 5. Relationship Between Economic Indicators and Military Expenditure

Authors	Pub. Date	Time Period	Independent Variables	Dependent Variables ^c	Findings: Relations Among Variables
Lotz	1970	1960-65	Per capita income	ME/GNP	Negative
			Urban population	ME/GNP	Positive
			CGE ^a as % of GNP	ME/GNP	Positive
Maizels and Nissanke	1986	1978-80	Per capita income	ME/GDP	Not significant
			Urban population	ME/GDP	Not significant
			For. exch. ^b constrained	ME	Negative
Harris	1986	1960-80	Inflation	ME	Weak negative
			Balance of payments	ME	Positive
			Government revenue	ME	Positive
O'Leary and Coplin	1975		GDP	ME	Not significant
			Rival budget levels	ME	Positive
			Rival arms purchases	ME	Positive
Looney and Frederikson	1988	varied	GDP	ME	Positive
			CGE ^a	ME	Positive
Looney	1986	1970-82	Per capita income	per capita ME	Positive
			Public debt	per capita ME	Positive
			For. exch. ^b constrained	ME	Negative
			For. exch. ^b unconstrained	ME	Positive

^a CGE = Central government expenditures.
^b For. exch. = Foreign exchange availability.
^c ME = Military expenditures.

of developing countries, economic variables were shown to account for the bulk of differences in per capita military expenditures across countries" (Looney 1986, p.29).

The extent of domestic and external resource constraints, as well as the country's domestic arms production capability, appear to alter the structural relations between other causal factors and military expenditure levels. More generally, the developmental homogeneity of Third World states cannot be assumed. Cross-sectional studies that have

pooled the experience of countries with extremely diverse economic and political conditions and incorporated a variety of time periods and testing models have had indifferent success in identifying the determinants of inter-country variations in defense spending. Subdividing countries according to similarities in economic characteristics reveals significant differences in the relative importance of various influences on military expenditures. We will return to the identification of significant sub-groupings in part III below.

Multi-Variable Explanations of Military Expenditure

Efforts to unravel the determinants of military spending using econometric analysis have centered on attempts to verify the corollary of Wagner's Law for defense spending: that there is a positive relationship between economic growth and the military burden. Early uses of multivariate regression techniques in this vein were framed within the context of more general studies of the determinants of all public expenditures.

Table 6 summarizes the econometric analyses of five authors who have explored the hypothesis that a positive relationship exists between economic growth and the military burden. Each econometric model utilizes a multivariate regression technique and employs several explanatory variables from the four major classifications listed in the table.

Lotz, for example, used data for 37 developing countries and employed factor analysis to determine the relationship between the composition of government spending and different dimensions of economic and social structure. Lotz's regression analysis estimated significant partial correlation coefficients for mineral and oil exports and size of the public sector (both indicators of budget/financial constraints in Table 6), and for per capita income and urbanization (indicators of economic development level), with respect to the military burden. As shown in Table 6, the variables explained 37 per cent of the inter-country variation in the military burden. Per capita income level showed a highly negative coefficient. Lotz concluded that modern military establishments have technical economies of scale, and that lower-income countries must often spend more than they otherwise would in order to keep up with their wealthier, expansionist neighbors.

Lotz's effort suffered from a paucity of *a priori* theorizing and the limitations of the variables he had available for use. His failure to include foreign-exchange/external-resource constraints or internal/external threat variables make his specification suspect. Lotz also did not address the question of the possible simultaneity between military expenditures and economic growth. As a result, Lotz's results are questionable.

Tait and Heller, in a broad IMF analysis of government expenditure in 84 developed and developing countries, regress per capita income, urban population share, the public sector size (net of defense), and population share under fourteen years of age on the military expenditures/GDP ratio. Explaining only 15 per cent of the inter-country variation (shown by the r^2 of Table 6), Tait and Heller's estimation fails to return a significant coefficient for per capita income, but it closely mirrors Lotz's results for the urbanization and government size variables. Constructed in a similar fashion and containing almost the same variables, the work of Tait and Heller falls victim to the same theoretical and methodological flaws encountered in Lotz's analysis.

In an update of the Tait and Heller work, Tait and Diamond returned to essentially the same analysis, using data for the period 1975-86. The defense expenditure estimation explained only 8 per cent of the variation. Tait and Diamond shed little additional light on the determinants of military expenditure.

Maizels and Nissanke (1986) introduced political, military, and external resource factors into their analysis. The authors also specify internal and external economic linkages that influence military expenditures. Internally, they allow for per capita income level, GDP growth rate, and public sector share of GDP; externally they suggest that growth of foreign-exchange availability, the

Table 6. Determinants of the Military Burden (Military Expenditure/GNP)
(values of regression coefficients)

	Lotz (1970)	Tait and Heller (1982)	Tait and Diamond (1990)	Maizels and Nissanke (1986)	Deger (1986)
Economic Development Level					
Per capita income level	-0.006**	n.s.	n.s.	n.s.	0.15**
Open economy inverse index					-0.22*
Urban population share	0.048**	0.05*	0.028*		
Urban population growth rate			0.33*		
Budget/Financial Constraints					
Public sector size CGE/GNP	0.081*	0.10**		0.21**	0.15**
Mineral export share	0.020*				
Growth of foreign exchange				2.79**	
GDP growth rate				n.s.	
Political/Military Influences					
War dummy				2.43**	11.35**
Oil-country dummy					3.98**
Regime-type/violence score				0.65**	
Arms-supplier concentration				0.63**	
Other Structural Factors					
Population share under 14 years		0.16**	0.098**		
Total population					n.s.
Ratio of FDI to capital stock				-1.15**	
Concentration of FDI investors				n.s.	
R ²	0.37	0.15	0.08	0.65	0.87
N	37	84	200	72	50

Note: Single and double asterisks indicate, respectively, significant at 95% and 99% level (one-sided);
n.s. = not significant at 95% level.

ratio of foreign direct investment to total capital stock, and the concentration of foreign investment should all have explanatory power with respect to the military burden.

Maizels and Nissanke carried out their regression analysis with military expenditure

data averages for 1978-80 for 72 developing countries. Table 6 shows that both per capita income and the GDP growth rate fail to have any significant explanatory power in the equation. (Both variables are listed in the table as n.s., or not significant statistically). According to Maizels and Nissanke, the most

powerful explanatory variable is the public sector burden. The incorporation of political and military factors and external economic influences significantly improves the overall explanatory power of their hypotheses.

The negative, significant impact on the defense burden of the change in foreigners' share of the total capital stock has been interpreted by Gyimah-Brempong (1987) to show that military expenditure is not exogenous. Since military expenditure both impacts on and is affected by the change in capital stock, or investment, Maizels and Nissanke's results appear to suffer from simultaneity bias.

Joerding (1986) provided additional evidence of the endogeneity of military expenditures by conducting a Granger Causality Test on data for the 1960s and 1970s from 57 developing countries. A variable is said to be directly "Granger-caused" by another variable if the original variable is better predicted by using lagged values of both variables than by lagged values of only the original variable. Joerding concluded that economic growth does Granger-cause military spending. Since Granger non-causality is a necessary condition for considering military expenditures to be exogenous, Joerding asserted that he had demonstrated the endogeneity of military expenditures. However, Joerding found no evidence that military expenditures Granger-cause economic growth. While this is not sufficient evidence to demonstrate the exogeneity of economic growth (in light of contradictory evidence presented in other studies), it introduces uncertainty about the reliability of Joerding's test of the exogeneity of military expenditures.

Deger (1986) carried out a series of regressions, using data averaged over 1965-73 for 50 developing countries, to test the sign and significance of per capita income as

different explanatory variables are added. Table 6 shows that Deger found per capita income to be positive and significant, confirming her Wagnerian expectation that, as incomes rise, the share in GDP of a public good such as military expenditures should increase.

Deger reported that experiments with other domestic variables, including growth rates, showed no significant explanatory relationship with inter-country variations in the military burden. She concluded that Wagner's Law cannot be validated empirically with respect to economic growth, but only with respect to levels of economic development.

Deger also found positive coefficients for two other variables explaining variations in defense spending: the indicators of government sector size and the total population. Public sector size may be interpreted here, as in the other studies, as an inverse indicator of relative domestic resource constraint. The population coefficient is borderline insignificant. Deger does not address the issue that adding the population variable when per capita income has already been included may be unnecessary and introduce collinearity into the equation. The question of the simultaneity of the public sector size and the military burden is also ignored by Deger.

Deger included country-specific dummy variables for oil exporters and war economies as measures of structural displacement. Both turned out positive and significant. A final variable measured the degree of integration of a national economy into the world economy by taking the difference of income per capita both at the official exchange rate and at the purchasing-power parity rate. Deger argues that this open economy measure is just another index of development, although she does not explain why she chose to include this measure rather than other development indexes.

Although Deger's estimation explains a substantial 87 per cent of the inter-country variance in military burdens, an assessment of her work must point out the absence of an internal threat variable or a measure of external resource availability other than the oil dummy. If higher income growth rates do not explain the variations in the military share of GDP, what about inflows of external capital or foreign-exchange constraints, as modeled by Maizels and Nissanke?

Considerable differences remain among analysts concerning interpretation of the effects of economic growth and per capita income on the military burden. Conclusive cross-sectional evidence of economic growth impacts on the share of military expenditure in GDP

have not been found. Nonetheless, a relationship between the military burden and the level of development, represented by per capita income or another indicator, does seem to emerge. In sum, the results neither fully confirm nor disprove the Wagner's Law propositions. This should not be unexpected, as demonstrating the corollary of Wagner's Law with respect to economic growth is a more appropriate task for time-series analysis than for cross-sectional analysis. Thus far, no empirically substantive evidence has been found to counter the intuitive notion that, as the process of economic growth proceeds, more resources are freed for the purposes of public expenditures, including national defense.

Demonstrating Differences Among Sub-groups of Developing Countries

Despite improvements in the econometric methods of research concerning the security and development relationship, there remains the question of the appropriateness of using econometric techniques to analyze the determinants of public expenditure. This difficulty, discussed in an individual country time-series framework earlier (in the section on reliability of testing methods), applies to cross-sectional analysis as well. The institutional discontinuities over time are analogous to the diverse functional and institutional characteristics of the countries in a broad cross-sectional sample. If the implicit segregation of developed from developing countries is legitimate and significant, what other sub-groups should be segregated? Looney (1988c) points out the difficulty of drawing useful generalizations from studies in which the samples may include countries as diverse as Chad and Saudi Arabia.

The multivariate research reviewed in the previous section has often used geographic regions (Latin America, Africa, and Asia) as a convenient way of choosing sub-samples for analysis. Unfortunately, the political and economic diversity present across such broad regions, as well as the small sample size for some regions, frequently results in coefficient estimates of little significance or practical application (e.g., Lim 1983, Deger and Smith 1983, and Faini et al 1984). It should also be noted that basing sub-groups on continents provides little opportunity for transfer between sub-groups, as underlying characteristics of individual countries change over time.

Other bases for sub-groups that have been suggested include special sub-region (e.g., Francophone Africa), political bloc, war or peace economy, size of military expenditures, physical quality of life index, or regime type

(Brauer 1988, pp. 29-33). Analysis of regime type differences has received the most attention, but as pointed out in part II above, there is no decisive evidence that military spending is correlated with the civilian/military regime distinction.

Two sub-groups--one based on the existence of domestic defense industries and the other on the availability of financial resources--are worth reviewing for the salient insights they offer into the relationship between security and development in developing countries. Robert Looney's work in both areas is explored because of his innovative use of statistical techniques in segregating countries as well as the interesting results he has obtained.

Differences Attributable to Domestic Defense Industries

For his analysis of the domestic defense industry sub-group, Looney (1986, pp.31-49) follows Neuman's (1984b) classification of developing countries on the basis of the presence of one indigenously produced major weapon system. As shown in Table 7, Looney finds that internal economic factors account for military spending behavior among arms producers. The military's budgetary allocation in non-producing nations, on the other hand, is importantly influenced by external factors. Non-producers, Looney maintains, do not face the same internal pressures as do arms-producing nations to continue defense spending in times of minimal external threat. Thus, there is a kind of artificial demand stimulation or "military Keynesianism" at work in arms-producing nations.

Contrary to assertions by other analysts of defense industries in the Third World, Looney does not find economic size, a threshold level of per capita income, or an industrial base to be necessary or sufficient preconditions for

domestic arms production. Instead, his analysis shows that, due to continued technological dependence on the developed world, the economic environment, in particular foreign-exchange availability, is the key determinant. Looney differentiates between Latin American and non-Latin American arms producers. Latin American arms production developed in the early 1960s, as export growth and external borrowing created a large import capacity. The establishment of indigenous arms industries in other developing countries seems to be independent of trade performance and to depend primarily on current-account financing through publicly guaranteed loans (Looney 1987; 1988).

Looney's emphasis on a country's economic environment as the primary factor influencing the installation of domestic defense-production capacity arises from his efforts to predict the classifications of countries as producers or non-producers, based on a discriminant analysis using socioeconomic variables. Political variables proved to add little to the differentiation between producers and non-producers. Looney's analysis demonstrates that arms producers have greater access to financial resources, particularly foreign exchange. Therefore, they can afford to finance their domestic defense industries through external debt accumulation. Unlike their resource-constrained non-producing counterparts, who lack debt service capacity, arms producers can maintain arms production without diverting domestic resources from productive civil sector investment.

The arms production basis for identifying sub-groups, while providing useful insights, is one-dimensional and static. The use of discriminant analysis does not determine the groupings but only uncovers the best predictors of a *de facto* segregation of countries. Given Looney's conclusion that it

Table 7. Determinants of Military Expenditure by Sub-Groups of Countries

Sub-Group	GNP	Debt	Balance of Payments (trade deficit)	Mobilization (external threat)
Arms Production				
Producers	+	+	n.s.	n.s.
Non-Producers	+	n.s.	+	+
Resources			(reserves)	(government deficit)
Unconstrained	n.s.	-	n.s.	-
Constrained	n.s.	+	+	+

Note: n.s. = not significant.

Source: Looney, 1988c.

is unlikely that additional developing countries will initiate defense industries because of the existing debt problem, this categorization of countries is also unlikely to mirror changing economic circumstances among developing countries. A typology based on economic variables is likely to be a much better candidate for effectively separating developing countries into fluid groups with different functional characteristics.

As noted earlier (in the section on the reliability of testing methods), a methodologically preferable solution to the problem of identifying country sub-groups is the use of techniques (such as factor analysis) that do not force the researchers' preconceived notions of country classification onto the analysis. Instead, the data is allowed to sort itself out and define the important characteristics (factors) that distinguish significant sub-groups. With the discontinuities eliminated, econometric analysis can be conducted.

Differences Attributable to Financial Constraints

This section describes Frederiksen and Looney's (1982; 1983; 1985) and Looney's (1986, pp. 3-30; 1990) methodology for grouping countries on the basis of financial capabilities. It summarizes their findings on the differences between the two groups and concludes with an appraisal of the contribution made by this body of work to understanding and modeling the security and development relationship in developing countries.

Looney and Frederiksen first argued in 1982 that a fiscal crunch in a resource-constrained nation causes development projects to be sacrificed in order to maintain military expenditures. They predicted that, in a similar situation, the relatively less constrained nations would utilize their access to foreign credits to maintain development programming and expand military expenditures. This behavior was confirmed in their 1982, 1983, and 1985

Table 8. Summary of Mean Values of Discriminant Analysis Variables

Variables	Rich to Poor Ratio
Inflow of public loans as % of exports, 1982	1.0 to 3.6
External public debt, 1982	4.5 to 1.0
Gross international reserves, 1982	10.5 to 1.0
External public debt as % of GDP, 1982	1.0 to 2.3
Average annual growth in imports, 1970-82	8.7 to 1.0
Debt service as % of exports, 1982	1.0 to 1.2
External public debt as % of GDP, 1970	1.0 to 2.0

Source: Looney (1986), p.11.

studies. Although the military expenditure impact on growth in the constrained countries was insignificant in two of the three studies, the unconstrained countries were in all three cases found to benefit positively from military expenditures.

The early studies used cluster analysis based on variables representing savings, investment, foreign-exchange earnings, import elasticity, and productivity of investment to group countries for the 1965-73 period. Discriminant analysis then tested the probability of having correctly classified each country. Finally, single equation OLS regressions produced estimates of the impact of military expenditures on growth. Unfortunately, in their initial estimates, a complete data set was available for only 9 countries in the resource-rich group and 24 in the resource-poor group.

Later work by Looney assembled a large number of economic and financial variables for over 60 developing countries during the 1970-82 period (Looney 1986, pp.3-30). This research demonstrated a greater statistical sophistication, employing factor analysis to select the variables for discriminant analysis.

Looney found seven variables contribute significantly to dividing his sample into two groups, based on their total access to foreign resources. The results of the discriminant analysis are shown in Table 8. The relatively constrained ("poor") group included most of the African and the poorer Latin American countries. The "rich" group was made up largely of Middle-Eastern and North African countries as well as the oil-exporting and newly industrializing countries of Asia, Africa, and Latin America.

Looking back to Table 7, we may note that two-thirds of the arms producers are also in the resource-rich category. With groupings based on access to foreign exchange, external threat factors are found to be not significant. This leaves internal economic variables such as the government deficit and external public debt as the significant determinants of military spending.

Military expenditures per capita in the larger, more debt-free, financially unconstrained nations show a negative correlation with external public debt and the government deficit. Looney believes that this demonstrates their reluctance to let military spending exceed

their means and to jeopardize their overall creditworthiness. Meanwhile, among the more constrained countries, there appears to be an association among expenditures on defense, foreign-exchange shortages, and high levels of external indebtedness.

Looney's work has consistently addressed the crucial question of how to let cross-sectional data identify sub-groups of countries, each with a distinctive set of security-development relationships. The varied techniques used by Looney and Frederiksen have served to disaggregate developing countries into sub-groups over four different time periods since the 1950s. One important result of this research has been to demonstrate that differences in techniques and in time periods used in the analysis reveal shifts in country group affiliations over time. Fifteen

of the fifty countries in Looney's factor analysis for 1970-82 switched groupings in his latest analysis, which used data for the period 1965-87.

This indicates the need for periodic reapplication of the best available sorting procedure in order to make available timely and appropriate sub-groupings for policy analysis. As the characteristics underlying country differences in the security-development relationship apparently fluctuate over time, both time-series and cross-sectional work must be updated. Econometric analyses that are both statistically significant and theoretically sound, but that rely on experience from as far back as the 1960s, may have only limited practical significance for policy design in the 1990s.

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Notes

- ¹ A very useful description of these sources and of the military expenditures data reported by each also appears in Ball 1988, pp. 84-87 and Appendix 2.)
- ² For a survey of studies on this subject, see Ball 1988, pp. 111-122; see also earlier reports by Brzoska 1981 and Ball 1984.
- ³ See United Nations, Department of Disarmament Affairs, 1983; Ball 1988, pp. 97-111.
- ⁴ These trends are evident in a report on compliance with the U.N. reporting system: U.N. General

Assembly Document A/41/622 of September 25, 1986.

- ⁵ See U.S. Arms Control and Disarmament Agency 1980, pp. 15-17.
- ⁶ See United Nations, Department of Disarmament Affairs, 1986.
- ⁷ For a concise overview, see Studenmund and Cassidy 1987.
- ⁸ For examples of multiple-channel testing models, see Deger and Smith 1983; Deger 1986.

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Appendix

BACKGROUND NOTE ON MILITARY EXPENDITURE: SOURCES AND PRICE CONVERSION PROCEDURES

Robert L. West

Virtually all of the cross-country empirical testing of propositions concerning the relationship of security and development in the developing world has been carried out in the last twenty years. Studies of the worldwide distribution of military expenditure and of the trends of military spending in different geographic regions are also predominantly a product of the past two decades. These lines of investigation have been made possible by the publication on a regular basis--beginning about twenty years ago--of data series reporting on the scale of national security expenditures by a large number of countries.

The fiscal reports of the individual governments are the primary source of these data. But the assembly, editing, and annual publication of data series for a large number of nations is the activity of a few international reporting agencies, notably the U.S. Arms Control and Disarmament Agency (ACDA), the Stockholm International Peace Research Institute (SIPRI), and the Government Finance Statistics Division of the International Monetary Fund.¹

Because the data reported by these agencies is readily available, and because users are confident of the care that has been exercised in assembling the information, the estimates

published annually by these agencies are very widely used to describe contemporary patterns and trends of military expenditures in developing countries.

The three agencies differ somewhat in country coverage, in methods of estimation employed, and in definitions of variables. Their annual publications are, however, broadly similar in the presentation of military expenditure (MILEX) estimates with very wide geographic coverage, reporting data on a consistent basis for a period of a decade.

Each of the three agencies also publishes estimates of associated expenditure series for each country, accommodating the familiar convention of comparing MILEX with total expenditures by the central government (CGE) and with gross national product (GNP). The ratios of MILEX to CGE (the "defense share" of central government expenditures), of CGE to GNP (a measure of the "size of the public sector"), and of MILEX to GNP (the "military burden")--are widely used as indicators of the level of effort by a government to provide for national security.

The expenditures reported by the national reporting sources are in local currency at current prices. Ratios of expenditures

expressed in national currencies--such as the ratio of military expenditures divided by national income--reflect the prices in each country during the period in which the expenditure occurred. For some analytical purposes, comparisons at national prices are appropriate. For comparisons of expenditures over time, however, an adjustment is required for changes in price levels. For purposes of making international comparisons, it is necessary to convert the spending in national currencies to a common numeraire or base currency, such as the U.S. dollar of some specified base period.

The convertor most commonly used for this purpose is the exchange rate. This is the convertor used by both ACDA and SIPRI.² The deficiencies of using exchange rates as convertors are widely acknowledged. When applied to broad national accounts aggregates, they result in statistics that are far from satisfactory for making inter-country comparisons of real income or real product, or for making comparisons between real quantities over time for groups of countries or for one country. The structure of prices for goods and services differs widely among countries, and the changes in these structures that occur over time are quite different across countries. Exchange rates do not adequately reflect these international differences in price levels and structures. ACDA (among others) recognizes that the convertors that it uses do not allow for a number of factors: "any within-country differences between the price indexes for military or central government expenditures and for GNP are not taken into account. . . . A more serious problem is that exchange rates in many cases do not adequately reflect the relative purchasing power of currencies."³

To correct for these factors, and to put expenditures in different countries on a comparable basis, it is necessary to use convertors derived from price comparisons of

the components of the expenditure aggregates. For broad national accounts aggregates, such as government sector expenditures and GNP as a whole, these convertors--termed parities, or purchasing-power parities (PPPs)--have been computed for a large number of countries and for a long span of years. These parities have been developed by the International Comparison Project, a cooperative statistical enterprise coordinated by the United Nations Statistical Office and supported by the World Bank.⁴

Using parities as convertors results in expenditure estimates in a numeraire currency, showing the real quantity of goods and services purchased, valued at a single set of international prices, in each country. The 1980 international dollar has the equivalent purchasing power of one U.S. dollar, in U.S. GNP terms, in 1980. Expenditures expressed in these PPP dollars can be aggregated for groups of countries and compared across countries and over time. In all these cases, the aggregates and comparisons correspond to real quantities of goods and services. These cross-country and inter-temporal comparisons are not subject to the distortions that result from currency conversion by exchange rates.

Purchasing-power parities that are appropriate for converting central government expenditures and GNP are provided by the International Comparison Project and by the statistical offices that have continued the developmental work of the ICP. But selecting the parities for converting the military expenditures of one country into the currency of another requires clarification of the question being asked. One possible purpose of making international comparisons may be to measure the total resources devoted by each nation to its military sector. But a second and quite different purpose may be to measure the cost to each nation of providing the military establishment that the country chooses to have.⁵

In comparing military expenditures as measures of the real resources devoted to national security, the focus is on military spending as the purchase of inputs for national defense. The component inputs—manpower, fuel, weapons, material—must be identified and convertors derived from price comparisons of the components. Improvement in the national reporting of standardized, detailed information on the composition of military expenditure categories has been a particular goal of the United Nations Department of Disarmament Affairs, whose experts have since 1975 pressed for member governments to publish disaggregated security expenditures data and to compute the associated military purchasing-power parities.⁶

Compliance has been partial and erratic. But a sufficient body of data has been assembled to permit the United Nations to convert the defense expenditures for a small number of countries on the basis of basic parities derived from detailed price and salary comparisons in 1980. Building on these directly derived estimates of military price levels, on the civilian price comparisons for the 71 benchmark countries that have participated in the ICP studies, and on methods of indirect estimation of price levels developed by the International Comparison Project, Alan Heston has computed estimates for 134 countries of real military expenditures in 1980 that have been converted by use of military purchasing-power parities.⁷

For Heston's computation of military price levels and parities, many of the basic parities for the military have been directly carried over from the basic parities for categories of civilian expenditures of the 1980 ICP study. For some items, however, there are no direct carry-overs, as in the case of military personnel and certain procurement items. For these items, methods to infer defense parities from civilian parities have been derived from the pilot military purchasing-power study by

the United Nations Expert Group. For the estimation of military personnel expenditures, the largest single expenditure category in most countries, the pricing of personnel, is complicated by the requirement to take into account that some countries use conscripts and some do not.

Heston's experimental set of military price level estimates and parities is available only for the year 1980. For that base year, it provides convertors that permit us to make comparisons across a wide range of countries of the quantities of real inputs devoted by each nation to its military sector, valued at a single set of international prices for military expenditures and expressed in 1980 international dollars.

A distinctly different purpose is to compare military expenditures as a measure of the cost to each nation of providing its military establishment. For this purpose, the proper measure of cost is that of opportunity cost—the value of alternative goods and services foregone because of the decisions made by the fiscal and budgetary authorities to allocate expenditures for national defense. In conformance with this concept of cost to each nation, the comparison should be made of military expenditures computed as the real value of the alternative bundle of goods and services sacrificed by the residents of the country (that is, the real value of the purchases that are not made) as a result of the government's decision to spend the amount of local currency devoted to national security. We need indexes of price-levels for comparing the real military burdens assumed by different countries, and their trend through time.

We cannot know what bundle of goods and services would have been purchased in each country if the nation had not made the military expenditures actually observed. But an estimate of the counter-factual can be based on reasonable assumptions and on the

observation that expenditures for national security are, in all countries, exclusively an activity of the public sector and the outcome of a process of central government decision making with respect to the allocation of fiscal resources. Military expenditures represent public use of resources; money expended for public purposes is fungible. For the period of years addressed in this paper, and for the large number of countries compared, civil governmental expenditures were expanding rapidly and the constraint on growth of public outlays appeared to be the government's capacity to mobilize resources for public uses.

In these circumstances, for the purpose of making international comparisons of the

opportunity cost of military expenditures, it is a reasonable assumption that the alternatives foregone as a result of a given country's military expenditure can be represented by equivalent additional spending on the actual mix of goods and services purchased by the central government in its civil expenditures during that year. The price level corresponding to this expenditure measure is the central government price level. The real value of the opportunity cost of military expenditures thus can be represented as the reported military spending in local currency converted at the purchasing-power parity for general government final consumption expenditure in 1980 international dollars.

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¹ The data appear in the following publications: U.S. Arms Control and Disarmament Agency (ACDA), *World Military Expenditures and Arms Transfers* (Washington, D.C.: U.S. Government Printing Office, annual). Stockholm International Peace Research Institute (SIPRI), *World Armaments and Disarmament*, SIPRI Yearbook, (Oxford and New York: Oxford University Press, annual). International Monetary Fund (IMF), *Government Finance Statistics Yearbook* (Washington, D.C.: IMF, annual).

² The IMF reports expenditures only in national currencies; SIPRI provides data in both national currencies and "dollars"; ACDA reports only the data converted into "dollars." The SIPRI and ACDA methods of conversion are similar, and both use exchange rates. The ACDA conversion approach

consists of two steps. (1) ACDA deflates each country's data, expressed originally in national currency and at current prices, by means of the country's implicit deflator for GNP as a whole (the GNP price index is used for all expenditure variables—military spending, total government spending, and GNP); thus national currency data for all years are expressed in the prices of the conversion base year. (2) These data are then divided by the annual average par/market exchange rate for the base year between the national currency and the U.S. dollar—and thus converted into constant base-year dollars. See ACDA, *World Military Expenditures and Arms Transfers 1989*, pp. 138-39. SIPRI conversion follows the same two steps but (generally) employs the consumer price index as the national deflator.

³ ACDA, *World Military Expenditures and Arms Transfers 1989*, p. 139. The deficiencies of exchange-

rate convertors and the desirability of using purchasing-power parities have also been addressed in the academic literature. See, for example, Jacques Fontanel, "A Note on the International Comparison of Military Expenditures," and "Note on the paper by Fontanel by Frank Blackaby," in Christian Schmidt, ed., *The Economics of Military Expenditures* (New York: St. Martin's Press, 1987) pp. 29-46, and Robert L. West, "Improved Measures of the Defence Burden in Developing Countries," in Saadet Deger and Robert L. West, eds., *Defence, Security and Development* (London: Frances Pinter Publishers, 1987) pp. 19-48.

⁴ The methods used for the direct estimation of price level indexed and parities for participating countries in benchmark years are described in the reports of the United Nations International Comparison Project. The Phase III report is: Irving B. Kravis, Alan Heston, and Robert Summers, *World Product and Income: International Comparisons of Real Gross Product* (Baltimore, Md.: Johns Hopkins University Press for the World Bank, 1982), esp. Chapters 1-3. The basic methodological approach is to obtain quantity comparisons by means of price and expenditure comparisons. Comparisons are based on data supplied by the participating countries on prices and expenditures for more than 150 detailed final expenditure categories. By combining these expenditure categories, price level indices and parities are computed for expenditure aggregates such as the main components of GNP (consumption, capital formation, and government) and for GNP as a whole. The methods of making indirect estimates for

nonbenchmark years, and for countries that do not directly supply price and expenditure observations, are described in Robert Summers and Alan Heston, "A New Set of International Comparisons of Real Product and Prices and 130 Countries, 1950-85," *Review of Income and Wealth*, Vol. 34, No. 1 (March 1988), pp. 1-25.

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⁷ Alan Heston, "Real World Military Expenditures: 134 Countries, 1980" (University of Pennsylvania: ACDA Discussion Paper, 1990). In addition to presenting estimates of 1980 real military expenditures and military price levels for 122 market-oriented economies and 12 centrally planned economies, this paper contains a description of the data sources and methods employed. Alan Heston is one of the principal economists associated with the International Comparison Project Unit at the University of Pennsylvania.

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