IMF WORKING PAPER

WP/93/17 INTERNATIONAL MONETARY FUND

Fiscal Affairs Department and Research Department

Economic Consequences of Lower Military Spending:
Some Simulation Results

Prepared by Tamim Bayoumi, Daniel Hewitt, and Jerald Schiff [1]

Authorized for distribution by Ke-young Chu and Peter Clark

March 1993

Abstract

The IMF MULTIMOD model is used to trace the economic impact of a
20 percent reduction in world military expenditures. GDP falls in the short
run, however private consumption and investment rise, leading to an increase
in GDP in the medium and long run. The estimated gains to economic welfare
are substantial, particularly for developing countries, although most of
these gains are realized in the long run. A positive international economic
externality is found to exist, implying that for any given country the
economic gains from a coordinated reduction in military expenditures exceed
the gains from a unilateral reduction.

JEL Classification Nos.

F47, H56

Contents   Page

Summary

Recent changes in international politics offer the possibility of general reductions in military expenditures, the so-called "peace dividend." This paper reports the results from simulations designed to estimate the economic and financial impact of a 20 percent decrease in worldwide military expenditures. No attempt is made to measure the impact on security of lower military expenditures or to estimate its associated welfare impact.

The initial impact of lowering military spending is a modest reduction in the growth of GDP, with those countries whose military expenditures (in proportion to their GDP) are above the world average experiencing greater losses. At the same time, lower government spending reduces interest rates and allows governments to lower taxes, which raises private sector consumption and investment. In the medium and long run, GDP rises significantly above baseline values. Hence, in the short run military spending creates jobs and stimulates the economy, but in the long run it lowers economic growth by crowding out investment.

Tracing the movements of GDP provides insight into changes in total output and employment, but GDP is not an appropriate measure of economic welfare in the present case. The correct measure of economic welfare is the gain in current and future nonmilitary consumption. A 20 percent cut in military spending is estimated to produce long-run increases in both private consumption and investment in industrial countries. Economic welfare is estimated to rise by 48 percent of 1992 GDP, with those countries that implement the largest cuts having proportionally higher benefits. Less developed countries could experience gains in economic welfare that are significantly larger than those of industrial countries (79 percent of 1992 GDP).

Since most of the gains in economic welfare come in the longer run, these results are relatively insensitive to short-term factors such as the timing of tax cuts associated with lower government expenditures and the speed of the spending cuts. They are affected, however, by the size of the government spending multipliers and the percentage of military spending that is assumed to represent productive investment. Nonetheless, in all cases, the simulations indicate a substantial gain to economic welfare.

Another result that emerges from the simulations is that a positive international economic externality is found to exist. The economic benefits to all countries are found to be greater when a coordinated reduction in military expenditures is carried out than when a nation undertakes a unilateral decrease in military expenditures. This externality results from lower world interest rates and increased volumes of international trade. The external benefits to developing countries appear to be particularly pronounced. This externality implies that there are economic, as well as security, reasons for coordinating expenditure cutbacks.

I. Introduction

Recent changes in international politics, and in particular the easing of East-West tensions, offer many new challenges to the world economy. One of the most clear and tangible is the possibility of general reductions in military expenditures, the so called "peace dividend". Lower military spending, by reducing the resources allocated to this sector of the economy, should expand the resources available for non-military consumption and investment, providing more rapid growth and higher standards of living in both industrial and developing countries.

While there is widespread agreement that such economic benefits would result from reductions in military spending, there is uncertainty as to the likely size and distribution of these benefits, both over time and across countries. Reductions in government spending on the military will have significant macroeconomic effects, particularly upon interest rates, exchange rates and trade patterns, all of which will influence the size and distribution of gains from cuts in military expenditures. Furthermore, there is considerable concern, often expressed in the popular press, regarding short-term increases in unemployment and a lowering of economic growth that might result from decreasing military expenditures. Particularly in industrial countries, it is widely acknowledged that decreasing military outlays will force military contractors to shrink their labor force in response to reductions in government contracts.

This paper reports the results from simulations designed to estimate the economic and financial impact of a broad-based decrease in world military expenditures using the IMF MULTIMOD computer simulation model. The model, which simulates the financial interactions between countries based upon economic principles and observed data, is used to trace the potential effects of lower military spending on economic growth, international trade and world capital markets for the major industrial countries as well as country groups. Due to the nature of the analysis, the simulations necessarily reflect a number of underlying assumptions on both the nature of the cuts and the responses of the government and the private sector. Thus, sensitivity analysis will be carried out in order to determine the robustness of our results to changes in these assumptions.

This study concentrates on the economic impact of military expenditures and accordingly traces the effect of alternative military expenditure levels on private consumption and investment. The primary impact of military expenditures is on security rather than on the economy. However, the allocation of resources to the military has indirect economic effects and untangling the economic consequences provides an important input into overall policy decisions.

This study makes no attempt to measure the impact on security of lowering military expenditures or to estimate the associated welfare impact since such an analysis is outside the scope of economic analysis. Economic theory does, however, provide a rationale for government provision of security, since security displays the classic features of a public good. Additionally, from an international perspective, military expenditures by one nation impose a negative externality on other nations that feel

threatened. 1/ Thus, the security impact of a coordinated decrease in military expenditures is quite different from a unilateral reduction by one nation. While a unilateral decrease in military expenditures almost certainly decreases national security, a coordinated decrease in military spending has an uncertain impact on security since the reductions in security caused by domestic military cuts are counter balanced by the greater security provided by lower military spending in rival countries. 2/

This paper focuses on the economic consequences when each and every country reduces military expenditures by 20 percent over a five year period. The initial impact of lowering military spending is a general reduction in the growth of GDP, with those countries whose military expenditures (in proportion to their GDP) are above the world average experiencing greater losses. These losses stem from the short-term fall in aggregate demand caused by reducing government spending, and support the popular notion that decreasing military expenditures will have negative macroeconomic consequences in the short run.

At the same time, however, lower government spending reduces interest rates and allows governments to lower taxes or the fiscal deficit. This sets in motion a sequence of events that induces higher private sector investment and consumption. Lower business taxes and long-term interest rates raise private sector investment, which in turn increase the rate of growth of the capital stock and potential output, while the anticipation of higher future disposable income raises private consumption. This increase in private sector activity overcomes the initial setback to output, and GDP rises significantly above baseline values in the medium and long run. Thus, after an initial fall, reduced military spending produces significant longer run increases in GDP.

Tracing the movements of GDP provides insight into changes in total output, employment, and perhaps the distributional consequences of lowering military expenditures. However, GDP is not an appropriate measure of economic welfare in the present case. GDP incorporates a crude measure of the benefits of government expenditures; government nontransfer expenditures, and therefore military expenditures, are automatically recorded as part of GDP. Clearly, when a coordinated decrease occurs,

---

1/ Alternatively, higher military expenditure of an alliance will have a negative impact on the security of rival alliances.
2/ In theory, the means of correcting for the negative security externality would be to impose a military expenditure tax on all countries. Theoretically the tax would be proportional to the negative externality imposed on other nations and would induce each country to reduce their military expenditures in proportion to their price elasticity of demand for the military. Since neither the information required to calculate such a solution nor the institutional framework is available, an alternative policy is examined in the paper.

changes in the level of military spending by one country do not necessarily coincide with changes in security. 1/ Therefore, this analysis concentrates exclusively on measuring changes in <u>economic welfare</u>, or the gain in current and future non-military spending, which can be easily estimated in the MULTIMOD framework. 2/ Any economic benefits provided by the military will eventually be transmitted through increases in civilian economic activity.

The economic welfare effects of a coordinated decrease in military spending can be quite different from the impact on total output. The initial fall in GDP compared to baseline values described above may obscure a rise in economic welfare in the short term. To the extent that cuts in military expenditures lead to immediate increases in non-military consumption, the immediate impact on economic welfare will be positive, even if GDP falls. The notion that "military expenditures are good for the economy" can only be true to the extent that they induce higher overall private sector activity. The results from the simulations in this study indicate that in the longer-term there is little question that military spending crowds out private consumption, and, in many cases this crowding out of private sector activity holds even in the short run.

Another interesting result that emerges from the simulations is that a positive international economic externality is found to exist. The economic benefits to all countries are found to be greater when a coordinated reduction in military expenditures is carried out than when a nation undertakes a unilateral decrease in military expenditures. This externality results from lower world interest rates and increased volumes of international trade. The external benefits to developing countries appear to be particularly pronounced.

The remainder of this paper is organized in the following manner. Section II provides background information on related research and the data. Section III describes the MULTIMOD model and summarizes the results for the industrial countries, developing countries, and the U.S. Section IV discusses the results in other industrial countries. Section V analyzes the results for developing countries. Section VI concludes.

1/ Even in the case of a unilateral decrease in military spending, GDP will only provide an accurate measure of the welfare when the spending on the military is at the social optimum and if other countries do not react to the changes.

2/ Since non-military government spending is assumed to be unchanged in the simulations, the gain to private sector consumption is used to measure the gain in welfare.

II. Literature Review and Background

1. Military expenditures and economic growth

The question of whether military expenditures promote economic growth or are detrimental to growth remains largely unsettled. Some people believe that the military creates jobs and is generally good for the economy. The case of the U.S. recovery from the depression during World War II and the high economic growth following the war is often offered as an example. Alternatively, the simple theory of opportunity costs implies that military expenditures will crowd out other types of expenditures, including private investment, with negative consequences for growth. The post World War II economic successes of Germany, Japan and Italy are often cited as counter examples.

At a more academic level, studies inspired by Benoit (1973) have found a positive correlation between military expenditures and the rate of economic growth in empirical studies using a cross section of countries. The explanation of the mechanism through which this comes about has always been somewhat weak. Followers of the Benoit thesis seem to subscribe to two views. First, military expenditures provide a beneficial macroeconomic stimulus to an economy. Second, the military can be a force for modernization, technological advancement, and training in developing countries and a source of technological innovation in industrialized countries. An alternative thesis is offered in Kohler (1988) who finds that the level of capital formation is positively associated with expenditures on military equipment and negatively associated with expenditures on military personnel in African countries. The conclusion offered is that the former promotes security, which induces more private investment, while the latter does not.

Deger (1986), on the other hand, offers evidence that military expenditures are detrimental to growth in a cross section of countries. In a simultaneous equations system, the direct impact of military expenditures on economic growth is indeed found to be positive. However, high military expenditures are associated with low savings ratios, which in turn leads to low economic growth; this effect turns out to be larger than the direct effect of military expenditures. These results suggests two opposing effects. On the one hand, a short term positive relationship exists between military expenditures and economic growth due to macroeconomic stimulus of increasing government spending. In the long term, military spending lowers the savings rate and therefore causes the steady state rate of economic growth to fall.

A new generation of studies investigates the direction of causality. Chowdhury (1991), Joerding (1986), and LaCivita and Frederiksen (1991) use Granger causality tests to investigate the connection between military spending and economic growth. All three find a feedback relationship for at least some countries, which suggests a complicated interaction between military spending and economic growth. Furthermore, the results provide

clear evidence that higher military spending leads to lower growth, but that higher growth induces higher military spending. In Chowdhury's study, although no significant relationship is found for 55 percent of the 55 countries covered in the study, military spending is found to lower economic growth in 35 percent, and economic growth causes higher military spending in 15 percent. 1/ LaCivita and Frederiksen find that among 21 countries investigated no significant relationship was found for 19 percent, in 38 percent military expenditures were found to have a negative impact on economic growth, and in 43 percent high growth was found to have a positive impact on military expenditures. 2/ Hewitt (1992) finds clear evidence that economic prosperity leads to higher military expenditures among developing countries. Thus, a simple correlation between high growth rates and high military expenditures could be interpreted as evidence that military expenditures are a "superior good."

In recent years, a number of simulation studies of the economic effects of reducing military expenditures have been published. Leontief and Dutchin (1983) conduct simulations in an input-output framework which confirm the long run economic gains from cuts in military expenditures. They note, however, that even if a substantial portion of the savings to the industrial countries were transferred to LDCs in the form of increased aid, the LDCs be unable to close the economic gap appreciably unless substantial structural changes were made. Atesoglu and Mueller (1990) find that military expenditures have a positive short-run effect on economic growth, but conclude that the impact is relatively small. Thomas, Stekler, and Glass (1991) use a macroeconomic model to simulate the effects of reducing military expenditures and find that there is a negative short-run effect on real output, employment, and the price level.

The simulation results herein differ substantially from those listed above mainly due to the use of the MULTIMOD framework. First, the short run macroeconomic effects of changes in the pattern of government expenditures can be distinguished from the long term economic growth effects. Second, the international trade effects are examined in detail, which provides insight into international linkages in the impact of military spending cuts. Third, this study provides estimates of the present value of the economic benefits from reducing military expenditures and thereby more fully analyzes

---

1/ For 16 countries military expenditures is found to cause lower economic growth, in 6 countries higher growth is found to cause higher military spending, in 2 countries both effects are present, and in 2 countries higher growth is found to cause lower military spending.

2/ The study itself provides no data on the direction of the causality, however, the authors provided details in personal correspondence. In 8 countries military spending is found to cause lower growth while in 5 countries the opposite effect is found. In 9 countries higher growth is found to cause higher military spending and the reverse effect is found in 5 countries. The authors cautioned that when a feedback relationship exists, causality should be determined in a simultaneous equations framework.

the long run implications. Two other simulation studies have recently been published that use a similar model, the McKibbin-Sachs Global Model, to examine the economic impact of decreased military expenditures. Congressional Budget Office (1992) investigates the impact of a cutback of U.S. military expenditures, and analyzes the differential regional/state impact and the effects on specific industries. McKibbin and Thurman (1992) carry out a simulation of a decrease in military expenditures by OECD countries, focusing on the differential impact of the timing of the cuts and of alternative monetary regimes. The results in these two papers are in many ways complimentary with those in this one, which concentrates on the impact of cuts in military spending on international economic linkages and economic welfare.

2. Military expenditures, imports, and exports

The simulations are based upon average levels of military expenditures, military imports and military exports during 1987-89, as shown in Table 1. The data on military expenditures comes from the Stockholm International Peace Research Institute (SIPRI), which are generally believed to be the most accurate estimates of levels of military spending available. 1/ Trade data were taken from the U.S. Arms Control and Disarmament Agency (ACDA), which is widely regarded as the best available source for this data.

The majority of world military expenditures are associated with industrialized countries, which account for 56 percent of total world military expenditures (3.7 percent of GDP). Within this group, the U.S. accounts for one third of world military expenditures (6.1 percent of GDP), while other industrialized nations spend considerably less, both in absolute value and as a share of GDP. The U.S. holds a similarly dominant position with respect to exports. Arms exports represent only 1.2 percent of total industrial country exports, with one third of these exports going to other industrial countries and two thirds to the rest of the world. For the U.S., however, arms exports are more significant, representing 4.3 percent of total exports. Arms exports are also relatively high in the United Kingdom (2.2 percent of total exports) and France (1.6 percent of total exports). These three countries are also those which tend to provide various forms of military assistance. For instance, direct U.S. military assistance was US$ 5 billion annually during this time period. In addition, trade credit is also regularly provided for military purchases. As a consequence, the level of net earnings from the sale of arms is relatively insignificant for these economies in question: relatively little income is gained from purely non-domestic financing of military goods.

1/ SIPRI does not provide estimate for the U.S.S.R. and China; Steinberg (1992) and ACDA were used for these two countries.

Table 1. Military Expenditure, Arms Exports, and Arms Imports, 1987-89 Average

	Military Expenditures	Arms Exports	Arms Imports	Military Expenditure	Arms Exports	Arms Imports	Arms Exports	Arms Imports
	(In percent of GDP)			(In billion U.S. dollars)			In percent of country's Total	
							Exports	Imports
Industrial countries, average	3.68	0.17	0.07	503.0	22.7	8.1	1.18	0.42
United States	6.07	0.28	0.04	296.1	13.4	2.1	4.29	0.57
Japan	1.00	0.00	0.04	26.8	0.1	1.2	0.04	0.52
Germany, Federal Republic	2.96	0.11	0.07	34.3	1.3	0.9	0.41	0.29
France	3.78	0.29	0.02	35.4	2.7	0.2	1.62	0.13
Italy	2.32	0.04	0.03	19.8	0.3	0.3	0.25	0.20
United Kingdom	4.25	0.41	0.08	33.2	3.1	0.6	2.17	0.41
Canada	2.03	0.12	0.04	9.8	0.6	0.2	0.49	0.17
Smaller industrial countries 1/	2.30	0.08	0.25	47.6	1.2	2.7	0.25	0.55
Eastern Europe & U.S.S.R.	14.35	1.31	0.22	269.0	24.3	3.9	9.80	1.60
Developing Countries	4.15	0.14	1.03	125.0	5.4	40.3	0.85	6.38
Net creditor countries 2/	7.05	0.02	2.03	30.9	0.1	9.0	0.07	8.98
Net debtor countries 3/	3.70	0.16	0.87	94.1	5.3	31.3	1.05	5.66

Sources: ACDA, SIRPI, IFS, Steinberg.

1/ Australia, Austria, Belgium, Denmark, Finland, Greece, Iceland, Ireland, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, and Switzerland.

2/ Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Taiwan Province of China, United Arab Emirates.

3/ See Masson et. al. (1990) for a list of countries incorporated in the analysis.

Although Eastern Europe and the U.S.S.R. are not included in the simulation analysis, examination of their data is important to any analysis of worldwide military expenditures and trade in arms. Further, they provide an interesting perspective on the military policies of other countries. These countries spent about US$ 269 billion on the military (14.4 percent of GDP) in 1987-89. 1/ Net military exports, presumably to developing countries, are estimated to be 8.2 percent of total exports. This clearly would represent a significant source of income, to the extent that the recipients actually paid for the military goods that they received. However, it is likely actual receipts were only a fraction of the value assessed by ACDA.

The data on developing countries indicate that in total, they spent US$ 125 billion on the military, 4.2 percent of GDP on average. However, the eight net creditor nations 2/ accounted for one quarter of this total with military expenditures to GDP of over 7 percent. The other developing countries (the net debtor developing countries) had a ratio of military expenditure to GDP that matched that of the industrialized nations, 3.7 percent. The net creditor countries also accounted for about one quarter of arms imports by developing countries (9 percent of total imports). Furthermore, for the most part these countries are known to have paid full price for the arms they received without the assistance of concessionary financing.

The arms imports of the net debtor countries are estimated at US$ 31 billion, 5.7 percent of total imports. This is quite significant compared to the estimate of official development assistance of about US$ 50 billion in 1988. However, these countries also received considerable amounts of military aid in the form of grants and concessionary loans associated with arms imports from the industrialized countries and discounts from the U.S.S.R. Through examining related data, Hewitt (1992) estimates that as much as 80 percent of the assessed value of military imports by net debtor developing countries could have been aid financed. This implies that domestically financed payments for military imports were probably a less significant part of overall domestic expenditures than the total figures would suggest. It is also worth noting that a good deal of the imports of arms is carried out by middle income developing countries. For instance, 40 percent of the imports of net debtor countries is accounted for by Middle East and North Africa.

1/ All the estimates related to these countries suffer from valuation problems. Even if a reasonably accurate ruble estimate exists, the conversion factor into US dollars is relatively arbitrary. In the data used in Table 1, the conversion for military expenditures is based on official exchange rates. Those for military trade, which come from a different source, are based upon valuation methods employed by the U.S. government.

2/ Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Taiwan and the United Arab Emirates.

III. Simulation Results

The simulations below use MULTIMOD, a multi-region econometric model designed to analyze the economic interactions among industrial and developing countries. The main linkages among the regions are through trade, exchange rates, and interest rates. Imports of the industrial and capital-exporting developing countries are functions of relative prices and aggregate demand, while imports by other developing countries depend upon the amount of available foreign exchange. Short-term interest rates depend on monetary policy through the money demand equations, while long-term interest rates are a moving average of current and expected future short term rates. Nominal exchange rates are determined by relative interest rates. 1/

For the purposes of this paper three features of the model are particularly important. It is a rational expectations model, which means that in those markets where future expectations are particularly important (in particular exchange rate and bond markets), future behavior feeds back into current prices. It has a well defined supply side based on a production function, so that changes in investment feed through into higher potential output in the future. Finally, the trade equations take account of the geographic distribution of trade across different economies.

At the same time the limitations of the highly aggregated MULTIMOD framework should be recognized. It combines all government spending, which limits the extent to which the simulations can be used to analyze the impact of changing the composition of government spending. The structure of the model also limits the extent to which issues related to the conversion from military to civilian production can be explicitly analyzed. While the initial decline in output reflects the implicit assumption that capital and labor are less than perfectly mobile, the aggregate production functions take no account of the fact that some capital currently used in the production of military output may not be convertible to civilian production. 2/ To the extent that this is the case, the capital stock, and hence output, will tend to be smaller than suggested by the simulations. However, this effect is unlikely to be large. The percentage of the world's capital stock engaged in military production is small, and will depreciate over time, allowing the capital stock in this sector to return to equilibrium.

The simulations are all expressed relative to a scenario corresponding to the projections of Multimod for each country and country group published in the May 1992 World Economic Outlook. Thus, each result

---

1/ A more extensive description of the properties of the model is contained in Appendix 1. Masson, Symansky and Meredith (1990) provide a detailed description of the model.

2/ The argument that military spending provides technological spinoffs for civilian industries suggests that conversion may not be particularly difficult.

reported in the tables represents a <u>deviation from the Baseline</u> caused by the policy changes associated with each simulation. In the primary policy change considered here, the <u>Main Case</u>, all countries simultaneously carry out a 20 percent reduction in military expenditures in equal increments over five years. Each nation is assumed to also lower its military aid, military imports, and military exports by the same percentage over the same period, so the cut can be thought of as a phased reduction in all types of military spending. In terms of MULTIMOD, government consumption was lowered by 20 percent of the average value of military spending over 1987-89 (as a percentage of GDP). 1/ The residuals on the trade equations were changed so that the first round effects on trade corresponded to the data on military trade, and the assistance to capital importing developing countries was also reduced. Since trade connected with military spending is relatively small, the initial fall in trade is smaller than would be predicted by a standard simulation. This produces responses which are significantly different from a standard government spending simulation. In particular, countries with relatively high military spending require larger devaluations of their exchange rate in order to bring their trade back into balance, as the relatively domestically orientated military spending is replaced by more import intensive consumption and investment.

The results from several other simulations are reported. In the first two, it is assumed that all nations simultaneously decrease their military spending by 20 percent as in the Main Case. In the <u>Accelerator Model</u>, the possibility that investment will be adversely effected by the fall in military spending is accounted for. In the <u>Investment Model</u>, the possibility that military spending has a positive impact on civilian productive capacity is taken into account. As far as government policy is concerned, it is assumed that governments adjust taxes (or government transfers, which are equivalent to negative taxes in the model) in order to keep the fiscal deficit unchanged. Alternative scenarios indicate that if instead the deficit is lowered (i.e., tax cuts are delayed), the short term output losses are larger but the long run economic gains are similar. On monetary policy, it is assumed that the monetary authorities in most of the industrial countries follow a target path for the money supply, which, in the face of cuts in government consumption and hence downward pressure on the price level, leads to a fall in interest rates. 2/

The simulation results in Table 2 show the percent change from the baseline caused by the policy shift for the two major country groups and a sample of major countries (see Appendix Table 5 for more details). The cut

---

1/ The baseline used in these simulations was based on the projections in the May 1992 World Economic Outlook produced by the IMF.

2/ France, Italy, the UK and the smaller industrial countries are assumed to participate in the exchange rate mechanism (ERM) in Europe, and hence to keep their exchange rates fixed to the Deutsche Mark. See McKibbin and Thurman (1992) for a fuller discussion of the effect of how different assumptions about monetary policy might effect the results.

Table 2. Sample Simulation Results: Main Case 1/

(In percent deviation from Baseline)

	Government Consumption	GDP	Private Consumption	Private Investment	Short Term Interest 2/	Long term Interest 2/	Exchange Rate	Exports	Imports
Industrial Countries									
Year 1	-0.8	-0.1	0.0	0.5	0.1	0.1	0.1	-0.0	-0.0
Year 5	-4.0	-0.0	0.6	1.7	-0.0	-0.3	0.0	0.1	0.0
Year 8	-4.0	0.3	1.0	2.0	-0.3	-0.2	0.0	0.6	0.2
Unites States									
Year 1	-1.4	-0.1	0.0	0.5	0.1	0.0	-1.7	0.3	-0.6
Year 5	-7.4	-0.0	0.8	1.8	-0.0	-0.3	-2.2	0.7	-1.4
Year 8	-7.4	0.3	1.2	2.2	-0.4	-0.3	-1.9	1.5	-1.2
Japan									
Year 1	-0.3	-0.0	0.0	0.4	0.0	-0.1	2.5	-0.4	0.8
Year 5	-1.5	0.1	0.4	1.1	-0.1	-0.2	2.9	-0.9	1.4
Year 8	-1.5	0.2	0.6	1.2	-0.2	-0.1	2.6	-0.4	1.7
France									
Year 1	-0.7	-0.1	-0.0	0.2	0.3	0.3	0.2	-0.0	-0.0
Year 5	-3.6	-0.1	0.5	1.9	0.0	-0.4	0.3	0.4	0.2
Year 8	-3.6	0.5	1.0	2.4	-0.5	-0.3	0.2	0.9	0.2
Net Debtor Developing Countries									
Year 1	-0.8	-0.1	0.0	-0.5	n.a.	n.a.	0.0	0.0	-0.6
Year 5	-3.9	-0.1	0.0	0.4	n.a.	n.a.	0.2	0.3	-1.5
Year 8	-3.9	1.1	1.1	3.5	n.a.	n.a.	0.2	0.5	-0.4

Source: Appendix Table 5.

1/ Assumes a 20 percent reduction in military expenditures, military exports, and military imports phased in over five years.

2/ Percentage point change.

Table 3. Sample Simulation Results: Alternative Simulations

(In billions of 1992 U.S. dollars)

| | Military Spending | Main Case | | Alternative Simulations | | | | | |
| | | | | Accelerator Model 1/ | | Investment Model 2/ | | U.S. Only 3/ | |
		GDP	Consumption	GDP	Consumption	GDP	Consumption	GDP	Consumption
Industrial Countries									
Year 1	-27.2	-11.6	1.2	-20.9	-0.6	-8.8	2.1	2.8	4.5
Year 5	-153.2	-0.6	80.1	1.2	71.9	-4.5	54.7	8.1	58.8
Year 8	-164.9	76.5	135.0	52.3	112.7	40.9	87.6	37.1	85.9
Unites States									
Year 1	-15.0	-3.8	0.2	-9.0	-1.1	-3.5	0.6	-2.4	-0.2
Year 5	-84.7	-3.4	38.8	-4.0	35.6	0.0	30.0	-6.4	31.6
Year 8	-91.1	25.9	61.7	18.4	54.0	15.4	45.5	18.5	50.1
Japan									
Year 1	-1.7	-0.8	0.8	-1.7	0.8	0.0	0.8	0.0	0.8
Year 5	-9.2	5.9	11.7	5.0	10.0	3.3	6.7	4.2	6.7
Year 8	-10.0	12.5	17.6	10.0	14.2	6.7	10.0	7.5	9.2
France									
Year 1	-1.3	-1.3	-0.2	-1.5	-0.2	-0.9	-0.1	-0.1	0.4
Year 5	-7.6	-0.6	3.2	-0.3	2.9	-0.6	2.1	0.7	1.7
Year 8	-8.1	5.2	6.6	3.8	5.4	3.1	4.2	0.9	2.2
Net Debtor Developing Countries									
Year 1	-7.7	-5.8	0.0	-8.8	-0.8	-6.1	0.4	-0.2	0.7
Year 5	-47.8	-5.7	1.2	-9.9	-4.9	-13.4	-3.9	-0.7	0.6
Year 8	-51.4	76.0	45.6	66.7	29.4	56.1	25.7	4.4	4.5

Source: Appendix Table 6.

1/ Assumes investment is more responsive to short-term fluctuations in output.
2/ Assumes 20 percent of military expenditure represents productive investment.
3/ Assumes that the U.S. unilaterally reduces military spending by 20 percent.

Table 4. Present Value of Costs and Benefits of Reducing Military Spending 1/

	1993 to 2000	Beyond 2000	Total Gain	1993 to 2000	Beyond 2000	Total Gain
	(In billion 1992 U.S. dollars)			(In percent of 1992 GDP)		
Industrial Countries						
Military spending	-750	-6025	-6775	-4.3	-34.2	-38.5
Main Case 2/	446	8024	8469	2.5	45.6	48.1
Accelerator Model	384	6503	6887	2.2	37.0	39.1
Investment Model	299	4916	5215	1.7	27.9	29.6
U.S. Only	319	4841	5159	1.8	27.5	29.3
United States						
Military spending	-415	-3329	-3744	-7.0	-55.8	-62.8
Main Case	211	3267	3478	3.5	54.8	58.3
Accelerator Model	188	2807	2995	3.1	47.1	50.2
Investment Model	161	2299	2460	2.7	38.6	41.3
U.S. Only	170	2595	2764	2.8	43.5	46.4
Japan						
Military spending	-46	-367	-413	-1.2	-9.3	-10.4
Main Case	65	1192	1257	1.6	30.1	31.8
Accelerator Model	54	978	1032	1.4	24.7	26.1
Investment Model	38	672	710	0.9	17.0	17.9
U.S. Only	36	642	678	0.9	16.2	17.1
France						
Military spending	-37	-297	-334	-3.0	-24.1	• -27.1
Main Case	18	407	425	1.5	33.0	34.5
Accelerator Model	16	325	341	1.3	26.4	27.6
Investment Model	12	307	318	1.0	24.9	25.8
U.S. Only	10	137	146	0.8	11.1	11.9
Net Debtor Developing Countries						
Military spending	-230	-1879	-2109	-4.6	-37.3	-41.8
Main Case	57	3913	3970	1.1	77.6	78.7
Accelerator Model	15	4169	4184	0.3	82.7	83.0
Investment Model	17	3776	3793	0.3	74.9	75.2
U.S. Only	11	181	192	0.2	3.6	3.8

Source: Appendix Table 7.

1/ See Table 3 and the text for a description of the different simulations.
2/ In each case, total benefits: consumption plus investment gains.

in military expenditures is recorded as a fall in real government spending. The movements in other variables will be discussed below. Table 3 lists the dollar values of the changes in military spending, GDP, and consumption for the main simulation and the alternative simulations. Table 4 lists the present value of the benefits.

1.   Aggregate world results

The long-run reduction in world military expenditures among industrial countries is about $160 billion. 1/ The developing countries are assumed to decrease military spending by $50 billion. 2/ Most of the countries in Eastern Europe and the former Soviet Union are not covered in the simulations. The long run reduction in military expenditures in both industrial and net debtor developing countries is equivalent to 0.75 percent of GDP, with decreases occurring in increments of 0.15 percent of GDP in each of the first five years.

For industrial countries the simulation results show a decrease in GDP in 1993 of $12 billion, less than 0.1 percent of GDP, compared to a cut in military spending of $27 billion. This reflects the boost to private sector spending caused by current and future reductions in taxes and interest rates. Private consumption rises by $1 billion in the first year and investment increases by $16 billion (see discussion below). Over the next four years, as military spending continues to fall, the output losses become smaller as private consumption and investment rise steadily to $80 billion and $65 billion above baseline, respectively. 3/ By the sixth year of the simulation, after all decreases in military expenditures have stopped, the economic performance of industrial countries is considerably improved. In the main case, GDP is up $38 billion (0.1 percent), consumption is up $104 billion (0.8 percent), and investment is up $78 billion (1.9 percent).

From the sixth year onward, economic growth begins to accelerate, and by the year 2000 GDP is 0.3 percent higher than would have been expected ($77 billion). Consumption is 1.0 percent higher than the baseline ($135 billion), and investment remains about 2 percent higher. Thus, due to the increased investment in the intervening years, the annual level of consumption increases by almost the full amount of the original decrease in military expenditures.

1/ Throughout the text, all the dollar figures are in 1992 real dollars.
2/ This includes some of the countries of Eastern Europe.
3/ This result is, however, sensitive to the assumptions in the simulation. Alternative simulations which incorporate a delayed reduction in tax rates, or longer accelerative effects in the investment equation, produce larger falls in economic activity. Indeed, both private consumption and investment could fall in the short-run. The long-run gains are, however, similar in these simulations.

The long-run change in economic welfare can be estimated by calculating the present value of the rise in private consumption over time. 1/ Over the period 1993 to 2000 this can be calculated directly, using the results from the simulation. From the year 2000 onwards, however, it was necessary to calculate the gains assuming that the values of consumption and investment as a share of GDP in the year 2000 represented the new long-run levels. The overall gains to consumption implied by permanently higher consumption, and by the increased growth implied by higher investment, were then calculated. The gains to economic welfare, based on a discount rate of 4 percent and underlying economic growth of 2 percent (see Appendix II for more details), can be split into three parts: (a) the rise in consumption between 1993 and 2000, estimated at $446 billion; (b) the long term gains in consumption based on the level reached in the year 2000, estimated at $4,933 billion; and (c) the increase consumption associated with the higher long term level of investment, estimated at $3,090 billion. The estimated present discounted value of the total long run gains for industrial countries sum to $8.4 trillion, 48 percent of 1992 GDP. 2/

The long-run gains in proportion to GDP are larger in those countries with a large military sector, in particular the U.S., and smallest in those with a small military, such as Japan. However, because of positive international economic externalities, these differences are significantly smaller than the differences in the underlying cuts. For instance, relative to GDP, the military cuts in Japan are assumed to be only 1/6 of those in the U.S., while the economic gains are over half of the U.S. value.

For the net debtor developing countries, the simulation results indicate that GDP falls by between 0.1 and 0.2 percent over the first 5 years, an accumulated loss of $50 billion. However, the loss in output is considerably smaller than the accumulated reductions in military expenditure, which total $134 billion over the same period. In the longer run GDP rises by 1.1 percent, with much of this offset coming from private sector investment, which is 3.5 percent ($61 billion) higher by 2000. For the net debtor nations, the decrease in worldwide military expenditures has a more pronounced economic impact than for industrial countries. The initial GDP decrease is larger, however the impact on investment is also

---

1/ No analysis is made of the distributional effects of a decline in military spending across different sectors and regions, an issue of clear economic as well as political significance. The conversion from military to civilian production would inevitably lead to increased unemployment in the short run, which would be concentrated in particular geographic regions and industries within countries. For this reason changes in GDP, which likely mirror trends in unemployment, are also important for a full understanding of the impact of cuts in military spending. See CBO (1992) for a discussion of these factors in the US context.

2/ The present discounted value of the foregone military expenditures is estimated to be $6.8 trillion, 38 percent of 1992 GDP.

greater, so that the long term gains are commensurately higher. These
countries benefit considerably from the international economic externality.

2.   U.S. results

     In order to fully explain the derivation of the simulation results, the
economic impact on individual economies must be traced. For expositional
ease, the analysis will trace the impact on one economy, the U.S., in some
detail and then discuss the results in other countries in comparison to this
country. This will enable a combined discussion of the economic linkages in
MULTIMOD along with a detailed description of the results.

     The United States was chosen because it is the largest economy, has the
largest level of military spending (30 percent of total world military
expenditure), and allocates an above average share of GDP to the military.
During 1987-89 military spending in the U.S. represented 6 percent of GDP.
A 20 percent reduction implies a total cut of $75 billion per annum
(7.4 percent of government expenditure), assumed to be phased in evenly over
5 years. As might be expected, the short-term impact of this is to reduce
GDP below baseline values. This fall in GDP reflects a drop in aggregate
demand from shifting expenditures from the public sector to the private
sector via the cut in taxes--the opposite of the balanced budget multiplier.
Since the cuts in military expenditure are spread out over 5 years, real GDP
is still below baseline in the fifth year, before rebounding from 1998
onwards.

     These losses in output are, however, relatively small; over the first
5 years the cumulative loss in real GDP is some $9 billion (less than
0.03 percent of GDP) compared to cumulative expenditure cuts of
$245 billion. 1/ The small initial losses reflect the stimulation to
private consumption and investment caused by lower interest rates and taxes.
Given that agents are forward looking, these expenditures are stimulated by
both current and by anticipated future reductions in these variables. Since
the cuts are phased in over several years, the short-run stimulus to these
variables is relatively large in comparison to the initial expenditure cuts,
and the short-term losses to GDP correspondingly smaller. Private
consumption increases slightly in the first year and continues to increase
over the simulation, reaching $62 billion above baseline by the year 2000, a
rise of 1.2 percent. Overall, the present value of the increase in
consumption is $211 billion over the course of the first 8 years (1993-
2000). Investment expenditures rise initially by 0.5 percent, and by over
2 percent ($28 billion) by the year 2000.

     Over time, the increase in the capital stock caused by higher
investment leads to a more than full recovery of GDP. The impact of

---

     1/ If military expenditures were cut more rapidly, the decrease in GDP
relative to the baseline estimates would be shorter but steeper ($16 billion
lost in 3 years).

military spending cuts on GDP turns positive after 6 years and from there onward rises quite substantially. By the year 2000, GDP is 0.3 percent higher than it otherwise would have been. Hence, while in the short term there is a tradeoff between military expenditures and the level of the GDP, in the medium term no such tradeoff exists because the higher level of investment expenditure causes an increase in the GDP growth rate. Eventually, the GDP level surpasses the level that it would have attained without the change in military spending.

The present value of the consumption gains are calculated in three parts (see Appendix II for a full explanation). The short and medium term consumption gains (up to the year 2000) are estimated at $211 billion. The long term direct consumption gains are estimated at $2,255 billion, while the future consumption gains associated with the higher level of investment are estimated at $1,012 billion. Thus the total economic welfare gain is $3,500 billion (58 percent of 1992 GDP). 1/ It should be stressed that most of the gains accrue in the very long term. By the year 2000 the overall gain to consumption is only 3.5 percent of GDP, less than 7 percent of the eventual total.

3. <u>Trade and financial flows: the positive international externality</u>

The basic effect of cutting military expenditure is to lower U.S. interest rates due to the reduction in government spending. In the medium-term, as the price level falls, the fixed monetary target implies lower interest rates. By the year 2000 short- and long-rates are 0.4 and 0.3 percentage points lower than in the baseline, respectively. In the short-run, however, interest rates rise. The reason for this is that there is an initial depreciation in the currency, which causes a rise in inflation. The increase in the price level raises nominal demand, which raises interest rates; in countries such as Japan, where the exchange rate appreciates, interest rates fall immediately.

The exchange rate depreciation (the real effective exchange rate falls by 1.2 percent in the first year) reflects the fact that the U.S. implements the largest cuts in military spending. Since the U.S. spends more on the military than other countries, the long-run fall in its interest rates is larger than in its competitors. Future falls in interest differentials result in a depreciation in the current nominal exchange rate, reflecting expectations of future appreciations in the rate. 2/ It also reverses the negative initial impact on net exports caused by the replacement of military spending by relatively import-intensive private sector consumption and

---

1/ By contrast, the present value of the rise in overall output is only 14 percent of 1992 GDP, reflecting the cuts in military spending. This highlights the importance of recognizing that the welfare gain is based upon the gains in consumption, not the change in GDP.

2/ This is the effect highlighted in the overshooting exchange rate model of Dornbusch (1976).

investment. The depreciation of the U.S. dollar leads to a boost to net exports and an improvement in the current account; by 2000 real exports are 1.5 percent higher and imports 1.2 percent lower than in the baseline, while the current account improves by $11 billion. More generally, countries with a large military budget (in particular the U.S.) experience a depreciation in their exchange rate, while those with a small military budget (such as Japan and Canada) experience an appreciation. This real exchange rate effect means that part of the aggregate consumption gains from countries with relatively large cuts in military spending benefits economies whose cuts are smaller. These external benefits are quite significant; real net exports represent almost a quarter of the rise in U.S. non-military output by the year 2000, although, since the U.S. would be running a current account surplus, some of the rise in net exports reflects an accumulation of international assets.

An implication of this external factor is that the economic welfare gains for any one country are larger when military expenditure cuts are carried out in conjunction with other countries, rather than unilaterally. This can be confirmed by comparing the results from the main case with a simulation in which only the U.S. cuts its military spending, Table 3. The U.S. suffers greater short-run losses in output, as downward pressure on world interest rates is weaker. In the long-run, U.S. welfare gains are about 20 percent lower than when all countries cut simultaneously.

IV. Other Industrial Countries

In **Japan**, military expenditures represent approximately 1 percent of GDP, the smallest ratio of all of the G7 countries. Because of Japan's relatively low military expenditures in proportion to GDP, two very different results occur. First, the initial fall in output is short lived and mild in comparison to the U.S.; real GDP growth is reduced in the first year, by $1 billion, but already by the second year it is above the baseline and continues to increase thereafter. Second, the long-run gains are also smaller in Japan than in the U.S. relative to GDP, although the terms of trade effect means that they are larger than might initially be expected. By the year 2000, real GDP is predicted to be $13 billion higher annually. Because the yen appreciates 3 percent, real net exports fall and real consumption and real investment both rise by about $17 billion, significantly larger than the gain to output, and produced by military expenditure cuts of just $8 billion per annum.

The total increase in the present value of consumption is $1.3 trillion, or 32 percent of 1992 GDP. Hence, in relative terms, the Japanese gain is slightly over half of that of the U.S. As might be expected given the small size of the military sector in Japan, much of the economic gains are attributable to positive externalities from cuts in military spending in other countries, transmitted through international trade, rather than the domestic cuts themselves. Comparing the results from a global reduction in military spending with those from a unilateral cut by

the U.S. alone, it appears that approximately half of the economic gains to Japan are attributable to the U.S. decreases in military expenditures alone.

Germany holds an intermediate position between the U.S. and Japan, with military expenditures of 3 percent of GDP during 1987-89. The results also fall between those of the U.S. and Japan. The exchange rate appreciates relative to the dollar, but remains largely unchanged in effective terms, and exports and imports both rise by around 1/2 percent. As in Japan, output is already higher than in the baseline by 1994, reflecting the positive response of output to lower interest rates and the impact of the ERM, as discussed below. Long-run gains are sizable; by 2000 GDP is $6 billion higher, and consumption and investment $9 billion higher (with military spending $12 billion lower). The present value of consumption rises by 42 percent of GDP, larger than the gains to Japan but somewhat lower than the U.S. The positive international economic externality is also apparent in the case of Germany and appears to account for approximately half the gains.

Among the other EC countries, the short-term effect of the cutbacks in military spending is magnified by the assumption that they are in the ERM (if these countries are not assumed to be in the ERM then the overall results can be inferred from those of the non-ERM countries). Because the currencies of these countries are in the ERM, and hence assumed to be pegged to the German mark, fiscal policy in general has a greater impact in these countries than in those countries operating under a floating exchange rate regime. The impact of the spending cuts on those countries in the ERM depends in large part on the size of these cuts compared with those made in Germany. For instance, in France and the U.K., in which military spending is a larger proportion of GDP than in Germany, short-term output losses are relatively large. Indeed, in relative terms, they are significantly larger than in the U.S. The long-term gains, which are largely unaffected by the ERM, are similar to those of Germany; by 2000, consumption increases by around 1 percent in both countries, while investment rises by between 2 percent and 3 percent. In Italy and the smaller industrial countries (which, for simplicity, are all assumed to be members of the ERM) military spending is less important than in Germany, and results are correspondingly more favorable. Italy, for instance, experiences almost no short-run output loss. The long-term gains for both Italy and the smaller industrial are very similar to those of Germany. The positive international economic externality appears to account for somewhat less than half the total gains for Italy.

V. Developing Countries

For developing countries, the MULTIMOD simulation is not as sophisticated as with the industrial countries. In the first place, only two categories exist: net creditor and net debtor countries. 1/ Secondly, the variables are more aggregated within the two developing countries groups, and the behavioral equations are less well developed. Nevertheless, a broad overview of the impact on these countries can be outlined and some suggestive findings observed.

For net creditor countries, primarily oil exporters, military expenditures are a relatively high 7.1 percent of GDP. Military imports represent a major share of total imports for this group, and for the most part these countries pay for these imports themselves without the use of military aid. 2/ Since a large portion of military expenditures represent imports, costs of conversion would be low since non-military imports can be easily substituted for military ones. As a result, cuts in military spending are immediately replaced by higher private consumption and investment. For these countries the reduction in military spending of about 1.4 percent of GDP is replaced approximately one-for-one by consumption and investment. The present value of this rise in private sector expenditures is 80 percent of 1992 GDP ($569 billion), significantly greater in relative terms than the effect in the U.S., reflecting the high level of initial military expenditures.

For the net debtor developing countries, total military expenditures represented 3.7 percent of GDP on average. Imports accounted for 0.9 percent of GDP or 23 percent of total military expenditures. However, very few countries actually pay for their military imports. 3/ In order to account for this factor, in addition to reducing exports and imports by 20 percent of the value of military trade, foreign assistance was lowered by 80 percent of the value of the fall in military imports. In MULTIMOD, these countries are assumed to be finance constrained, so that their ability to import and invest is limited by their ability to attract foreign financing.

1/ A satellite model exists which estimates the impact of policies on the major developing countries. The authors plan to investigate this question in more detail in a subsequent research paper.

2/ If the entire Middle East is considered, their imports in 1987 were US$ 21.9 billion or 24 percent of their total imports. A large portion of these imports are financed through aid and other military credits, particularly for such countries as Egypt, Israel, Jordan, and Syria. Total military expenditures in 1987 in the Middle East are estimated at US$ 57 billion, however, it is uncertain to what extent this includes military imports. If they do include the imports, military imports would represent as much as 40 percent of military spending.

3/ Military aid of the U.S. alone equaled US$ 5 billion that year and major clients such as Israel and Egypt made no net payments for their arms imports; even their military loans were subsequently forgiven.

This, in turn, depends on the ratio of interest payments on foreign debt to exports. Lower interest rates imply lower debt servicing and increased access to foreign capital inflows. In addition, the shift in resources from military spending to private sector consumption and investment increases the demand in the industrial countries for exports of LDCs, in particular primary commodities and oil. This shift in the composition of demand also increases the ability of developing countries, both debtors and oil exporters, to access foreign loans.

Unfortunately, the domestic sector of these economies is modeled in an extremely rudimentary way in MULTIMOD. In particular, falls in domestic consumption are assumed to reflect falls in domestic supply potential. As a result it was not possible to use the unadjusted model in the simulations. Two alterations were made affecting the short- and long-run responses of output. In the short-run it was assumed that the multiplier effects from cuts in military spending lead to lower output of non-tradable goods by the full amount of the spending decline in the first year, and half the amount in the second year. These multipliers are somewhat larger than those found for industrial countries, reflecting the less developed financial and labor markets in these countries. In the long-run, as in the industrial countries, the level of potential output is made independent of the cuts in military spending.

The simulation results indicate that GDP falls by between 0.1 and 0.2 percent over the first 5 years, an accumulated loss of $50 billion, largely reflecting the multiplier effects of reducing military spending. However, the loss in output is considerably smaller than the reductions in military expenditure, which total $134 billion over the same period, with much of the offset coming in the form of higher private sector investment. This rise in investment reflects the lessening of the constraint on imports and the increase in domestic savings. Higher export prices for primary goods, again aided by the demand shift from military to other consumption and investment, and lower worldwide interest rates both increase the ability of the net debtors to access international financial markets. By the year 2000 investment is 3.5 percent above the baseline value.

This rise in investment leads to a substantial increase in GDP in the medium to long term. By the year 2000, GDP is projected to be 1.1 percent higher, over US$ 70 billion. This increase continues to rise to over 7 percent in future years. Therefore, while it appears that net debtor countries as a whole will experience a larger and longer negative impact on output than in industrial countries, the positive impact on domestic investment is more pronounced, leading to more dramatic GDP gains in the medium to long term. The gains to economic welfare can be calculated in the same manner as in the industrial countries. The results indicate that developing countries gain $4.0 trillion in present value terms, 79 percent of their 1992 GDP.

The large gains reflect the fact that most of the gains from the cuts in military expenditure come in the form of productive investment. This

provides a significant boost to the capital stock which in turn raises the growth of potential output in these countries. It is also reflected in the time profile of consumption. There is almost no net cumulative gain to private consumption until the year 2000.

An interesting feature of the results for the net debtor countries is that the overall impact of cuts on military spending appears to depend on the speed at which the cuts are implemented. This can be illustrated by discussing the results from an alternative scenario where the military cuts were assumed to be phased in over 3 years, rather than 5 years. It might be expected that this would cause larger short-term losses in output and similar long-run gains, as is the case for the industrial countries. However for the net debtor developing countries there are several offsetting effects. First, as industrial countries shift more quickly from military spending to other consumption and investment, the demand for oil and other commodities experience a larger increase in the first two years. In addition, world interest rates are lower in the initial years under this scenario. Both of these factors allow LDCs to increase foreign borrowing and, so, imports and investment. The decline in output is actually lower than the base case in the first three years, while higher investment leads to higher real GDP in the medium-term.

VI. Industrial Country Variations

In order to test the sensitivity of the results to changes in the assumptions used in the main case, two further variations of the main case were simulated, in addition to the variants on the simulations discussed above. In the first, the investment function was augmented to make investment more sensitive to short-term change in output. In the second, the implicit assumption that military spending does not enhance civilian economic productivity is dropped. Instead, it is assumed that one-fifth of military spending is equivalent to productive investment.

1. Accelerator effect on investment

In this variant, the investment equation was augmented by a term which linked changes in private investment to changes in overall output. One possible justification for this is that military spending, being relatively geographically concentrated, may have larger short-run negative economic effects other types of government spending. The major impact of the larger accelerator effect is to exacerbate the initial fall in output. In the industrial countries, real GDP declines by more in the first four years, reflecting both lower investment and, as a consequence of this, lower private consumption. The long-run gains to consumption and investment are also lower, and, at 39 percent of GDP, the gain to economic welfare is some 20 percent lower than in the main case. The short-run impact on developing countries is similar. Real growth declines more in the short-run as exports and investment are somewhat lower. However, by 2000, investment is actually higher, as is the gain in economic welfare.

The primary conclusion from this simulation is that there is considerable uncertainty above the size of the initial output losses, since they depend crucially upon the extent to which reducing military expenditures inhibits business and consumer expectations. There has been considerable publicity associated with decreasing military expenditures. The initial negative impact could be larger than the relatively mild results obtained in the main case. It is entirely possible that the cuts in military spending could induce an initial reduction in private sector investment, rather than the increase which is predicted in the main case. However, the long-term gains from military spending cuts continue to be large.

2. Military spending as productive investment

Perhaps a more troubling issue is the extent to which military expenditures increase the productive capacity of a nation. It is now well established both theoretically and empirically that certain types of government expenditures promote civilian productivity. For instance, a direct positive relationship has been established between private capital and the level of public services (e.g., transportation), and between the quality of human capital and labor productivity. A question that has been hotly debated is the extent to which military activities enhance productivity. Here, a distinction must be established between the GDP and civilian output. Military expenditures enhance GDP in an accounting sense since they are counted as part of the GDP. The possible macroeconomic and trade benefits from military spending have already been explicitly considered in the simulation model. The question raised here is the extent to which the military provides positive spinoffs to civilian production. The spinoffs could come from military related research that has civilian applications, training given to demobilized military personnel, or possibly from infrastructure constructed by the military that is used by civilian producers. The scope for these is obviously more limited in the developing countries which import most of their military equipment.

In order to determine the potential impact of this assumption, a simulation was produced under the assumption that one-fifth of the reduction in military spending in the industrial countries constitutes a cut in productive investment. Thus, four-fifths of the spending cuts were assumed to be from government consumption and one fifth from productive government investment. The factor of one fifth is not supposed to be an accurate estimate of the usefulness of military spending to civilian production. 1/ Rather, the object is to get a sense of the impact of different assumptions about the usefulness of military spending for the civilian economy on the simulation results.

1/ In this regard, it should be noted that personnel, operations and maintenance make up between 1/2 and 3/4 of military spending in most industrial countries.

The main effect of the simulation is to reduce the long-run welfare gains from cutting military spending. In this scenario, part of the increase in investment brought about by lower taxes and interest rates is offset. While the short-run output declines are similar to the main case, the longer-term gains are smaller. By the year 2000 consumption and investment have increased by 0.6 and 1.1 percent, compared to 1.0 and 2.0 percent under the main case scenario. Hence, while the overall path of consumption and investment is similar, the level of benefits is considerably lower. The present value calculation indicates that the economic welfare of industrial countries rises by $5.2 trillion, 30 percent of 1992 GDP, about a third lower than in the main case. The distribution of benefits also changes, with the U.S. losing proportionately less than Japan. As a result, the benefits are closer to the initial distribution of military cuts than was true in the main case scenario.

At 75 percent of 1992 GDP, the economic welfare benefits accruing to developing countries are very similar to those found in the main case, partly reflecting the fact that none of the developing countries spending was assumed to be investment. Lower growth in the industrial countries does, however, tilt the mix in non-military demand towards investment rather than consumption. By the year 2000 private sector consumption is 1/2 percent above the baseline, only about half of that in the main case. However, almost all of this shortfall is made up for by higher investment. One implication of this switch to investment is that, while the overall increase in consumption is similar, these gains take longer to materialize.

Overall, the results indicate that the positive economic externality gained from reducing world military expenditures continue to exists even if the military proves to enhance civilian production substantially. However, the size of the overall benefits for the industrial countries are lowered somewhat.

VII. Conclusions

This paper reports the results of a number of simulations using MULTIMOD, a macroeconomic model, to investigate the impact of lowering military expenditures on the world economy. Such a model makes it possible to investigate the implications of a complicated set of assumptions whose interactions are too complex to be traced theoretically. As with any set of simulations, the results reflect the structure and parameter values in the model. There are many factors, particularly of a microeconomic type, that have not been considered in the relatively simple approach pursued in this paper. Possibly the most important of these being that in the main case military expenditures are treated as entirely unproductive expenditure. Despite these caveats, the results provide several insights into the economic effects of military expenditures, as well as a useful benchmark of the potential economic welfare gains.

While there are substantial gains from cutting military spending, these gains are mainly generated in the longer run. Indeed, in the short run output is generally somewhat lower than it would have been otherwise, reflecting the negative impact on demand of cutting government spending. This pattern provides a reconciliation of the different views on the economic impact of military expenditures. In the short run, military spending does create jobs and stimulate the economy. However, military expenditures crowd out both private consumption and private investment and thus in the long term diminish economic growth.

Cutting military spending by 20 percent worldwide could produce a long run increase in private consumption and investment in industrial countries of 1 percent and 2 percent, respectively. These gains in turn produce the lion's share of the rise in economic welfare, which is estimated to be 48 percent of current output. Those countries which implement the largest cuts have largest longer term gains in consumption and investment (as well as the largest short term losses in output). The long run impact on less developed countries is also large, since these countries benefit both directly from the direct downsizing of their military and indirectly from lower interest rates and increased demand for their exports. Nonmilitary consumption is estimated to rise by some 1 percent and investment by 3 1/2 percent, producing overall gains in economic welfare which, on a proportionate basis, could be around double those of the industrial countries (78 percent of current GDP), reflecting the larger positive externalities experienced by these countries.

Since most of the gains in economic welfare come in the longer run, these results are relatively insensitive to short term factors such as the timing of the tax cuts associated with lower government expenditures and the speed of the cuts in spending (the latter may have some effect on the developing country results), although these factors do have an impact on the size of the short-term losses to output. Two factors, however, do appear to lower the economic welfare gains, namely increasing the government spending multipliers and incorporating the assumption that part of cut in military spending in the industrial countries represents a fall in productive investment. Even in these cases, however, the simulations indicate there would be substantial gains to economic welfare from cutting military spending. Finally, it should be stressed that all of these estimates of the change in economic welfare are extremely uncertain. They depend upon many assumptions, both in the MULTIMOD model and in the way the simulations were calculated, and should be seen as preliminary attempts to look at the magnitudes involved, rather than precise estimates of the exact benefits which will accrue.

Military expenditure cuts in any one country produce significant positive externalities for the rest of the world, both through lower interest rates and real exchange rates. As a result, the distribution of the economic benefits is considerably more even than the distribution of the cuts. For example, in the base case the cuts in spending in Japan are, as a ratio to GDP, only one sixth of those in the U.S., while the economic

welfare gains are over half of those by the U.S. This implies that there are economic, as well as security, reasons for coordinating expenditure cutbacks.

<u>A Short Description of MULTIMOD</u> <u>1/</u>

MULTIMOD is a system of linked models designed to analyze the interactions of economic policies and developments among the industrial countries, as well as to examine how changes in economic conditions in the industrial world affect developing countries as a group. The system presently contains econometric models (estimated on the basis of annual data) for each of the G-7 countries (the United States, Canada, Japan, Germany, France, Italy, and the United Kingdom), the smaller industrial countries as a group, high-income (capital-exporting) developing countries as a group, and other (capital-importing) developing countries as a group.

The main linkages among the regions are the endogenous determination of prices and volumes of trade in goods and of exchange rates and interest rates. Each of the countries and regions produces manufactured goods which are imperfect substitutes. Imports of manufactured goods by the industrial countries (and capital-exporting developing countries) are functions of relative prices and absorption. Imports by other developing countries depend upon the amount of available foreign exchange (which depends, in turn, on export earnings and borrowing from other regions, as discussed further below). Each country's (or region's) imports of manufactured goods are allocated as exports across the other countries and regions through a trade matrix, with the initial pattern based on historical trading patterns. Trade shares adjust in response to changes in relative prices. It is assumed that all countries demand oil and that oil is homogeneous. Production and exports of oil by the industrial countries are assumed exogenous, and they adjust their imports to satisfy demand. The developing countries as a group are the residual suppliers. Non-oil primary commodities are produced by the developing countries and the price of this aggregate good adjusts in the short run to clear the market with production and supply eventually responding to changes in relative prices.

The prices of domestically-produced goods are determined in a price-markup Phillips curve relationship that incorporates overlapping contracts, so that prices are sticky. Current wage contracts are forward looking, incorporating anticipated future rates of inflation. Export prices are assumed to move with the domestic output price in the long run, but respond in the short run to price movements in the export markets. Import prices are a weighted average of the export prices of other countries.

MULTIMOD models the demand for base money, rather than for a broader aggregate. It is assumed that the monetary authorities in most industrial country set a target path for the monetary base. The actual path of the money supply is determined by an interest rate reaction function, which

---

1/ A more detailed description of the model is given in Masson, Symansky and Meredith (1990).

smoothes interest rate changes in the short run. In the long run, however, the actual money supply converges to the target path. A fixed exchange rate system is imposed on the model for those countries of the European Monetary System (EMS) who participate in the exchange rate mechanism (ERM). Italy, France, the United Kingdom and the smaller industrial countries as a group are assumed to peg their currencies to the German deutsche mark by changing their interest rates (and, of course, money supplies). This policy regime results in a loss of independent monetary actions by all the ERM countries except Germany.

Financial assets of the industrial countries are assumed to be perfect substitutes, and nominal exchange rates are determined by open interest parity. Long-term interest rates are specified as a moving average of current and expected future short term rates. An important feature of the model is that expectations about interest rates and exchange rates, as well as prices, are forward-looking and consistent with the model's solution in future periods (i.e., expectations are "rational"). This means, for example, that the effects of future policy changes announced today, but implemented sometime in the future, can have an immediate effect on exchange rates, interest rates, and inflation rates, and thereby, on other macroeconomic variables.

Another key feature of the model is the financial link between industrial countries and the capital-importing developing countries. The flow of credit to developing countries is assumed to depend upon a forward-looking measure of their ability to service their external debt. If current, past, or future events lead to increased developing country export earnings in the future (and to an expected decline in the ratio of their debt service payment to exports), industrial countries will be encouraged to increase their lending to the developing countries in the current period. As noted above, imports of these developing countries are determined residually, by the availability of foreign exchange.

Calculation of Present Value of Long Term Welfare Gains

The benefits obtained in any country from reducing military expenditure are equivalent to the increase in private consumption realized in current and future years. The cost to the country of this policy is the decrease in security due to lower military expenditures. If a coordinated decrease in military spending occurs, the decrease in the level of military spending by a given country will not necessarily be reflected in a fall in security. Each country will benefit from the decreased military expenditures by neighboring countries and others, to the extent that they feel threatened. Theoretically, countries could experience an increase in security with a coordinated decrease in military expenditures as the capability of all countries to wage an attack would be diminished.

The present value of the consumption flows consists of a number of different steps. The underlying macroeconomic assumptions behind the calculations are that the baseline real rate of interest is 4 percent and that the world level of economic growth is 2 percent per annum. The short and medium term costs and benefits can be calculated directly from the simulation results using the discount rate of 4 percent. For instance, for net debtor developing countries in the main case simulation, the increase in consumption from 1993-2000 is estimated to be $57 billion while military expenditures fall by $230 billion.

The long term gains in consumption consist of two parts. First, there is a higher level of consumption relative to the base case in the year 2000. This will continue to increase as the economy grows. Therefore, in order to calculate the present value of these future increases in consumption, the discount factor is the real interest rate less the rate of growth or 2 percent. For net debtor developing countries this is estimated to be $1,667 billion.

The increased level of investment from the year 2000 onward will also result in consumption gains. In a well functioning market economy in equilibrium, the present value of future consumption from each project should be equal to the cost of capital investment (with distortions, the present value of future consumption associated with investment projects may differ from unity). Therefore, the consumption value of investment was calculated at the level of investment expenditures in the year 2000 discounted at the real rate of interest less the growth rate. For the net debtor developing countries this level is estimated at $2,246 billion. The total benefits are $3,970 billion, while the decrease in military spending (using the same discount factors) is $2,109 billion. In the case of the net debtor developing countries, the future consumption increase is considerably above the decrease in military spending. This is due in part to the international economic externality. For instance, with the U.S. the gains are estimated to be $3,477 billion compared to lower military spending valued at $3,744 billion.

Table 5. Reducing Military Expenditures: Main Case Simulation Results

	1993	1994	1995	1996	1997	1998	1999	2000
	(In percent deviation from Baseline)							
Industrial Countries								
Real government spending	-0.8	-1.6	-2.4	-3.2	-4.0	-4.0	-4.0	-4.0
Real GDP	-0.1	-0.0	-0.0	-0.0	-0.0	0.1	0.3	0.3
Real consumption	+0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.0
Real investment	0.5	0.9	1.1	1.4	1.7	1.9	2.0	2.0
Developing Countries (Net Debtor)								
Real government spending	-0.8	-1.6	-2.3	-3.1	-3.9	-3.9	-3.9	-3.9
Real GDP	-0.1	-0.2	-0.2	-0.2	-0.1	0.3	0.7	1.1
Total consumption	-0.2	-0.4	-0.6	-0.8	-1.0	-0.8	-0.5	-0.1
Real consumption	0.0	-0.0	-0.1	-0.1	0.0	0.2	0.6	1.1
Real investment	-0.5	-0.4	-0.1	0.1	0.4	1.7	2.8	3.5
United States								
Real government spending	-1.4	-2.9	-4.3	-5.9	-7.4	-7.4	-7.4	-7.4
Real GDP	-0.1	0.0	-0.0	-0.0	-0.0	0.2	0.3	0.3
Real consumption	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.2
Real investment	0.5	0.9	1.1	1.4	1.8	2.1	2.2	2.2
Real short term interest rate 1/	0.1	0.2	0.3	0.2	-0.0	-0.3	-0.4	-0.4
Real long term interest rate 1/	0.0	-0.1	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3
Exchange rate (effective)	-1.7	-1.8	-2.0	-2.1	-2.2	-2.2	-2.0	-1.9
Real exports	0.3	0.6	0.8	0.7	0.7	1.2	1.4	1.5
Real imports	-0.6	-1.1	-1.2	-1.3	-1.4	-1.4	-1.3	-1.2
Japan								
Real government spending	-0.3	-0.6	-0.9	-1.2	-1.5	-1.5	-1.5	-1.5
Real GDP	-0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Real consumption	0.0	0.2	0.3	0.3	0.4	0.5	0.5	0.6
Real investment	0.4	0.8	0.9	1.0	1.1	1.2	1.2	1.2
Real short term interest rate 1/	0.0	-0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2
Real long term interest rate 1/	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.1
Exchange rate (effective)	2.5	2.6	2.8	2.9	2.9	2.9	2.8	2.6
Real exports	-0.4	-0.6	-0.6	-0.8	-0.9	-0.6	-0.4	-0.4
Real imports	0.8	1.2	1.4	1.4	1.4	1.7	1.7	1.7
Germany								
Real government spending	-0.5	-1.0	-1.6	-2.1	-2.6	-2.6	-2.6	-2.6
Real GDP	-0.0	0.0	0.0	0.0	-0.0	0.1	0.1	0.2
Real consumption	0.0	0.2	0.4	0.5	0.6	0.8	0.9	1.0
Real investment	0.6	1.1	1.3	1.5	1.7	2.0	2.1	2.1
Real short term interest rate 1/	0.0	0.0	0.1	0.1	-0.0	-0.2	-0.3	-0.3
Real long term interest rate 1/	0.0	-0.0	-0.1	-0.2	-0.2	-0.3	-0.3	-0.2
Exchange rate (effective)	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.1
Real exports	-0.0	0.1	0.2	0.2	0.2	0.4	0.5	0.5
Real imports	0.1	0.3	0.4	0.3	0.3	0.5	0.6	0.5

Table 5. Reducing Military Expenditures: Main Case Simulation Results
(continued)

	1993	1994	1995	1996	1997	1998	1999	2000
			(In percent deviation from Baseline)					

France

Real government spending	-0.7	-1.4	-2.1	-2.9	-3.6	-3.6	-3.6	-3.6
Real GDP	-0.1	-0.2	-0.2	-0.1	-0.1	0.2	0.4	0.5
Real consumption	-0.0	0.1	0.2	0.4	0.5	0.8	0.9	1.0
Real investment	0.2	0.6	1.0	1.4	1.9	2.3	2.4	2.4
Real short term interest rate 1/	0.3	0.4	0.4	0.2	0.0	-0.3	-0.5	-0.5
Real long term interest rate 1/	0.3	0.1	-0.0	-0.2	-0.4	-0.4	-0.4	-0.3
Exchange rate (effective)	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2
Real exports	-0.0	0.1	0.3	0.3	0.4	0.7	0.9	0.9
Real imports	-0.0	0.2	0.3	0.3	0.2	0.3	0.3	0.2

United Kingdom

Real government spending	-0.7	-1.5	-2.2	-3.0	-3.7	-3.7	-3.7	-3.7
Real GDP	-0.2	-0.3	-0.3	-0.2	-0.2	0.1	0.3	0.5
Real consumption	-0.1	-0.0	0.1	0.2	0.4	0.6	0.8	0.9
Real investment	0.1	0.4	1.0	1.6	2.2	2.6	2.9	2.8
Real short term interest rate 1/	0.4	0.5	0.5	0.3	0.1	-0.2	-0.4	-0.5
Real long term interest rate 1/	0.4	0.2	0.1	-0.1	-0.3	-0.4	-0.4	-0.3
Exchange rate (effective)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Real exports	-0.1	0.0	0.2	0.3	0.4	0.8	1.1	1.2
Real imports	-0.1	-0.0	0.1	0.1	0.1	0.2	0.3	0.2

Italy

Real government spending	-0.5	-0.9	-1.4	-1.8	-2.3	-2.3	-2.3	-2.3
Real GDP	-0.0	0.0	0.1	0.1	0.1	0.2	0.4	0.4
Real consumption	0.0	0.2	0.4	0.5	0.7	0.9	1.0	1.1
Real investment	0.6	1.1	1.3	1.6	1.8	2.1	2.2	2.2
Real short term interest rate 1/	0.1	0.1	0.1	0.1	-0.1	-0.3	-0.4	-0.4
Real long term interest rate 1/	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.2
Exchange rate (effective)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Real exports	-0.1	0.0	0.1	0.1	-0.0	0.2	0.3	0.3
Real imports	0.2	0.5	0.7	0.8	0.9	1.1	1.2	1.1

Canada

Real government spending	-0.4	-0.7	-1.2	-1.6	-2.0	-2.0	-2.0	-2.0
Real GDP	-0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.3
Real consumption	0.0	0.2	0.4	0.5	0.6	0.7	0.8	0.9
Real investment	0.6	1.1	1.3	1.4	1.6	1.8	2.0	1.9
Real short term interest rate 1/	-0.0	0.0	0.1	0.0	-0.1	-0.3	-0.3	-0.3
Real long term interest rate 1/	-0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.2	-0.2
Exchange rate (effective)	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.7
Real exports	-0.0	0.2	0.3	0.3	0.1	0.3	0.3	0.3
Real imports	0.3	0.6	0.8	0.9	1.0	1.2	1.2	1.1

Table 5. Reducing Military Expenditures: Main Case Simulation Results
(concluded)

	1993	1994	1995	1996	1997	1998	1999	2000
				(In percent deviation from Baseline)				
Smaller Indsutrial Counties								
Real government spending	-0.4	-0.9	-1.3	-1.8	-2.3	-2.3	-2.3	-2.3
Real GDP	-0.1	0.0	0.0	0.1	0.0	0.2	0.2	0.3
Real consumption	0.0	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Real investment	0.6	1.1	1.2	1.4	1.6	1.8	1.9	1.9
Real short term interest rate 1/	0.0	0.0	0.1	0.0	-0.1	-0.2	-0.2	-0.2
Real long term interest rate 1/	0.0	-0.0	-0.1	-0.2	-0.2	-0.3	-0.3	-0.2
Exchange rate (effective)	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.3
Real exports	-0.1	-0.1	0.0	-0.1	-0.3	-0.0	0.1	0.1
Real imports	0.2	0.3	0.3	0.2	0.2	0.4	0.5	0.4

1/ Percentage point change.

Table 6.   Reducing Military Expenditures: Alternative Simulations
(In 1992 billion U.S. dollars)

	1993	1994	1995	1996	1997	1998	1999	2000
Industrial Countries								
Military spending	-27.2	-56.3	-87.0	-118.7	-153.2	-156.9	-160.9	-164.9
Main Case								
Real GDP	-11.6	-2.1	-0.8	-1.2	-0.6	38.1	64.4	76.5
Real Consumption	1.2	20.8	39.2	59.0	80.1	103.9	122.8	135.0
Accelerator Model								
Real GDP	-20.9	-7.9	-5.9	-2.3	1.2	26.7	43.1	52.3
Real Consumption	-0.6	19.0	35.8	53.8	71.9	88.9	102.6	112.7
Investment Model								
Real GDP	-8.8	-4.2	-7.1	-6.7	-4.5	20.4	33.6	40.9
Real Consumption	2.1	15.5	27.1	40.4	54.7	69.0	79.6	87.6
U.S. Only 1/								
Real GDP	2.8	12.8	10.2	8.7	8.1	22.6	32.4	37.1
Real Consumption	4.5	20.2	32.5	45.6	58.8	70.7	79.9	85.9
Developing countries (Net Debtors)								
Military spending	-7.7	-16.3	-25.9	-36.3	-47.8	-49.0	-50.2	-51.4
Main Case								
Real GDP	-5.8	-10.6	-13.7	-12.6	-5.7	16.6	45.4	76.0
Real Consumption	0.0	-0.9	-2.2	-2.2	1.2	9.9	25.4	45.6
Accelerator Model								
Real GDP	-8.8	-13.4	-16.7	-15.9	-9.9	10.5	37.4	66.7
Real Consumption	-0.8	-2.6	-5.0	-6.2	-4.9	0.8	12.7	29.4
Investment Model								
Real GDP	-6.1	-12.0	-16.5	-17.4	-13.4	5.1	29.4	56.1
Real Consumption	0.4	-0.7	-2.9	-4.5	-3.9	0.4	10.7	25.7
U.S. Only 1/								
Real GDP	-0.2	0.7	0.1	-0.4	-0.7	1.6	3.4	4.4
Real Consumption	0.7	1.5	1.3	0.8	0.6	1.3	2.9	4.5
United States								
Military spending	-15.0	-31.2	-48.3	-66.1	-84.7	-86.8	-88.9	-91.1
Main Case								
Real GDP	-3.8	1.7	-0.4	-2.3	-3.4	12.6	22.4	25.9
Real Consumption	0.2	10.8	19.4	28.8	38.8	49.0	56.7	61.7
Accelerator Model								
Real GDP	-9.0	-1.6	-2.8	-3.5	-4.0	8.5	15.4	18.4
Real Consumption	-1.1	9.7	18.0	26.7	35.6	43.6	49.6	54.0
Investment Model								
Real GDP	-3.5	0.7	-2.2	-3.9	-4.7	7.5	12.9	15.4
Real Consumption	0.6	9.1	15.5	22.5	30.0	37.1	42.0	45.5
U.S. Only								
Real GDP	-2.4	1.0	-3.8	-5.9	-6.4	6.5	15.0	18.5
Real Consumption	-0.2	8.6	15.2	23.0	31.6	39.4	45.9	50.1

Table 6.   Reducing Military Expenditures: Alternative Simulations
(In 1992 billion U.S. dollars) (continued)

	1993	1994	1995	1996	1997	1998	1999	2000
Japan								
Military spending	-1.7	-3.3	-5.0	-7.5	-9.2	-10.0	-10.0	-10.0
Main Case								
Real GDP	-0.8	3.3	4.2	5.0	5.9	9.2	11.7	12.5
Real Consumption	0.8	4.2	6.7	9.2	11.7	14.2	16.6	17.6
Accelerator Model								
Real GDP	-1.7	2.5	3.3	4.2	5.0	7.5	8.4	10.0
Real Consumption	0.8	3.3	5.9	8.4	10.0	11.7	13.4	14.2
Investment Model								
Real GDP	0.0	1.7	1.7	2.5	3.3	5.0	5.9	6.7
Real Consumption	0.8	2.5	4.2	5.0	6.7	8.4	9.2	10.0
U.S. Only 1/								
Real GDP	0.0	2.5	3.3	4.2	4.2	5.9	6.7	7.5
Real Consumption	0.8	2.5	4.2	5.0	6.7	7.5	8.4	9.2
Germany								
Military spending	-2.0	-4.0	-6.2	-8.5	-11.0	-11.3	-11.6	-11.8
Main Case								
Real GDP	-0.4	0.7	0.7	0.3	-0.1	3.1	5.2	6.1
Real Consumption	0.3	1.6	2.7	3.8	4.8	6.5	7.8	8.8
Accelerator Model								
Real GDP	-1.3	0.1	0.2	0.2	0.3	1.7	3.0	4.0
Real Consumption	0.2	1.5	2.4	3.4	4.2	5.2	6.3	7.1
Investment Model								
Real GDP	-0.3	0.1	-0.2	-0.3	-0.2	1.3	2.3	3.1
Real Consumption	0.4	1.1	1.7	2.4	3.0	3.9	4.6	5.4
U.S. Only 1/								
Real GDP	0.5	1.4	1.6	1.7	1.7	2.2	2.7	3.0
Real Consumption	0.4	1.1	1.7	2.2	2.8	3.4	4.0	4.5
France								
Military spending	-1.3	-2.8	-4.3	-5.9	-7.6	-7.7	-7.9	-8.1
Main Case								
Real GDP	-1.3	-1.7	-1.5	-1.2	-0.6	2.3	4.2	5.2
Real Consumption	-0.2	0.3	1.1	2.0	3.2	4.7	5.9	6.6
Accelerator Model								
Real GDP	-1.5	-1.9	-1.8	-1.2	-0.3	1.7	3.1	3.8
Real Consumption	-0.2	0.3	0.9	1.8	2.9	4.0	4.8	5.4
Investment Model								
Real GDP	-0.9	-1.5	-1.6	-1.2	-0.6	1.4	2.6	3.1
Real Consumption	-0.1	0.2	0.6	1.3	2.1	3.0	3.7	4.2
U.S. Only 1/								
Real GDP	0.9	1.1	1.0	0.9	0.7	0.6	0.7	0.9
Real Consumption	0.4	0.9	1.2	1.4	1.7	1.9	2.1	2.2

Table 6. Reducing Military Expenditures: Alternative Simulations
(In 1992 billion U.S. dollars) (continued)

	1993	1994	1995	1996	1997	1998	1999	2000
United Kingdom								
Military Spending	-1.6	-3.2	-5.0	-6.9	-8.7	-8.9	-9.3	-9.5
Main Case								
Real GDP	-1.8	-2.6	-2.6	-2.4	-1.8	13.9	3.8	5.0
Real Consumption	-0.4	0.0	0.0	1.6	2.8	4.4	5.6	6.3
Accelerator Model								
Real GDP	-2.4	-3.0	-2.8	-2.2	-1.4	0.8	2.6	3.6
Real Consumption	-0.4	-0.2	0.6	1.4	2.4	3.6	4.4	5.2
Investment Model								
Real GDP	-1.4	-2.4	-2.6	-2.2	-1.6	0.6	2.0	2.8
Real Consumption	-0.2	-0.2	0.2	0.8	1.6	2.6	3.2	3.8
U.S. Only 1/								
Real GDP	1.4	1.8	1.6	1.4	1.0	1.0	0.8	0.8
Real Consumption	0.8	1.4	2.0	2.4	2.6	2.8	3.0	3.0
Italy								
Military Spending	-0.9	-2.0	-3.1	-4.2	-5.4	-5.5	-5.6	-5.8
Main Case								
Real GDP	-0.5	0.2	0.7	0.8	0.9	3.0	4.4	5.1
Real Consumption	0.2	1.3	2.5	3.8	5.0	6.6	7.8	8.6
Accelerator Model								
Real GDP	-0.7	-0.1	0.3	0.7	0.9	2.0	2.8	3.3
Real Consumption	0.1	1.2	2.1	3.2	4.2	5.1	5.9	6.4
Investment Model								
Real GDP	-0.4	-0.3	-0.2	0.0	0.3	1.3	2.1	2.5
Real Consumption	0.1	0.7	1.2	1.9	2.6	3.4	3.9	4.5
U.S. Only 1/								
Real GDP	1.0	2.1	2.3	2.3	2.1	1.9	1.6	1.4
Real Consumption	0.7	1.9	2.6	3.3	3.7	3.9	4.0	3.9
Canada								
Military spending	-0.5	-0.9	-1.5	-2.1	-2.6	-2.7	-2.8	-2.9
Main Case								
Real GDP	-0.1	0.5	0.6	0.5	0.5	1.3	1.7	2.0
Real Consumption	0.2	0.7	1.3	1.8	2.4	2.9	3.4	3.6
Accelerator Model								
Real GDP	-0.3	0.4	0.6	0.6	0.6	0.9	1.1	1.2
Real Consumption	0.2	0.8	1.3	1.7	2.2	2.6	2.7	3.0
Investment Model								
Real GDP	0.0	0.4	0.4	0.4	0.3	0.5	0.6	0.7
Real Consumption	0.2	0.5	0.8	1.0	1.3	1.5	1.6	1.8
U.S. Only 1/								
Real GDP	0.1	0.5	0.7	0.8	1.0	1.5	1.6	1.6
Real Consumption	0.1	0.6	1.1	1.6	2.1	2.6	2.9	3.1

Table 6.   Reducing Military Expenditures: Alternative Simulations
(In 1992 billion U.S. dollars) (concluded)

	1993	1994	1995	1996	1997	1998	1999	2000
Smaller Industrial countries								
Military spending	-1.6	-3.4	-5.1	-7.1	-9.1	-9.3	-9.6	-9.8
Main Case								
Real GDP	-0.9	0.1	0.9	1.0	0.7	3.1	5.0	6.3
Real Consumption	0.3	1.8	3.2	4.6	6.0	7.7	9.1	10.0
Accelerator Model								
Real GDP	-1.3	-0.1	0.7	1.4	1.6	2.3	2.8	3.4
Real Consumption	0.4	1.8	3.1	4.4	5.5	6.5	7.3	7.9
Investment Model								
Real GDP	-0.3	0.4	0.6	0.8	0.9	1.7	2.0	2.3
Real Consumption	0.4	1.4	2.3	3.1	3.9	4.5	5.0	5.5
U.S. Only 1/								
Real GDP	0.1	0.4	0.7	0.8	1.0	1.4	1.6	1.6
Real Consumption	0.1	0.6	1.1	1.5	2.0	2.5	2.8	3.0

1/ In the U.S. Only scenarios, the military expenditures of other countries are
maintained at the same percentage of GDP.

Table 7. Present Value of Costs and Benefits of Reducing Military Spending

	1993 to 2000	Beyond 2000	Total Gain	1993 to 2000	Beyond 2000	Total Gain
	(In billion 1992 U.S. dollars)			(In percent of 1992 GDP)		
Industrial Countries						
Military spending	-750	-6025	-6775	-4.3	-34.2	-38.5
Main Case						
Real GDP	120	2794	2913	0.7	15.9	16.6
Real consumption	446	4933	5379	2.5	28.0	30.6
Investment		3090	3090		17.6	17.6
Accelerator Model						
Real GDP	58	1910	1968	0.3	10.9	11.2
Real consumption	384	4116	4500	2.2	23.4	25.6
Investment		2387	2387		13.6	13.6
Investment Model						
Real GDP	43	1494	1538	0.2	8.5	8.7
Real consumption	299	3201	3499	1.7	18.2	19.9
Investment		1715	1715		9.7	9.7
U.S. Only 1/						
Real GDP	107	1357	1464	0.6	7.7	8.3
Real consumption	319	3139	3457	1.8	17.8	19.7
Investment		1702	1702		9.7	9.7
Net Debtor Developing Countries						
Military spending	-230	-1879	-2109	-4.6	-37.3	-41.8
Main Case						
Real GDP	60	2776	2836	1.2	55.1	56.3
Real consumption	57	1667	1724	1.1	33.1	34.2
Investment		2246	2246		44.6	44.6
Accelerator Model						
Real GDP	28	2436	2464	0.6	48.3	48.9
Real consumption	15	1075	1090	0.3	21.3	21.6
Investment		3094	3094		61.4	61.4
Investment Model						
Real GDP	10	2051	2061	0.2	40.7	40.9
Real consumption	17	938	955	0.3	18.6	18.9
Investment		2838	2838		56.3	56.3
U.S. Only 1/						
Real GDP	7	159	166	0.1	3.2	3.3
Real consumption	11	164	175	0.2	3.2	3.5
Investment		18	18		0.4	0.4

Table 7. Present Value of Costs and Benefits of Reducing Military Spending
(continued)

	1993 to 2000	Beyond 2000	Total Gain	1993 to 2000	Beyond 2000	Total Gain
	(In billion 1992 U.S. dollars)			(In percent of 1992 GDP)		
United States						
Military spending	-415	-3329	-3744	-7.0	-55.8	-62.8
Main Case						
Real GDP	39	946	985	0.7	15.9	16.5
Real consumption	211	2255	2465	3.5	37.8	41.4
Investment		1012	1012		17.0	17.0
Accelerator Model						
Real GDP	13	672	685	0.2	11.3	11.5
Real consumption	188	1972	2159	3.1	33.1	36.2
Investment		836	836		14.0	14.0
Investment Model						
Real GDP	15	561	577	0.3	9.4	9.7
Real consumption	161	1662	1823	2.7	27.9	30.6
Investment		637	637		10.7	10.7
U.S. Only						
Real GDP	15	676	691	0.3	11.3	11.6
Real consumption	170	1830	2000	2.8	30.7	33.5
Investment		765	765		12.8	12.8
Japan						
Military spending	-46	-367	-413	-1.2	-9.3	-10.4
Main Case						
Real GDP	40	458	499	1.0	11.6	12.6
Real consumption	65	642	707	1.6	16.2	17.9
Investment		550	550		13.9	13.9
Accelerator Model						
Real GDP	31	367	398	0.8	9.3	10.1
Real consumption	54	520	574	1.4	13.1	14.5
Investment		458	458		11.6	11.6
Investment Model						
Real GDP	21	245	266	0.5	6.2	6.7
Real consumption	38	367	404	0.9	9.3	10.2
Investment		306	306		7.7	7.7
U.S. Only 1/						
Real GDP	28	275	303	0.7	7.0	7.6
Real consumption	36	336	372	0.9	8.5	9.4
Investment		306	306		7.7	7.7

Table 7. Present Value of Costs and Benefits of Reducing Military Spending
(continued)

	1993 to 2000	Beyond 2000	Total Gain	1993 to 2000	Beyond 2000	Total Gain
	(In billion 1992 U.S. dollars)			(In percent of 1992 GDP)		
Germany						
Military spending	-54	-433	-486	-3.4	-27.5	-30.9
Main Case						
Real GDP	12	224	236	0.8	14.2	15.0
Real consumption	29	322	351	1.8	20.5	22.3
Investment		305	305		19.4	19.4
Accelerator Model						
Real GDP	6	147	154	0.4	9.4	9.8
Real consumption	24	261	285	1.5	16.6	18.1
Investment		226	226		14.4	14.4
Investment Model						
Real GDP	4	113	117	0.3	7.2	7.5
Real consumption	18	197	215	1.1	12.5	13.6
Investment		132	132		8.4	8.4
U.S. Only 1/						
Real GDP	12	111	123	0.8	7.0	7.8
Real consumption	16	165	181	1.0	10.5	11.5
Investment		122	122		7.7	7.7
France						
Military spending	-37	-297	-334	-3.0	-24.1	-27.1
Main Case						
Real GDP	3	190	193	0.3	15.4	15.7
Real consumption	18	241	259	1.5	19.5	21.0
Investment		166	166		13.5	13.5
Accelerator Model						
Real GDP	0	138	138	0.0	11.2	11.2
Real consumption	16	199	214	1.3	16.1	17.4
Investment		127	127		10.3	10.3
Investment Model						
Real GDP	0	114	114	0.0	9.2	9.2
Real consumption	12	153	165	1.0	12.4	13.4
Investment		153	153		12.4	12.4
U.S. Only 1/						
Real GDP	6	33	39	0.5	2.7	3.2
Real consumption	10	82	91	0.8	6.6	7.4
Investment		55	55		4.5	4.5

Table 7. Present Value of Costs and Benefits of Reducing Military Spending
(continued)

	1993 to 2000	Beyond 2000	Total Gain	1993 to 2000	Beyond 2000	Total Gain
	(In billion 1992 U.S. dollars)			(In percent of 1992 GDP)		
United Kingdom						
Military spending	-43	-348	-391	-4.6	-36.8	-41.3
Main Case						
Real GDP	8	181	189	0.8	19.1	19.9
Real consumption	16	232	247	1.6	24.5	26.1
Investment		174	174		18.4	18.4
Accelerator Model						
Real GDP	-5	130	125	-0.6	13.8	13.2
Real consumption	13	188	201	1.4	19.9	21.3
Investment		138	138		14.5	14.5
Investment Model						
Real GDP	-5	101	96	-0.5	10.7	10.2
Real consumption	9	138	147	0.9	14.5	15.5
Investment		101	101		10.7	10.7
U.S. Only 1/						
Real GDP	8	29	37	0.9	3.1	3.9
Real consumption	15	109	123	1.5	11.5	13.0
Investment		27	27		2.8	2.8
Italy						
Military spending	-26	-211	-238	-2.6	-20.5	-23.1
Main Case						
Real GDP	11	188	199	1.1	18.2	19.3
Real consumption	29	314	342	2.8	30.4	33.2
Investment		181	181		17.5	17.5
Accelerator Model						
Real GDP	7	119	126	0.7	11.6	12.2
Real consumption	23	235	258	2.2	22.8	25.0
Investment		133	133		12.9	12.9
Investment Model						
Real GDP	4	92	96	0.4	8.9	9.3
Real consumption	14	164	178	1.4	15.9	17.3
Investment		96	96		9.3	9.3
U.S. Only 1/						
Real GDP	12	51	64	1.2	5.0	6.2
Real consumption	20	143	163	1.9	13.9	15.8
Investment		47	47		4.6	4.6

Table 7. Present Value of Costs and Benefits of Reducing Military Spending
(concluded)

	1993 to 2000	Beyond 2000	Total Gain	1993 to 2000	Beyond 2000	Total Gain
	(In billion 1992 U.S. dollars)			(In percent of 1992 GDP)		
Canada						
Military spending	-13	-107	-120	-2.4	-19.5	-21.9
Main Case						
Real GDP	6	73	79	1.0	13.4	14.4
Real consumption	13	133	146	2.4	24.4	26.8
Investment		81	81		14.8	14.8
Accelerator Model						
Real GDP	4	43	47	0.8	7.9	8.7
Real consumption	12	110	122	2.1	20.1	22.2
Investment		59	59		10.8	10.8
Investment Model						
Real GDP	3	27	29	0.5	4.9	5.4
Real consumption	7	67	74	1.3	12.2	13.5
Investment		30	30		5.6	5.6
U.S. Only 1/						
Real GDP	6	60	66	1.1	11.0	12.1
Real consumption	11	113	125	2.0	20.7	22.8
Investment		66	66		12.1	12.1
Smaller Industrial Countries						
Military spending	-45	-359	-404	-1.9	-15.3	-17.2
Main Case						
Real GDP	12	230	242	0.5	9.8	10.3
Real consumption	34	366	400	1.4	15.6	17.1
Investment		304	304		13.0	13.0
Accelerator Model						
Real GDP	8	123	131	0.4	5.2	5.6
Real consumption	29	288	317	1.3	12.3	13.6
Investment		214	214		9.1	9.1
Investment Model						
Real GDP	7	84	91	0.3	3.6	3.9
Real consumption	21	201	222	0.9	8.6	9.5
Investment		139	139		5.9	5.9
U.S. Only 1/						
Real GDP	6	58	64	0.3	2.5	2.7
Real consumption	11	110	121	0.5	4.7	5.2
Investment		155	155		6.6	6.6

Source: Appendix Table 6.

1/ In the U.S. Only case, the military expenditures of other countries are maintained at the same proportion of GDP.

References

Alexander, W. Robert, "The Impact of Defence Spending on Economic Growth," _Defence Economics_, Vol. 2, pp. 39-55, 1990.

Atesoglu, H. Somnez, and Michael Mueller, "Defence Spending and Economic Growth," _Defence Economics_, Vol. 2, pp. 19-27, 1990.

Benoit, Emile, _Defense Spending and Economic Growth in Developing Countries_, (Boston, D.C. Health & Co., 1973).

Brzoska, Michael, "Military Trade, Aid and Developing Country Debt," World Bank working paper, 1990.

Chowdhury, Abdur, "A Causal Analysis of Defense Spending and Economic Growth," _Journal of Conflict Resolution_, Vol. 35 No. 1, pp. 80-97, 1991.

Congressional Budget Office, _The Economics Effects of Reduced Defense Spending_, February 1992.

Deger, Saadet, _Military Expenditure in Third World Countries_, (London, Routledge & Kegan Paul, 1986).

Dornbusch, Rudiger, "Expectations and Exchange Rate Dynamics," _Journal of Political Economy_, Vol. 84, pp. 1161-76, 1976.

Hewitt, Daniel, "Military Expenditures Worldwide: Determinants and Trends, 1972-1988," _Journal of Public Policy_, forthcoming, 1992.

International Monetary Fund, _International Financial Statistics Yearbook_, (Washington D.C., International Monetary Fund, 1992).

Joerding, W., "Economic Growth and Defense Spending: Granger Causality," _Journal of Development Economics_, Vol. 18, pp. 1-12, 1986.

Kohler, Daniel, "The Effects of Defense and Security on Capital Formation in Africa: An Empirical Investigation," Rand Working Paper N-2653-USDP, 1988.

LaCivita, Charles, and Peter Frederiksen, "Defense Spending and Economic Growth: An Alternative Approach to the Causality Issue," _Journal of Development Economics_, Vol. 35, pp. 117-126, 1991.

Leontief, W. and F. Dutchin, _Military Spending: Facts and Figures_, (New York, Oxford University Press, 1983).

Masson, Paul, Steven Symansky, and Guy Meredith, "MULTIMOD Mark II: A Revised and Extended Model," International Monetary Fund, Occasional Paper No. 71, July 1990.

McKibbin, Warwick and Stephan Thurman, "The Impact on the World Economy of Reductions in Military Expenditures and Military Arms Exports," (October 1992), Paper presented at the United Nations University Conference on "Arms Reduction and Economic Development in the Post Cold War Era" Tokyo, November 1992.

Steinberg, Dimitri, "Soviet Defense Burden: Estimating Hidden Defense Costs," Soviet Studies, March 1992.

Stockholm International Peace Research Institute (SIPRI), SIPRI Yearbook 1992, (Oxford, Oxford University Press, 1992).

Thomas, R. William, H.O. Stekler, and G. Wayne Glass, "The Economic Effects of Reducing U.S. Defence Spending," Defence Economics, Vol. 2, pp. 183-197, 1991.

U.S. Arms Control and Disarmament Agency (ACDA), World Military Expenditures and Arms Transfers 1990, (Washington, ACDA, 1991).