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MILITARY SPENDING AND ECONOMIC STRUCTURES WITH SPECIAL REFERENCE
TO MARKET ECONOMIES

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INTRODUCTION

1. In its resolution 40/55 of 16 December 1985, the General Assembly approved the report of the Preparatory Committee for the International Conference on the Relationship between Disarmament and Development. 1/ Paragraphs 19 and 20 of that report requested the Secretary-General of the Conference, inter alia, to update existing materials, to prepare background papers and bibliographies and to compile information and an analysis relevant to the work of the Conference, including succinct papers on the three substantive items on the agenda. Those have already been published as information papers A/CONF.130/PC/INF.3 to 6.

2. In addition, paragraph 20 of the report stated that "the preparation of a number of other new documents and papers, on a strictly selective basis, might be necessary. In this connection, the Secretary-General of the Conference should make full use of the United Nations system and also be free to consult acknowledged expertise in the field." It should also be noted that a statement by the Secretary-General of the United Nations, contained in document A/C.5/40/52, "anticipated that approximately five research papers would be required".

3. In keeping with the above, the Secretary-General of the Conference, in consultation with the members of the Bureau, invited Mr. Petter Gleditsch, of the International Peace Research Institute of Oslo (PRIO), to prepare a personal contribution on military spending and economic structures, with special reference to market economies, which is reproduced in the annex below. The views expressed in the paper are solely those of the author.

Notes


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Annex

MILITARY SPENDING AND ECONOMIC STRUCTURES WITH SPECIAL REFERENCE TO MARKET ECONOMIES

CONTENTS

I. MILITARY SPENDING .......................................................... 1 - 5 4
II. MAIN ECONOMIC EFFECTS OF MILITARY SPENDING ............... 6 - 13 4
III. EFFECT OF MILITARY SPENDING ON EMPLOYMENT ............... 14 - 20 6
IV. EFFECT OF MILITARY SPENDING ON GROWTH ....................... 21 - 27 7
V. GROWTH EFFECTS OF MILITARY RESEARCH AND DEVELOPMENT: THE QUESTION OF SPIN-OFFS .................................................. 28 - 49 9
VI. MILITARY AND CIVILIAN SPENDING: PUBLIC PRIORITIES ........ 50 - 55 13
VII. MILITARY SPENDING: ALTERNATIVE USES ........................... 56 - 67 17

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I. MILITARY SPENDING

1. In 1982 the world spent about $US 674 billion on armaments. 1/ This is 5.3 of
   the total global output and 19 per cent of total public spending. Arms expenditure
   exceeds world spending on public education by 5 per cent and health spending by
   28 per cent. Global arms spending is 18 times higher than foreign aid and
   2,500 times higher than what is spent on international peace-keeping. 2/ There is
   no question but that the arms race remains one of the major international
   undertakings.

2. In wartime, of course, military spending has reached much higher levels. For
   example, the United Kingdom of Great Britain and Northern Ireland spent about
   60 per cent of its gross national product (GNP) on the war effort during the Second
   World War and the United States of America reached 40 per cent of GNP. 3/ For
   Norway, it has been calculated that the war and the German occupation cost about
   45 per cent of the expected national income for the war years. 4/

3. Historically, the mobilization of major peacetime resources for armaments is a
   relatively recent phenomenon. Traditionally, military use of resources was low in
   the inter-war period. In wartime a major share of a nation's resources may be
   mobilized. When the military sector declines after a war, it does not contract to
   the pre-war level. This "ratchet effect", as Bruce Russett 5/ has called it, is
   evident in data on military use of resources for many countries. 6/

4. The period following the Second World War has witnessed the independence of
   close to 100 countries in the third world. Virtually all of them have acquired a
   military capability and their military spending has grown quite rapidly.
   Nevertheless, industrialized countries still account for three fourths of world
   military spending.

5. In the following pages, the economic effects of the arms spending of the
   industrialized market economies will be examined. While many of the points made
   here could no doubt also be made about developing countries and planned economies,
   there are also a number of dissimilarities which justify a separate treatment.

II. MAIN ECONOMIC EFFECTS OF MILITARY SPENDING

6. As a major international undertaking, the arms race is bound to have a number
   of economic effects. 7/ The available studies suggest that a large share of
   government consumption military spending serves in the short run to stimulate
   demand, with favourable consequences for employment and other measures of economic
   activity.

7. In a long-term perspective, military spending influences economic growth and
   development through different channels. The military sector draws resources away
   from non-military use. The importance of this effect depends on the scarcity of
   various resources. The financing of military spending may influence the overall
   savings rate in a negative way, and less saving means less growth. On the other
   hand, certain components of military expenditure may yield non-military benefits
towards economic growth. This might be true particularly in less-developed countries for certain kinds of infrastructure (roads, airports) and for education of military personnel, and, in mature industrialized economies, for technological progress resulting from military research and development expenditure (R and D).

8. Military spending allocates resources to an unproductive endeavour. This is well summed up in the most recent United Nations report on the economic and social consequences of the arms race:

"The arms race represents a waste of resources, a diversion of the economy ... a hindrance to national development efforts and a threat to democratic processes ... military outlays have no long-term positive effects on economic growth, ..." 8/

9. At the national level, the negative consequences of military spending must be weighed against national security needs. Seen from a global perspective, one country's security is another country's perceived threat and the unproductive character of the arms race is more obvious.

10. Because military spending is so centralized, it is sometimes suggested that it may be used as an instrument of economic policy. Any significant economic effect represents a possible motive for increasing or taking recourse to arms spending. In the short term, arms spending may be used to boost the economic outlook. In the long term, arms spending may be used to promote the emergence of a national high technology industry. This is not to say that there are not more effective national policy instruments for achieving the same ends. But the economic effects of arms spending - and particularly beliefs about such effects - may influence defence policies. 9/

11. Even if arms spending in the long term is likely to be harmful to the economy as a whole, it may also benefit certain subgroups such as industries and professionals with specialized skills in military production. With effective lobbying, such groups may exercise a disproportionate effect on the formulation and execution of national policy. Thus, it is all the more important to focus attention on the national and global effects of the arms race.

12. The literature on the subject suggests that military spending may have a significant effect on a number of important economic variables: the level of employment, the savings rate, economic growth, inflation, 10/ the volume of imports and exports and the balance of payments. It is beyond the scope of this paper to review all of the effects of arms spending in industrialized countries. Instead, this study will concentrate on the effects on the two key national indicators of employment and economic growth (see paras. 14-27 below). The literature here is quite extensive. One of the key issues is the effect of arms spending on the innovative capacity of the economy. Systematic research has only just begun on this subject which is explored in some detail in this paper (see paras. 28-49 below). The competition between military and civilian expenditure is examined in paragraphs 50-55 below. Finally, in paragraphs 56-67 below, the question is raised as to how resources may be put to alternative use - particularly for the purpose of promoting development in the Third World.
13. The methods used to study the effects of military spending vary greatly. Some studies are limited to the national level. Others are based on cross-national comparisons. A third category of studies models the global economy as a whole. From the political standpoint that disarmament is more realistic if undertaken by all or most countries at the same time, it would be preferable to study the economic effects by means of a global model. From the results of a global model, results can also be derived for individual countries. 11/ On the other hand, such models are in their infancy and the data problems are enormous. Also, the prospects for multilateral disarmament seem remote, while decisions about increases or cut-backs in military expenditure have to be faced by most countries on an annual basis. For this reason, studies which focus on national effects have their obvious place. There is still a choice between studies using models of the national economy and those using cross-national comparisons. Ideally, it would be preferable to have both. If both yield the same results, confidence in the findings would be strengthened. As will be seen in the following pages, this is not always the case.

III. EFFECT OF MILITARY SPENDING ON EMPLOYMENT

14. Direct employment in the armed forces in 1982 totalled about 25 million for the world as a whole, including about 10 million in the industrialized countries, and 6 million among the members of the Organisation for Economic Co-operation and Development (OECD). To take account of the indirect employment effect, one would probably have to multiply these figures by a factor between 1.5 and 2. 12/ Clearly, instant disarmament releasing all of these people to the labour market simultaneously, would create major unemployment. The level of unemployment in the OECD countries was about 9 per cent in 1982. Disarmament without countermeasures would have raised it by one third.

15. For obvious reasons, this is an unreal fear. By using the military budget for alternative purposes, the excess labour can be absorbed by other sectors. Studies in various countries indicate that although the military sector is labour-intensive, it has gradually become less so, and other forms of public expenditure can easily fund greater employment. A case study of Norway, which is probably typical of a small industrialized country with conscription, shows that public expenditure in general generates 120 per cent as much employment as the military per unit of expenditure. 13/

16. In the United States, a much larger economy without conscription, studies also indicate that more employment can be generated by non-military spending. Robert W. DeGrasse, Jr. cites figures to the effect that the number of jobs created by military industry contracts falls slightly below the median for industry. 14/ Studies by the United States Department of Labor in 1976 indicated that civilian government spending created 30 per cent more jobs than military spending, and increased private consumption through tax cuts would create 47 per cent more jobs. 15/
17. Thus, the evidence from national studies does not support the idea that high military spending is necessary for full employment. On the contrary, military spending may contribute to unemployment by reducing public expenditure in labour intensive sectors.

18. There have been several cross-national studies of military expenditure and employment. Some studies have concluded that high military expenditure is associated with high unemployment, whereas others have failed to find any relationship. The results are not very conclusive, but at least they provide no support for the idea of a positive association between military expenditure and employment. 16/

19. Studies of military employment show that local conversion problems are likely to be more severe than the national problem. In Norway, some municipalities have a direct military employment above 30 per cent and these municipalities are in areas of the country where unemployment is above average. However, if increased transfers to local authorities are used as a main countermeasure in the case of disarmament, a regional correction factor could probably be introduced to rectify some of these local problems.

20. Local conversion difficulties are in any case a short-term transition problem. In the long run, the increased employment generated by civilian spending creates new opportunities for local communities with employment problems.

IV. EFFECT OF MILITARY SPENDING ON GROWTH

21. The case for the generally harmful effect of military spending on economic growth rests on the premise that the arms sector is unproductive and that a reallocation of resources to the civilian sector is likely to improve the performance of the economy. This view is not particularly novel. It can be traced back to classical economists such as Smith, Ricardo and Say. 17/ More specifically, military spending is likely to depress economic growth in at least three different ways:

22. First, it may decrease investment and thus affect negatively the renewal and expansion of civilian industry. Second, if military spending leads to lower employment, as argued in the previous section, labour resources will be utilized in an inefficient way. Third, military spending may create bottle-necks for highly qualified labour, R and D resources, etc., that would be necessary for innovation and growth.

23. On the other hand, it has been claimed that military spending is conducive to economic growth. One basis for this claim is the "underconsumptionist" argument put forward by Baran and Sweezy and referred to in the previous section. Another line of reasoning is that there are significant spin-offs from military research and development, which lead to innovation and improved productivity in the civilian sector. This is probably what Harold Brown had in mind when, as United States Secretary of Defense, he argued in 1980:

/...
"... our research indicated that [military expenditures] are beneficial to the civilan economy, since much of the additional spending promotes domestic production in our most capital and technology intensive sectors." 18/

24. Cross-national comparisons indicate that industrialized countries with high military spending tend to have lower economic growth. 19/ On the other hand, country by country comparisons over time for the period following the Second World War show that productivity growth was higher in periods with high military spending. 20/

25. The longitudinal relationship seems more likely to be spurious. A positive correlation can come about by a "reversed" casual relationship: economic expansion (or decline) may lead decision-makers to increase (or cut back) public spending generally, including military spending. Besides, high military spending need not have an immediate negative effect on economic growth. The long-term effect is probably better measured by cross-national comparisons than by longitudinal comparisons without time lags from single countries.

26. Nevertheless, the contrast between the cross-sectional and longitudinal results warrant a certain caution in interpreting the results of such simple comparisons. However, a number of studies have gone beyond these comparisons to apply economic models to the relationship between military spending and economic growth. As far as industrialized market economies are concerned, their conclusion is fairly unanimous: high military spending competes with investment and thereby reduces economic growth. 21/ In the author's own study of 17 OECD countries for the period 1960-1980, it was found, for instance, that military spending generally had a positive impact on manufacturing output, but a negative effect on investment. These two effects have an opposite impact on economic growth. The net effect was that military spending had a negative influence on growth for the OECD area as a whole and for the subgroups of major Powers and "other small countries", but not for the Mediterranean countries. 22/

27. A different approach was taken by Leontief and Duchin, using a model of the world economy. 23/ Comparing a scenario for reduced growth in military expenditure to a base scenario essentially continuing present trends, they found that the former scenario led to increased growth in the gross domestic product (GDP) in all of their seven regions of developed countries and in five out of their seven regions of developing countries. The additional GDP generated was modest (generally a low percentage), but, of course, the degree of conversion envisaged in this scenario was also very modest.

...
V. GROWTH EFFECTS OF MILITARY RESEARCH AND DEVELOPMENT:
THE QUESTION OF SPIN-OFFS

28. As already noted, there is a school of thought which argues that military R and D has significant spin-offs (or spill-overs) to the civilian sector, that research in the military field yields civilian applications as a by-product. Radar, computers, and electronics are often cited as examples.

29. Two scientists from the Massachusetts Institute of Technology state the case for spin-offs in these terms:

"Missile guidance systems were an early source of support for integrated circuit development; requirements for satellite-tracking radars have supported the development of surface acoustic-wave technology and charge-coupled devices, as well as modern signal-processing techniques ... Finally, we should mention such significant second-order developments as radio and radar astronomy, microwave spectroscopy, and instrumentation for earth-resources satellites and for modern health care, all of which are heavily dependent on concepts and components derived from military electronics." 24/

30. Specific examples of spin-offs include commercial aircraft: the Boeing 707 was developed from the B-47 bomber and the Boeing 747 was developed from the design for the C-5 cargo plane. 25/

31. A variant of the spin-off argument is that even when innovations are not made originally through military R and D, the military provides the extensive "first use" of a new technology which makes it commercially viable. The transistor has been mentioned as an example where heavy purchases for military purposes led to an improved product and reduced price. 26/

32. Spin-offs from the military to the civilian sector are also used as an argument for West European participation in various United States space research programmes. 27/ It is argued that the programmes will produce goods directly useful to the civilian sector. Secondly, European participants will gain insight into modern United States technology which would be difficult to obtain otherwise. Thus, it is argued that high-technology sectors in Western Europe will be strengthened.

33. The evidence for such spin-offs is mixed, varying from one field to another. Bernhard Udis has interviewed various professionals in Western European military R and D institutions and in firms producing military goods. 28/ Their opinions were divided. Some believed that military and civilian production were quite similar in many fields and that substantial spin-offs occurred. Others were more skeptical and felt that the spin-off argument was frequently used as an excuse for high defence spending.

34. Lloyd J. Dumas cites from a 1974 report of a committee of the United States National Academy of Engineering. While not commenting directly on military R and D, this report was very critical of the alleged spin-offs from federal R and D programmes, of which military programmes constituted a major share:

/...
"With a few exceptions the vast technology developed by Federally funded programs since World War II has not resulted in widespread 'spinoffs' of secondary or additional applications of practical products, processes and services that have made an impact of the nation's economic growth, industrial productivity, employment gains and foreign trade." 29/

35. The efficiency of publicly funded R and D projects has been questioned in some econometric studies. Two studies have indicated positive returns from privately financed R and D but no effect from federally funded R and D. 30/ As a larger share of military R and D than civilian R and D is publicly funded, it is difficult to determine whether the lack of spin-offs from military R and D is due to its being military or to the public funding. Other studies, however, have emphasized the role of the Ministry of International Trade and Industry (MITI) of Japan in promoting the growth of knowledge-intensive industries. 31/ This role has been favourably compared to that of the Department of Defense in the United States economy. 32/

36. There are a number of counter-arguments to the spin-off argument. First, the spin-off argument builds on selected examples. With military R and D after the Second World War absorbing at least 25 per cent of all R and D, it would be surprising if no examples of benefits to the civilian sector could be found. The civilian benefits seem to be in no proportion to this enormous amount of money, however.

37. According to some, it is the civilian rather than the military demand that primarily stimulates further technological development. 33/

38. The importance of spin-offs has probably also decreased because of a highly specialized military production with fewer civilian applications. 34/ Cost considerations make the gap between engineering feasibility and operational practice much wider in the civilian than in the military sector. The military sector is characterized by highly sophisticated production and small quantities, while civilian products need to be inexpensive and are often produced in large quantities. Nuclear submarines and supersonic aircraft are examples of well-established military products with little if any promise of civilian use.

39. Spin-offs are sometimes discussed as if they occur only from military R and D to civilian products. However, spin-offs occur both from military R and D to the civilian sector and the other way round - from civilian R and D to the military sector.

40. Chalmers 35/ has examined the spin-off argument and argued that at least for some military R and D it may even be negative. Spin-offs from military R and D have led to investments in civilian sectors which in themselves are uneconomic and need government subsidies - the major example being the aerospace industry and the nuclear power industry. Both have received large subsidies, and both are at least partly a result of strong emphasis on military R and D in these fields. In both industries, United States firms have a dominant position, and Chalmers concludes that military and military-related production requires large resources. Small and medium-size countries may lose in this competition; they are probably better off researching in areas where they have a long-term comparative advantage.
41. Several studies emphasize the important role of small firms in the process of innovation. These are not the firms which receive the greatest support from the military. Large firms with major defence contracts tend to be risk minimizers, rather than innovators. 36/

42. The most fundamental reservation concerning the spin-off argument, however, is the following: spin-offs are uncertain, and when deciding on the desirability of an R and D programme only the direct costs and benefits should be evaluated. As Lester Thurow puts it:

"Hoping that a solution for a known problem will come from some project focused on a completely different goal makes no sense at all." 37/

43. As a general rule, it is more efficient to use more money directly on a civilian project, instead of spending money indirectly via military R and D. Military R and D is carried out for military reasons; chance by-products to the civilian sector cannot provide a justification for such programmes.

44. Military R and D and military production would be most beneficial in an economy with considerable unutilized resources. In that case, any alternative use of these resources has zero value. This situation hardly exists for military R and D, however. Military R and D competes with civilian R and D for the best qualified personnel. Even when unemployment is high, there may be a shortage of personnel required in the military establishment, for instance, computer engineers or electrical engineers. Thus, an expansion within military R and D may cause bottle-necks in the civilian sector. Fewer are left to teach in the universities and to work on product innovations in civilian industries.

45. In addition to the competition for human resources, the military also competes for other resources such as energy, raw materials and land. These resources generally have good alternative use in the civilian sector.

Cross-national comparisons

46. The economic performance of countries with different levels of military R and D spending can be compared "cross-nationally" as has been done for military spending generally. However, there is relatively little research as yet on the effects of military R and D spending, and only a few cross-national assessments involving military R and D spending appear to be known.

47. DeGrasse 38/ presents data for productivity growth in manufacturing industries and military and civilian R and D efforts relative to GDP. Six countries were investigated for the period 1970 to 1979. His study shows that countries with most military R and D have the slowest productivity growth, while countries with less military R and D have higher productivity growth. The relationship between civilian R and D and productivity is less clear-cut. DeGrasse argues that the negative relationship between military R and D and productivity growth can be explained partly by the low share of military R and D spent on basic research. This share was only 3 per cent in the United States from the early 1960s to the
early 1980s. He considers basic research important for broad innovations and productivity growth - a view which contradicts the view of most economists. Generally, applied research is considered to have a stronger effect on productivity than basic research.

48. The longitudinal relationship between R and D and economic growth was not studied by DeGrasse, however. The correlations are given in table 1 below. There is a clear negative relationship between the two variables. For civilian R and D, five out of eight correlations are positive, whereas for military R and D the correlations with productivity growth are mostly negative (six out of eight countries). The three negative (and thus anomalous) correlations for civilian R and D are smaller than those for military R and D for the same countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Military R and D (percentage of GDF)</th>
<th>Civilian R and D (percentage of GDF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>-0.91</td>
<td>-0.55</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.48</td>
<td>0.25</td>
</tr>
<tr>
<td>Germany, Federal Republic</td>
<td>-0.76</td>
<td>0.87</td>
</tr>
<tr>
<td>Republic of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>-0.87</td>
<td>0.77</td>
</tr>
<tr>
<td>Japan</td>
<td>-0.42</td>
<td>-0.33</td>
</tr>
<tr>
<td>Canada</td>
<td>-0.92</td>
<td>-0.43</td>
</tr>
<tr>
<td>Norway</td>
<td>0.77</td>
<td>0.64</td>
</tr>
<tr>
<td>Finland</td>
<td>-0.83</td>
<td>0.61</td>
</tr>
</tbody>
</table>

49. Thus, the same contradiction is not found between the cross-national comparison and the longitudinal comparison as in the studies on the effects on economic growth of military spending generally, thus strengthening confidence in the empirical relationship. However, it is still a weakness of these analyses that they do not build on a theory-based model. 39/
VI. MILITARY AND CIVILIAN SPENDING: PUBLIC PRIORITIES

50. Discussion of defence policy frequently leaves the impression that "national security" is a non-negotiable good, which takes absolute priority. This is not always the case when it comes to actual budgeting. "Military spending seems quite simply to have lost out to social and political forces which are stronger in the competition for limited federal dollars", as stated in an analysis of military spending during the period 1951-1983. 40/ As Hugh Mosley points out, the military share of the United States budget in President Truman's administration was arrived at residually, after essential domestic programmes had been subtracted. 41/ The testing of the first Soviet nuclear weapon and the outbreak of the Korean War changed that pattern and military expenditures were given priority. This military expansion did not, however, occur at the expense of domestic programmes. Rather, the rearming of the United States involved an expansion of the public sector of the economy. A "military Keynesianism" became prevalent: rearmament, in addition to its role in checking perceived foreign aggression, also stimulated economic activity. Increased military spending and deficit financing seems to be co-related in situations where resort to additional taxes is not a viable political option.

51. Table 2 below compares military spending and spending for public education by region for four time-points from 1970 to 1982. For most regions, public education has grown more rapidly. However, comparison of the last two time-points indicates that this trend has been reversed.

52. Data on civilian and military R and D spending for the period 1963-1984 has been examined in greater detail for 13 OECD countries. Plotting these data over time for each country reveals two rather striking points: (a) growth rates for civilian R and D are markedly higher; and (b) whereas curves for military R and D have many ups and downs, curves for civilian R and D generally show a steady upward trend. Table 3 gives average annual growth rates for all 13 countries, as well as the percentage of years in which there was real growth. The first of these measures indicates the size of the growth, the second its stability. Civilian R and D is higher on both for every country except Norway (where military R and D grew more rapidly, but also more erratically and from a very low level) and Italy (where the initial level was also low).

53. Figure 1 shows the development of military and civilian R and D plotted over time for all 13 countries as a whole. This figure demonstrates the same relationship, even though the R and D curve for all countries together is less erratic than are the curves for each country - probably because the ups and downs occur at different times in various countries.

54. A breakdown by subgroups within OECD - not reproduced here - indicates that, initially, the United States was dominant within OECD in terms of civilian R and D. But civilian R and D grew more rapidly in the other OECD countries than in the United States and, by 1980, the other OECD countries included in the present study, not including the United Kingdom and France (i.e., 10 countries) surpassed the United States.
Table 2. Military spending and spending for public education, 1970-1982
(percentage of GDP)

<table>
<thead>
<tr>
<th>Year</th>
<th>Military spending</th>
<th>Public education spending</th>
<th>Military spending as a percentage of public education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>1970</td>
<td>3.3</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td>1975</td>
<td>3.4</td>
<td>4.8</td>
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<tr>
<td></td>
<td>1980</td>
<td>3.4</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>1982</td>
<td>4.1</td>
<td>4.3</td>
</tr>
<tr>
<td>North and South America</td>
<td>1970</td>
<td>6.6</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>1975</td>
<td>4.9</td>
<td>6.1</td>
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<tr>
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<td>1980</td>
<td>4.4</td>
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</tr>
<tr>
<td></td>
<td>1982</td>
<td>5.2</td>
<td>5.3</td>
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<td>Asia</td>
<td>1970</td>
<td>5.4</td>
<td>3.6</td>
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<tr>
<td></td>
<td>1975</td>
<td>5.6</td>
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<tr>
<td></td>
<td>1982</td>
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<td>5.0</td>
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<td>Europe</td>
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<td>6.7</td>
<td>5.3</td>
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<tr>
<td></td>
<td>1975</td>
<td>6.7</td>
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<td>1982</td>
<td>5.6</td>
<td>5.0</td>
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<td>Oceania</td>
<td>1970</td>
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<td>2.5</td>
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<td></td>
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<td>2.7</td>
<td>6.0</td>
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<tr>
<td>World</td>
<td>1970</td>
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<tr>
<td></td>
<td>1975</td>
<td>5.8</td>
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<td>1982</td>
<td>5.3</td>
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<tr>
<td>OECD area</td>
<td>1970</td>
<td>4.8</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>1975</td>
<td>4.0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>1980</td>
<td>3.7</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>1982</td>
<td>4.2</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Source: Based on data from OECD, SIPRI and the Institute for Peace Research, Oslo.

a/ Excluding China.
Table 3. Military and civilian R and D in 13 member countries of OECD: level, stability and growth

<table>
<thead>
<tr>
<th></th>
<th>1983 level of R and D expenditure based on 1975 prices (billion US dollars)</th>
<th>Average annual growth of R and D expenditure, 1963-1984 (per cent)</th>
<th>Percentage of years in which R and D expenditure rose in constant price (per cent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Military</td>
<td>Civilian</td>
<td>Military</td>
</tr>
<tr>
<td>United States</td>
<td>14</td>
<td>36</td>
<td>1.06</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2</td>
<td>5 a/</td>
<td>1.38</td>
</tr>
<tr>
<td>France</td>
<td>2</td>
<td>6</td>
<td>4.13</td>
</tr>
<tr>
<td>Germany, Federal Republic of</td>
<td>0.4</td>
<td>10</td>
<td>1.80</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.2</td>
<td>1</td>
<td>1.89</td>
</tr>
<tr>
<td>Italy</td>
<td>0.1</td>
<td>3</td>
<td>12.11</td>
</tr>
<tr>
<td>Japan</td>
<td>0.1</td>
<td>18 a/</td>
<td>7.18</td>
</tr>
<tr>
<td>Canada</td>
<td>0.07</td>
<td>2</td>
<td>0.00</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.02</td>
<td>2</td>
<td>3.06</td>
</tr>
<tr>
<td>Norway</td>
<td>0.02</td>
<td>0.4 a/</td>
<td>8.20</td>
</tr>
<tr>
<td>Spain</td>
<td>0.003</td>
<td>0.6 a/</td>
<td>-1.21</td>
</tr>
<tr>
<td>Finland</td>
<td>0.004 a/</td>
<td>0.4</td>
<td>2.85</td>
</tr>
<tr>
<td>Belgium</td>
<td>0.001</td>
<td>0.8 a/</td>
<td>-8.39</td>
</tr>
</tbody>
</table>

All 13 countries | 19 | 85 | 1.36 | 5.42 | 61 | 89

Source: Based on data from OECD, SIPRI and the Institute for Peace Research, Oslo.

a/ Latest year available.

b/ Based on substantially fewer than 20 years.
Figure 1. Civilian and military R and D expenditures, 1963-1984, for 13 member countries of the Organization for Economic Co-operation and Development

(billion US dollars at 1975 prices)

Source: Based on data from the Organization for Economic Co-operation and Development (OECD), the Stockholm International Peace Research Institute (SIPRI) and the International Peace Research Institute, Oslo.
55. An attempt has been made to examine the available data country by country, to find evidence of direct competition between military R and D and civilian R and D. Both civilian R and D and military R and D have had a long-term positive growth - although much more modest for military R and D. Therefore, it is not reasonable to expect a negative correlation between the levels of military and civilian R and D, whether in absolute terms or in relative terms (as a fraction of the national product, public expenditure, etc.). But a negative correlation might be expected between the annual changes in military and civilian R and D; when one increases, it is at the expense of the other. In fact, a negative relationship of any size holds only for a small number of countries. No clear evidence of a competitive relationship emerges from these data. 42/

VII. MILITARY SPENDING: ALTERNATIVE USES

56. It was concluded from the previous sections that releasing resources from the unproductive arms race would put industrialized market economies in a position to improve their economic performance with regard to key indicators like employment and economic growth. Whether disarmament measures in fact would lead to such desirable results, would depend on the economic policy carried out by the country in question.

57. Recent international debate on conversion has focused on the link between disarmament and development, the idea being that the resources currently used on the arms race would be used for development purposes. 43/ The idea is intuitively appealing. As already noted, global military spending was 18 times higher than all foreign aid in 1982. Even the smaller States in Western Europe which are the only countries that approach the target of providing development aid corresponding to 1 per cent of GDP, spend three times as much on arms.

58. For most countries it would not be economically possible in the short term to convert all arms spending into development aid, because it would take too many resources out of the domestic economy. It should be possible, however, to put together a package of reduced military spending, increased development aid and domestic countermeasures which could satisfy both domestic and international economic goals. A study of Norway indicated that if three fourths of the released resources were put into domestic programmes of a labor-intensive kind (in the social sector), one fourth could be used for increased financial transfers to developing countries. Even assuming that the increased development aid yielded no feedback to the Norwegian economy, employment and economic growth would be maintained at exactly the same level. 44/ On the average, industrialized countries should be able to put together packages involving a larger proportion of development aid, since many of them would gain from the increased purchasing power of the developing countries.

59. Clearly, then, major disarmament efforts coupled with a political will to transfer resources to international development would mean a very substantial increase in development aid.
60. That is not to say, of course, that it would mean a revolution in development. Some results from an application of the World Model are set out in table 4 below. A baseline scenario (BASE) was compared with three disarmament/conversion scenarios. The BASE scenario projects to the year 2000 the current trends (around 1980) in international economic development and military spending.

61. Both disarmament scenarios were computed with 100 per cent conversion, i.e., development aid was increased by an amount corresponding to the reduced military spending. The moderate disarmament scenario was also computed without increased development aid.

62. Tables 5 to 7 set out the results. Table 5 gives GDP per capita in 2000 for the various scenarios. The BASE scenario involves a major increase in GDP for recipients as well as donors of aid and for developed as well as developing countries. However, under the assumption of disarmament both donors and recipients gain even more. And the greater the reduction of military spending, the greater the benefits to both sides. Naturally, the aid recipients — and particularly the resource poor developing countries — gain more when the military spending is added to the aid programme. However, even donors and developed countries gain from increased aid.

63. The main reason for this is that the poor regions operate under a balance of payments constraint in the model. Increased aid relaxes this constraint and permits them to increase their imports of machinery and other capital goods contributing directly to economic growth. These goods are bought from the developed countries, which in turn show a net gain from the conversion process, although a smaller gain than that of the developing countries.

Table 4. World Model scenarios
(per cent)

<table>
<thead>
<tr>
<th>Reduction in military spending</th>
<th>1990</th>
<th>2000</th>
<th>Conversion index a/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (BASE)</td>
<td>100</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Disarmament (DIS)</td>
<td>85</td>
<td>70</td>
<td>0</td>
</tr>
<tr>
<td>Conversion - low level (CON-LO)</td>
<td>85</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Conversion high level (CON-HI)</td>
<td>70</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>


a/ Percentage of reduced military spending transferred to increased development aid.
Table 5. GDP per capita, 1980 and 2000
(US dollars at 1970 prices)

<table>
<thead>
<tr>
<th></th>
<th>1980</th>
<th>BASE</th>
<th></th>
<th>DIS</th>
<th>CON-LO</th>
<th>CON-HI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donors</td>
<td>1,972</td>
<td>3,388</td>
<td>3,456</td>
<td>3,459</td>
<td>3,480</td>
<td></td>
</tr>
<tr>
<td>Recipients</td>
<td>172</td>
<td>186</td>
<td>197</td>
<td>317</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>Other regions</td>
<td>837</td>
<td>1,180</td>
<td>1,224</td>
<td>1,302</td>
<td>1,392</td>
<td></td>
</tr>
<tr>
<td>World total</td>
<td>1,115</td>
<td>1,663</td>
<td>1,700</td>
<td>1,767</td>
<td>1,842</td>
<td></td>
</tr>
<tr>
<td>Developed</td>
<td>3,323</td>
<td>5,475</td>
<td>5,655</td>
<td>5,663</td>
<td>5,709</td>
<td></td>
</tr>
<tr>
<td>Developing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class I a/</td>
<td>711</td>
<td>1,867</td>
<td>1,829</td>
<td>1,943</td>
<td>2,059</td>
<td></td>
</tr>
<tr>
<td>Class II b/</td>
<td>184</td>
<td>241</td>
<td>244</td>
<td>320</td>
<td>399</td>
<td></td>
</tr>
<tr>
<td>World total</td>
<td>1,115</td>
<td>1,663</td>
<td>1,701</td>
<td>1,773</td>
<td>1,842</td>
<td></td>
</tr>
</tbody>
</table>

Source: Cappelen, et. al., "Global conversion from arms to development aid ...", p. 23.

a/ Resource rich developing countries.

b/ Resource poor developing countries.

64. Table 6 sets out the same information in terms of annual growth rates for GDP. Under the BASE scenario and the disarmament scenario, recipients - in particular the resource poor developing countries - are not expected to grow as much as the donors. Under the conversion scenarios, however, recipients - including the resource poor developing countries - achieve higher growth rates than the donors.
Table 6. Annual growth of GDP per capita, 1980-2000
(per cent)

<table>
<thead>
<tr>
<th></th>
<th>BASE</th>
<th>DIS</th>
<th>CON-LO</th>
<th>CON-HI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donors</td>
<td>2.7</td>
<td>2.8</td>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Recipients</td>
<td>0.4</td>
<td>0.7</td>
<td>3.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Other regions</td>
<td>1.7</td>
<td>1.9</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>World total</td>
<td>2.0</td>
<td>2.1</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>Developed</td>
<td>2.5</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Class I a/</td>
<td>4.9</td>
<td>4.8</td>
<td>5.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Class II b/</td>
<td>1.4</td>
<td>1.4</td>
<td>2.8</td>
<td>3.9</td>
</tr>
<tr>
<td>World total</td>
<td>2.0</td>
<td>2.1</td>
<td>2.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Source: Cappelen, et. al., "Global conversion from arms to development aid ...", p. 23.

a/ Resource rich developing countries.
b/ Resource poor developing countries.

65. In table 7, the consequences for global redistribution are examined. The extreme right-hand column represents the hypothetical distribution of equal GDP per capital for donors and recipients, which might well be posited as the eventual goal of an international development policy. Compared with this elevated ideal, the distributions under all the scenarios are extremely skewed. However, the two conversion scenarios can be clearly seen to effect a certain amount of redistribution, whereas the pure disarmament scenario does not. The gap narrows, but not by very much.
Table 7. Global redistribution in 2000 as a result of conversion
(Percentage of distribution of world GDP)

<table>
<thead>
<tr>
<th></th>
<th>BASE</th>
<th>DIS</th>
<th>CON-LO</th>
<th>CON-HI</th>
<th>Hypothetical (equal GDP per capita)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donors</td>
<td>90</td>
<td>90</td>
<td>86</td>
<td>83</td>
<td>44</td>
</tr>
<tr>
<td>Recipients</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>49</td>
</tr>
<tr>
<td>Other regions</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>World Total</td>
<td>101</td>
<td>101</td>
<td>101</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Developed countries</td>
<td>76</td>
<td>76</td>
<td>74</td>
<td>71</td>
<td>23</td>
</tr>
<tr>
<td>Developing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class I</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Class II</td>
<td>9</td>
<td>9</td>
<td>12</td>
<td>14</td>
<td>64</td>
</tr>
<tr>
<td>World total</td>
<td>100</td>
<td>100</td>
<td>101</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

**Source:** Cappelen, et al., "Global conversion from arms to development aid ...", p. 23.

66. Clearly, the transfer of a major share of arms spending to increased development aid will increase GDP per capita in the poorest countries fairly substantially. Even in the absence of such a deliberate transfer of resources, the improved beneficial economic effects which can be expected in market economies as a result of disarmament, should put these countries in a better position to increase their aid to developing countries. Faye Duchin remarks pessimistically that such aid increases

"will have a negligible impact on the average standard of living if they are incorporated into the existing structures of production, trade and consumption. Strategies focused on structural change will be indispensable for sustained improvement in the standard of living of the less-developed countries - even in the presence and especially in the absence of large 'gifts' from the rich countries." 45/

67. While this conclusion may be overly pessimistic, it is clear that, with present knowledge, disarmament and conversion is not a sufficient condition for overcoming the development gap. Neither is it a necessary condition. As pointed out earlier, peacetime military spending - in spite of a rising trend in this century - still occupies a minor proportion of the total resources of the industrialized market economies. In many of those countries, annual growth rates of GDP of 3 per cent were common after the Second World War. A single year's growth channeled into increased development aid would equal the military spending for most market economies - and thus would compensate for the lack of conversion.

/...
Notes

1/ The 1982 figure is used here for the purpose of comparison with other available data. World Armaments and Disarmaments: SIPRI Yearbook, 1985 (henceforth SIPRI Yearbook), gives the 1984 figure as $US 649 billion.


6/ Paul F. Diehl and Gary Goertz, "Trends in military allocations since 1816: what goes up does not always come down", Armed Forces and Society, vol. 12, No. 1 (Fall 1985), pp. 134-144.


8/ Economic and Social Consequences of the Arms Race and of Military Expenditures (United Nations publication, Sales No. E.83.IX.2), paras. 7 and 97.

9/ See, for instance, Lindgren, loc. cit.

Notes (continued)

11/ The world model of Leontief and Duchin (see footnote 23 below) has been used to calculate the economic effects of global disarmament for Norway. Cf. Adne Cappelen, Olav Bjerkholt and Nils Petter Gleditsch, "Global conversion from arms to development aid: macroeconomic effects", Norway Publication No. 5-9 (Oslo, International Peace Research Institute, 1982).


15/ United States Department of Labor studies cited in Reijo Lindroos, Disarmament and Employment (Helsinki, Central Organization of Finnish Trade Unions, 1981), p. 116. A number of other United States studies are cited in Mosley, op. cit., chap. 5. All the studies point in the same direction, although there is some dispute about the number of jobs lost through military spending.

16/ The studies are reviewed in Lindgren, loc. cit., pp. 380 ff.


18/ Former United States Secretary of Defense Harold Brown in testimony before the United States Senate Budget Committee, 27 February 1980, cited from DeGrasse, Military Expansion, Economic Decline ..., p. 55. DeGrasse also indicates that at least three other United States defense secretaries have made similar statements in the past decade.

19/ For a review of the evidence, see Lindgren, loc. cit., Cappelen et al., "Military spending and economic growth ..."; Chan, loc. cit.

20/ Congressional Budget Office, Defense Spending and the Economy (Washington, D.C., Superintendent of Documents, 1983), p. 38; Cappelen et al., "Global conversion from arms to development and ...".


22/ Cappelen et al., "Military spending and economic growth ...". /...
Notes (continued)


28/ From Guns to Butter: Technology Organizations and Reduced Military Spending in Western Europe (Cambridge, Massachusetts, Ballinger, 1978).


31/ DeGrasse, "The military and semi-conductors", p. 95.


34/ Malcolm Chalmers, Paying for Defence. Military Spending and British Economic Decline (London, Pluto), p. 120.

35/ Ibid., pp. 120 f.
Notes (continued)


38/ "The military and semi-conductors", p. 126.

39/ Christensen and Torvanger have applied an econometric model to these same data and have performed separate analyses for the longitudinal cross-sectional and pooled data sets. (Cf. Arne Magnus Christensen and Asbjorn Torvanger, Military and Civilian Research and Development and Growth (Oslo, International Peace Research Institute, 1985). In the time-series analysis, their first model yielded significant positive influence for military R and D for two countries and negative influence for two. Their second model yielded mixed results: a negative correlation for four countries. In the cross-section analyses, there were also few significant co-efficients. Using the second model, military R and D was found to have a significant positive influence on growth in the periods 1964-1969 and 1974-1976 and a negative influence in the period 1977-1980. Surprisingly, the co-efficients for civilian R and D were largely negative. One possible explanation for this finding is that civilian R and D data include both basic and applied research, while military R and D is overwhelmingly concentrated on applied research. Thus, the comparison is biased in favour of military R and D; a "fairer" comparison would be between the applied parts of civilian and military R and D. However, the available data do not permit such disaggregation. Some authors discuss "growth-oriented" R and D as a separate category, excluding not only military R and D, but also e.g., medical R and D; and it has been shown that such growth-oriented R and D has stagnated in the United States. (See Mosley, op. cit., pp. 75 f. for a review of such studies.) Data are not available for enough countries to permit a comparative study. On the whole, the results of the Christensen/Torvanger study are not very conclusive.

40/ The quotation is from Goertz, loc. cit., p. 128.


43/ Review of the implementations of the recommendations and decisions adopted by the General Assembly at its Tenth Special Session on development and international economic co-operation. Study on the Relationship between Disarmament and Development (United Nations publication, Sales No. E.82.IX.1); Relationship between disarmament and development. Report of the Secretary-General (A/40/618 and Corr.1).

44/ Gleditsch et al., "Conversion: global, national, and local effects ...", pp. 186 ff.

Appendix I

SPENDING ON RESEARCH AND DEVELOPMENT FOR THIRTEEN MEMBER COUNTRIES OF THE ORGANISATION OF ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD), 1963-1984

1. Gross expenditure on research and development (GERD) is defined by OECD as the expenditure on all R and D performed in a country independent of the source of finance. At the sector level, R and D expenses are classified according to their primary objective. Defence R and D is defined by OECD as follows:

   Defence includes all R and D programmes undertaken primarily for military reasons regardless of their content or whether they have secondary civil applications. It includes nuclear and space R and D undertaken for military purposes. It does not include civil R and D financed by ministries of defence, for instance on meteorology or telecommunications. 1/

2. Because of statistical problems, OECD publishes data on public financed military R and D only.

3. The Stockholm International Peace Research Institute (SIPRI), in its 1972 study on military R and D, used a somewhat different definition:

   (a) All R and D financed through the budget expenditures of a country's defence department (or comparable administrative unit);

   (b) All other R and D financed by national government departments and agencies, which is officially identified as being conducted for military defence or civil defence purposes, or concerned mainly with weapons. 2/

4. Thus, OECD delimits R and D by function, whereas SIPRI focuses on institutional origin. The SIPRI study may thus include some projects which are excluded by OECD and vice versa. It cannot be said generally whether one definition or the other will produce higher figures for military R and D.

5. A more recent publication from SIPRI offers a general definition of military R and D:

   "Military research and development (R and D) is the effort to extend knowledge and technical expertise wherever there are thought to be military applications, existing or potential, in order to create more effective weapons, more effective means of using them and more effective ways of making these same weapons (when used by the other side) ineffective." 3/

Yet this and subsequent publications from SIPRI appear to use OECD data, with some adjustments for selected countries. 4/

6. Separate statistics on civilian R and D have not been available to the author who has therefore calculated this as GERD, less publicly financed military R and D.

...
Notes


