Guns or Butter Problems of the Cold War

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Rudimentary methodology for studying the effects of military programs on the Soviet economy.

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When a Roman commander in 50 B.C. took the men and materials to throw up a fortress wall or build a new catapult, no one balanced this against civilian use of the resources. Defense was paramount. But no organization man in Washington or Moscow today would think of ordering a strategic weapon system without inquiring, among other things, into its impact on the economy. In this nuclear age both weapons and organization have become so complex, even in peacetime, that men must now study carefully the economic result of every major armaments decision. The questions asked may range from the industrial implications, here and in the USSR, of disarmament proposals on the one hand to the effects for the Russian consumer if Moscow matches a Washington decision to install an expensive antimissile system on the other. This article will explore the contribution of economic analysis in studying the impact of alternative military programs and will point out some of the intelligence problems involved in doing it on the USSR.

Economists recognize that in a global context the major considerations relative to disarmament or increased armament are not economic. Maintaining a counterpoise to the adversary in military strength and political initiatives will continue to be the overriding objective over the next decade. The economic problems will increase in importance only if

the political and military problems come nearer to solution. But analysis of the economic impact of alternative defense budgets may help us understand the implications of military and political developments as they occur.

It is the cost of modern armaments and the stretch-out in development of new military hardware that make it necessary to consider the economic impact of defense. The world now spends about $135 billion annually on the war industry, roughly as much as the entire income of the poorer half of mankind. The United States spends a little more than a third of the total, the USSR about a third, and the rest of the world a little less than a third. There are many competing demands for the resources represented by this money; for example increases in personal consumption, more investment to accelerate economic growth, war on poverty, expansion of higher education, more aid to developing countries. Moreover, decisions on arms spending made today cannot easily be changed tomorrow by beating the swords into plowshares. The Pentagon's shopping list has few items in common with the housewife's, and military hardware ordered two or three years ahead cannot be converted to patios or cabin cruisers. That is why a new military order, usually expensive and highly specialized, will affect other claimants to the nation's output for several years to come.

What is needed for studying the economic impact of defense is a technique that will translate military spending into civilian spending and vice-versa, so as to forecast the effect on the structure and growth of all civilian sectors as the resources available to them are increased or decreased. One must take into account: (1) the quality as well as the quantity of resources left for the civilian economy (a GI mustered back to an Iowa farm will not contribute as much to technological progress as an engineer released from the Redstone arsenal to AT&T); (2) the regional impact of defense spending, particularly with respect to small cities where the phasing out of a weapons system may close an assembly plant, for example; (3) the speed of military-civilian conversions, which may aggravate the frictions developed in switching resources from production of household appliances, say, to marine turbines; (4) the differences in national abilities to adjust, recognizing that a taut and muscle-bound economy like the USSR's will not as readily absorb increased defense outlays as one with some unused resources and the tremendous flexibility of the American. Economists have not yet developed standard techniques with which to attack this many-faceted task, indeed have done very little pioneering work on it.

A Hypothetical Case: The Problems

Military planning today requires some notion of the possible size and structure of the enemy's forces ten years from now and of its economic capability to support them. Suppose one were speculating about the size of Soviet defense outlays through 1975, necessarily making assumptions about many things such as technological breakthroughs and the shifting winds of coexistence. With the USSR's current defense spending at about $45 billion, a plausible range of alternative budgets over the next decade might be from a low of $35 billion to a high of $75 billion (reflecting, perhaps, a great difference in the magnitude and sophistication of strategic forces). With this frame of reference established, the economic impact problems begin.

First, would the $40 billion difference between the high and the low, if Moscow chose the latter, buy $40 billion worth of Russian consumption, or foreign aid, or investment in economic growth? Not necessarily. It might yield more (or less) than $40 billion in additional consumption, less (or more) than $40 billion in new investment, or some indeterminate addition to foreign aid. One of the riddles that research on the Soviet economy has not yet solved and must devote more attention to is the "exchange rate" between military and other spending.

This problem illustrates a fundamental difference between the U.S. and Soviet economies. In the United States a dollar is a dollar whether spent on military R&D or new housing, and our price system reflects the spending of economic resources in a way that accords with our national and individual desires. Through the price system people vote for the goods they want, and investors plan their output in line with these price votes -- a very efficient arrangement. But in the USSR a ruble is not a ruble, because prices are set by Moscow without reference to consumer votes. If more resources are needed for military R&D, the Soviet price system does not determine which sector of the civilian economy will give up these resources. The decision is part of the economic plan, and the resulting shift in resources may be quite inefficient. Thus it is difficult to determine whether a ruble taken from housing will buy a ruble of military R&D.

Second, would Soviet GNP grow at the same rate under the high and the low military budgets? That depends on the quantity and quality of men and materials left for the civilian sector and on how Moscow divides them between investment and consumption. The quantity problem by itself is easily interpreted -- sum up all the men and the metal and the electronics gear ticketed for defense, and those resources are lost to the civilian economy. The quality problem is more difficult the kinds of men and metal preempted by defense will affect the rate of technological development and hence the rate of growth in the civilian economy.

A high defense budget that concentrated specialized resources on military research, development, production, and space activities would interfere seriously with the introduction of new techniques in civilian industry. For example, if a disproportionate share of high-grade scientists and engineers are shunted to defense for several years, progress in developing new chemical processes and automation may be greatly retarded. Economists would say that growth in "factor productivity" -- the productivity of labor and capital, measured by the ratio of GNP to the input of the two combined -- has slowed down because of pressing military needs.

A question quite apart from the character of the military bite on resources is how Moscow will use those that are left, whether to increase (or decrease) the rate of growth of GNP by raising (or lowering) investment. But adding a ruble to investment will subtract a ruble, more or less, from consumption.

A Quantitative Method

The concept of factor productivity is useful in expressing more specifically the impact on the Soviet economy of the $75 billion and $35 billion defense budgets. Historically, during the long period 1928-63, factor productivity in the USSR increased at a rate of 1.5% annually; but during 1950-58, when defense expenditures grew slowly, this rate was accelerated to a little more than 3.0%, and then during 1958-63, when defense expenditures were stepped up, it fell to about 1.0%. This is the empirical basis for the following hypothesis: high defense expenditures preempt critical resources such as R&D and cause a slowdown in the

growth of factor productivity. In our hypothetical example the growth in factor productivity might be about 1.0% with the high defense budget and about 2.0% with the low.

The higher rate, of course, permits a faster growth of GNP. But several other factors enter into the projections of GNP under the two defense budgets:

(1) Moscow's decision whether to put primary emphasis in the civilian economy on investment or on personal consumption; if investment is planned to increase 10% annually, the capital stock (plant and equipment) will grow faster than if it increases only 7%, and the faster capital stock grows the faster GNP will grow;

(2) The annual growth in the labor force; this is related to the growth in adult population and is estimated at 1.7%;

(3) The relative shares of labor and capital in GNP; it is estimated that the return to labor in the form of wages and other payments amounts to about 75% of GNP, and the return to capital about 25%.

We are now ready to summarize in a table the possible impact of a high and a low defense budget on Soviet consumption and economic growth over a decade.

	Average Annual Rate of Growth (%)	
	Priority on Economic Growth	Priority on Consumption
Case I – High Military Budget:		
GNP	5.0	4.0
Consumption	-1.0	3.5
New Fixed		

New Fixed Investment	10.0	7.0
Military Expenditures	5.5	5.5
Case II – Low Military Budget:		
GNP	6.0	5.0
Consumption	3.5	5.0
New Fixed Investment	10.0	7.0
Military Expenditures	-2.5	-2.5

The general formula is:

> GNP growth rate = (factor productivity growth rate) + (labor growth rate) X (labors share of GNP) + (capital growth rate) X (capital's share of GNP)

Substituting figures for the high military budget and priority on economic growth:

> GNP growth= 1.0%+(1.7%) (.75)+(10%) (.25)
> =1.0%+1.275%+2.5%
> =4.775%, rounded to 5.0%

When the GNP growth rates have been determined, aggregate GNP can be projected to 1975 for each of the four cases. Military expenditures and investment, as given, can then be subtracted

from GNP to derive the only residual -- consumption.

From this quantification of economic impact it can be seen the high defense budget is not compatible with a premium on economic growth; it would result in an annual *decline* of 1.0% in personal consumption (about 2% in per capita terms), which would be anathema that to the Soviet leaders and their constituents. If Moscow chose the high military budget for a decade, it would probably have to be content with a rather low rate (4%) of growth in GNP, and even then personal consumption would increase more slowly-0 -- 3.5% annually in aggregate, or about 2.5% per capita -- than it has during the past 10 years. If, on the other hand, Moscow considered the low military budget adequate through 1975, it could maintain a substantial growth in GNP (5%) and the large increase of 5% in personal consumption (about 4% per capita), or alternatively it could opt for a higher rate of growth in GNP (6%) and a more modest increase in consumption (3.5%).[1]

A puzzling question still remains. Would the high military budget put too much strain on the Soviet economy? The new leadership is already stretching resources to the limit in its grandiose plans for expanding agriculture, boosting consumer welfare, keeping abreast of the United States in space, and maintaining the image of a dynamic economy. If Moscow spent $75 billion annually for defense by 1975 it is certain that something else in the economy would have to give. Could the USSR really afford such a high level of military spending? This question economic analysis cannot answer; it can say how much must be sacrificed for a given level of defense, but not whether the sacrifice will be made. What a nation can be persuaded to give up for defense depends on a host of sociological factors, including the nature and seriousness of the threat, the charisma of the leadership, and the cohesiveness of the people. It is a problem for the combined talents of political scientists, sociologists, economists, and other kinds of experts.

The Disarmament Problem

Although disarmament talks have made no dramatic progress, it is wise to think of economic impact along with the disarmament itself. Some of

the many forms that an agreement might take are general and complete disarmament, halting the production of nuclear weapons and delivery systems, a ban on research, development, and testing of new weapons, reduction in conventional forces, and annual percentage reduction in over-all defense spending. All of these programs would release men and resources to the civilian economy, but some would be more useful to a particular economy than others. For example, a country with a labor shortage might be attracted by the prospect of a reduction in conventional forces that would release manpower, whereas a technology-poor one might prefer a ban on new weapons development in order to free scientists and engineers for industrial research. It would be useful for disarmament negotiators to know which possible proposals would be most attractive to the USSR, or Communist China, because of economic impact.

The impact of disarmament might be likened to that of a shift in popularity from vacations at the beach to private swimming pools in the back yard. Demand for services at Ocean City would go down, whereas demand for cement, excavating equipment, and local labor would go up. There would be a similar shift of men and resources if the Pentagon were to slash its orders for aircraft and the Interior Department let contracts for large new dams. In a modern, developed economy there are dozens of industries that would be involved in the switch from planes to dams. While some industries push the finished planes off their assembly lines, others produce only the engines or the tires or the radar systems, and still others make only the metal or only the sulphuric acid that helps make the metal. Some sell primarily to other industries; some sell most of their output to final consumers. How will each of these interrelated industries be affected if military aircraft production is banned by a disarmament agreement? Would the subsequent shifts in resources affect economic growth and personal consumption? These are the key impact questions.

One way of getting at the answers is through input-output analysis, a technique for tracing the complex adjustments that occur throughout a nation's industrial machine as demand for final products is cut back or increased at one point or another. A large "flow table" is prepared, in which each major industry is listed once as a row and once as a column. The row shows how industry A sells its products to all the industries listed in the columns, and to final consumers in an extra column. The column shows how industry A buys from all the industries listed in the rows, and from the labor market in an extra row. The table thus shows,

for example, the total sales of aluminum to the aircraft industry and as pots and pans to households.

Using the Table

Table 2 is a highly simplified example of the basic flow table in input-output analysis. A usable one would have at least 30 columns and rows; in practice it would be likely to have several hundred.

HYPOTHETICAL INPUT-OUTPUT TABLE *millions of dollars*					
	Total Inter-				
	Purchases by Steel	Purchases by Coal	Industry Purchases	Purchases by Consumer	Total Output
Sales of Steel	20	20	40	25	65
Sales of Coal	30	10	40	10	50
Sales of Labor	10	15	25		25

It is apparent from the table that in producing $25 million of steel for use by final consumers the steel and coal industry used up $40 million of steel. In other words, it takes steel to make steel and coal, and it takes coal and steel to produce coal. If consumer

demand for steel and coal should increase by $5 million each, the input-output technique will tell us how much additional steel, coal, and labor will be needed to satisfy both the increase in consumer purchases ($5 million each) and the additional inter-industry purchases ($? million). The procedure is approximately as follows: The flow table is used to derive a coefficient matrix, a table which shows the inputs of steel, coal, and labor required *per dollar* of steel and coal output. We now ask a computer to invert the coefficient matrix and multiply it by the column showing the increases in consumer demand. The resulting product is the total increase of steel, coal, and labor needed. If a flow table has 200 industries rather than 2, and if we define a calculation as either a multiplication or a division, inversion of the corresponding coefficient matrix requires about 2,500,000 calculations.

If the Pentagon were to cancel its contracts for the F-111, an economist with a set of input-output tables and a digital computer could estimate the resulting changes in every industry affected. There would be a decrease in demand for steel, which in turn would require less sulphuric acid, less iron, less limestone, and less coal. There would be a reduced demand for synthetic fibers and plastics from the chemical industry. The tire industry would demand less rubber and less nylon and rayon. Employment would be cut at General Dynamics and at some of its subcontractors and suppliers. These are only a few of the ramifications from such a single cut in production of military aircraft. The input-output tables are a tool for tracing the highly intricate chain reaction through the industrial structure and measuring the resulting demands, direct and indirect, on each of the industries.

Aircraft production is a comparatively trivial example. General and complete disarmament would have a substantial impact, releasing perhaps $40 billion in resources annually to both the Soviet and the U.S. economy. Input-output tables would show the kinds and amounts of material and the quantity of labor that would be freed for use in civilian industry. This information, together with regional economic data, would form the basis for planning the alternative uses. In the USSR the government would make *all* the decisions as to what resources go where and when. But in the United States planners in private industry would bid for the released materials and labor, basing their bids on their estimates of consumer demand; the government would step in only if a geographic region or an industry needed outside help to adjust to the new conditions.

Another use for the input-output tables would be to evaluate the impact of a large increase in military expenditures. They would show the additional effort required by each industry, would point to the kinds of civilian activities that might be cut back, and would help identify bottlenecks.

To construct an input-output table for the USSR would require a great deal more data than is presently available to Western economists, but fortunately the USSR has become interested enough in this technique to develop some large-scale tables of its own. Parts of the tables for the year 1959 were published in 1962. Russian books and journals have referred to nine national and nineteen regional input-output tables that have been constructed or are in preparation. Soviet writers use input-output data widely in their unclassified papers, implying that the tables are circulated in the USSR and that economists are free to use their statistics in detail. Moscow may in time release some of the more extensive tables for other years.

It is clear that Soviet input-output tables would be more useful to economic planners in Moscow than to intelligence analysts in Washington. The planners have to solve the problems, whereas analysts only identify them. Nevertheless, the wealth of information that emanates from an input-output table would help the analyst measure the strains in the Soviet economy caused by increased defense spending or evaluate the impact of resources released through disarmament.

Other Economic Impact Questions

The ready transferability of men and factories from the military to the civilian sector has received relatively little attention. In the event of general disarmament, what amounts and kinds of the material and human inputs to defense could be used in the civilian economy (1) immediately? (2) after modification or retraining? (3) not at all? A number of excellent studies of this problem have been made in the West,[2] but the few Soviet economists who have written on problems of disarmament substantially understate the difficulties that would likely be encountered in the USSR.[3] The costs of transfer would be less in the

United States than in the USSR, because our market mechanism will more quickly and efficiently switch resources to products the consumers want. Conversion probably would cause more problems for the Soviet economy and require greater effort than is now recognized in Moscow, and some of our economic intelligence efforts should be directed to the specifics of the consequent dislocations and effects on the development of the economy.

Educational progress has been an important factor, though difficult to quantify, in the rapid economic growth of the USSR. With the increasing complexity of modern weapons, a greater share of the highly trained scientists and engineers in the USSR are now used in defense, and the implications of this for the future development and growth of civilian industry are uncertain. In order to refine his impact studies, the economist needs more information on educational achievement in the USSR, including projections a decade ahead, and a better understanding of the contribution that education makes to economic growth.

Economists often say that defense is a quite separate sector of the economy that drains resources away from other uses. Although prima facie true, this assertion may ignore a possible feedback from defense to the civilian economy. To what extent, if any, does technological know-how developed specifically for defense benefit the civilian economy? In the United States, military-space technology is often diffused into the civilian sector: e.g., the 1/2-thousandth-inch aluminum coated plastic film developed for the ECHO satellite is now used as a reflective insulator for very low temperature vessels; superior printing rolls have been made from the polysulfide rubber developed for cast solid propellants; sintered aluminum oxide ceramic, developed for rocket nozzles, is now used in industry for special check valves and resistor cores. Little is known about interchange of technology in the Soviet economy between the military and civilian sectors; it is probably not as widespread as here. It is an important matter to the economist, however, because the extent to which military R&D filters into the civilian sector will affect his estimate of factor productivity and future growth of Soviet industry.

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1 It is emphasized that these figures are purely hypothetical, serving only to illustrate the methodology.

2 Benoit and Boulding, *Disarmament and the Economy*, 1963. The Economist Intelligence Unit, *The Economic Effects of Disarmament*, 1963.

3 I. S. Glagolev, *Vliyaniye razoruzheniya na ekonomiku* (The Economic Impact of Disarmament), 1964. I. S. Glagolev, ed., *Ekonomicheskiye problemy razoruzheniya* (Economic Problems of Disarmament), 1961.