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AUTHOR: Clyde C. Wooten

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Argues that DoD pressure for figures on Soviet military outlays and their economic impact has brought a spurious response.

ECONOMIC INTELLIGENCE IN DEFENSE PLANNING*

Clyde C. Wooten

In the last few years new requirements for intelligence data on costs of present and future Soviet forces and for analysis of the Soviet economic potential with respect to supporting expensive weapon systems have been expressed:

. . . I believe that it is essential that all estimates of Soviet force levels be required to meet reasonable tests of economic feasibility. This means that NIEs should include cost estimates and overall budgetary implications of the estimated forces. It would be very useful to me to know how the Soviets are allocating their military expenditures. . . .

—Secretary McNamara to the DCI, 13 February 1963

We need estimates of costs . . . for several reasons. First, it is very useful for top level planners working on the problem of shaping the US defense program to know where the Soviets are putting their money. . . . Next, costs to the Soviets give us some indication of the likelihood of certain changes. For example, it is important to know what the Soviet defense budget is as a percentage of gross national product. And, it is also very useful to have some feeling for the marginal costs to them of various changes in their programs. . . .

—Dr. Alain Enthoven, 25 July 1963

It is of course obvious that economic feasibility is an important constraint on the development of military capabilities. It is one thing, however, to recognize that there are limitations on Soviet economic capability to maintain modern armed forces and quite another to measure that capability for the purpose of testing the feasibility of particular force levels. Or put another way, can "strains" in the Soviet economy caused by advanced weapon programs be effectively measured and the measurement applied in a useful way to solution of U.S. defense planning problems? The purpose of this paper is to

* This is the editors' condensation of a more comprehensive study by the author which is available on request.

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examine this question and a broader one implied by the new DoD requirements for economic intelligence: Given the kind of data available to the economic analyst, what kind of response is it feasible for him to make?

In order to comply with the DoD requests¹ it is necessary for intelligence to develop estimates of:

1. Current Soviet military expenditure allocations within the current GNP.

2. The cost of Soviet forces by mission, including with respect to advanced systems the current and future expenditures for both present and future systems (i.e., present operations and maintenance costs, current investment for present and future inventories, current R&D costs for future systems).

3. The Soviet GNP growth rate or some other measurement of economic capability to support defense expenditures, projected as far as the estimates to be tested are projected.

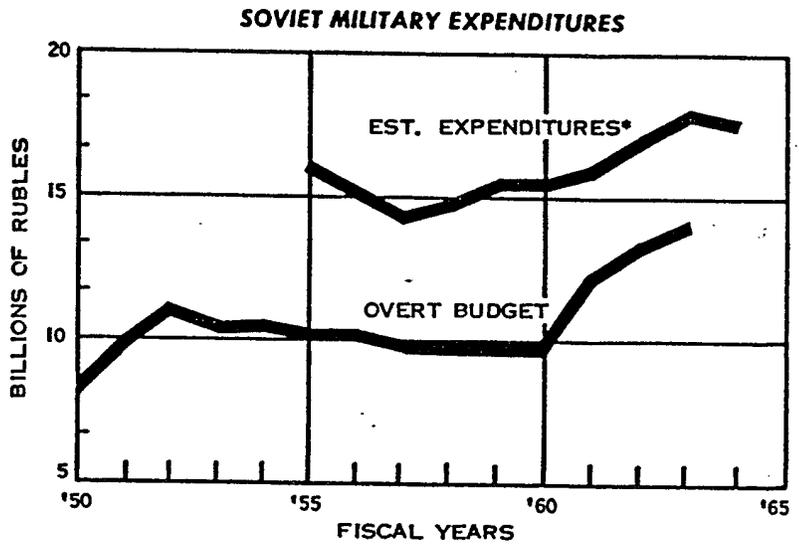
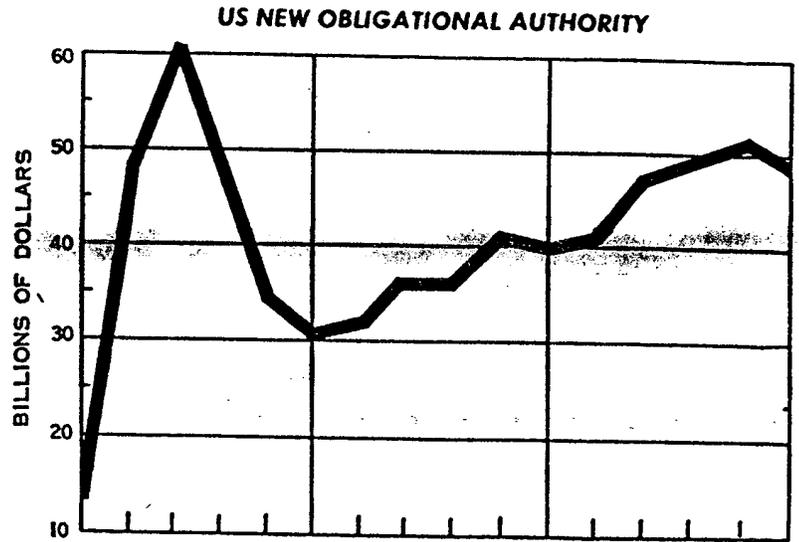
Allocation of Expenditures

The Soviet military budget is publicly a one-line item, a single figure for all military outlays each year. Its interpretation and breakdown, a job for economic intelligence, is not simplified by the Soviet practice of hiding increments to it elsewhere, much as we hide the CIA budget.

Figure 1 shows how this overtly budgeted amount has compared with actual expenditures as estimated by intelligence and with U.S. obligational authority for defense spending. There is considerable uncertainty associated with the estimated Soviet expenditures, not only present and future but also past, as we shall see. But accepting these figures, we see they give little warrant for extrapolating into the future on the basis of trend. This is as we might expect; military budgets are a product of compromise among contrary influences and subject to seemingly unpredictable fluctuations. We are therefore probably not justified in relying on trend analysis as a technique for estimating future military expenditures and the economic limitations on them.

A considerable amount of analytical ingenuity has been demonstrated in tracking down the hidden increments of the Soviet military budget. Data on industrial production have been analyzed to iden-

¹Cited and discussed in greater detail in W. E. Seidel's "Intelligence for Defense Planning," *Studies* VIII 2, p. 19ff.



*The estimated expenditures are taken from "Soviet Defense Expenditures," CIA/RR MP 65-1, 2 June 1965.

FIGURE 1

tify defense production, largely by a residual method, identifying components which are not defense programs in order to isolate what may be attributed to defense. There are a number of difficulties with the residuals approach, but the most important one is that the resulting figures give little insight into the mission breakdown of the military expenditures. Such a breakdown has been made an important objective for economic intelligence, which therefore requires resort to an extensive effort at synthesizing Soviet military costs, in particular costs of Soviet weapon systems.

Soviet Costs

Meaningful analysis of expenditures requires, first, data on prices and quantities, and second, relationships between these and other prices and quantities. Neither of these conditions is fulfilled by data directly available on Soviet military expenditures.

First let us speak of Soviet prices. While it is an oversimplification to say that prices in the Soviet Union are what someone says they are, they bear no regular rational internal relationship which could form a basis for extrapolation. Because the USSR is a controlled and rationed economy, prices are not a reflection of buyers' and sellers' independent choice in a free market. Ruble costs have no necessary relationship to real costs. The variations between the two have been indirectly and approximately expressed by intelligence (and elsewhere) in terms of divergent ruble-dollar relationships.² It may be added that there is some divergence among estimates of these divergent relationships. We shall return to this matter; but for the moment it is necessary only to note that a ruble is not a ruble in the same sense that a dollar is a dollar.

This circumstance poses the first of two difficulties in the costing of Soviet military forces. Because Soviet costs derived from Soviet prices and quantities are not a true reflection of real costs, it is quite hard to make simple comparisons between the costs of different elements of the Soviet forces (either investment costs or, even more difficult, total cost of operations, maintenance, research and development, test and evaluation, etc.). Of course the difficulty is multiplied when one attempts to compare U.S. and Soviet military costs. But precisely this kind of comparison has to be made in order to estimate

² See, for example, the discussion in Alan B. Smith's "Costing Nuclear Programs" on p. 34 of this issue, especially footnote 7.

the cost of Soviet elements in the first place. Here arises the second and more serious costing difficulty.

Inasmuch as very little Soviet military cost data is directly available, it is necessary to synthesize the Soviet costs by estimating the cost-generating characteristics of the Soviet forces, assigning prices to individual elements, and summing the costs of the required numbers. The long and short of this is that intelligence cannot develop the costs from economic data available from the Soviet Union. "All attempts to calculate the costs of Soviet forces" have depended "upon basic cost factors derived from U.S. data."³

The costing is thus done primarily by analogy: a weapon system is costed as if it were produced in the United States by U.S. technology and methods and with U.S. personnel. For the sake of comparability the U.S. systems closest to those of the Soviets are used and are modified to allow for known differences. Where possible, Soviet factors such as Soviet labor prices in rubles are used, though this introduces non-homogeneous units, rubles and dollars.

How good are these costs? Since the costing is by analogy with U.S. practice, it will be useful to inquire how good U.S. costing is.

U.S. Costs

The cost of advanced weapon systems has been increasing rapidly in the United States. Dr. Harold Brown has illustrated this point by comparing the fly-away cost of the World War II F6F, \$9 per pound, with that of the F4B, to be over \$74 per pound.⁴ The reasons usually advanced for the increase are a greatly increased sophistication in weapon system components and the increased cost of materials and highly skilled labor. It is well known that there are other factors; we shall mention three.

The first is inherent in the way the business is done in the United States, and more particularly in the defense industry. Suppose there is a design competition for a new weapon system. Two or more companies may carry out very extensive and expensive R&D efforts, often involving the same general technology. It is not unknown for such competitions to become quite protracted, with resubmissions

³E. D. Brunner, *Soviet Air Armaments and Their Costs, 1946-1961* (Santa Monica, California: The Rand Corporation, RM-3508-PR (Secret RD), May 1963), p. 1.

⁴Statement before a meeting of the Institute of Aeronautics and Astronautics in Washington, D.C., 22 September 1964.

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required. Each competitor must demonstrate competence, in terms of personnel and facilities, to proceed with the contract after it is awarded. Only one company ultimately wins the contract. The loser or losers may be reimbursed under terms of the development contract for part of their expenses, in which case this adds to current R&D costs. More usually, the company absorbs the loss, expecting to make it up through profits on other defense contracts, so that the apparent costs of succeeding systems are increased. There are advantages to this way of doing business, but saving money is not one of them.

A second factor is inefficiency in R&D. There is a dearth of data on this subject, for understandable reasons; companies are not likely to advertise their inefficiencies. But efficiency is likely to be of a different order when limitations on funds require heavy emphasis on economy and reliance on the ingenuity of project leadership and personal incentives, as against the conventional U.S. R&D practices, with cost-plus contracting, emphasis on massive documentation, detailed control of lower echelons, etc.

Recent research by Arnold C. Cooper⁵ on the cost of civilian product development disclosed no investigations into relative efficiency among companies of different size, but on the basis of an "introductory exploration" he hypothesized that "... large companies tend to spend substantially more to develop particular products than do small firms." In interviews with managers he found that most think a large company "spends from 3 to 10 times as much as a small one to develop a particular product." In a case study of a small and a large firm developing a protective coating for similar products, the small one carried out a 12-month part-time project estimated to cost \$1,400, while the larger's project lasted 38 months and ran \$11,000 in direct costs.

Cooper is careful to restrict his conclusions to R&D, avoiding any suggestion that small companies are more efficient in production activity. But it is the very large R&D costs in the U.S. missile and space field, rather more than production costs, that have created a view here that heavy expenditures are required for substantial progress, especially in the light of competition with the USSR. Such R&D activities are non-standard and difficult to control, thereby lending themselves to rat-hole expenditures and enterprises.

⁵ Arnold C. Cooper "R&D is More Efficient in Small Companies," *Harvard Business Review*, May-June 1964, pp. 75-83. This article was drawn to my attention by Tom Glennan of the Rand Corporation.

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A third factor which pyramids costs is competition for labor and materials. The missile and space industry in the United States has over the past few years been its own worst competitor for talent. When projects proliferate, new investment in facilities is required. In a competitive economy the pricing system is the mechanism for gaining priority in personnel recruitment, capital investment, and resource allocation. Therefore unit costs are higher on priority projects.

Implications for Analog Costing

The relative tightness of the Soviet economy suggests that Soviet R&D is not likely to share the rich man's results-count-more-than-the-money attitude. The Soviet design-team approach lends itself to internal communication and continuity in technology. It has been noted by intelligence that Soviet design goals are usually more modest, less prone to press the state-of-the-art, less likely to incorporate cost-multiplying modifications after series production has begun, than in U.S. practice. Priority seems to be arranged through direct allocation of resources—men, facilities, material—rather than by price adjustment. There are, of course, disadvantages to this way of operating, but it seems economical in terms of costs on high priority programs. All this would suggest that we have a tenuous basis for analog costing.

Before we turn to future weapon systems, a rather important implication of analog costing of current forces needs to be made explicit. Costs developed by the analog method depend not only on what is costed (unit costs) but on how much is costed (systems costs). "The reasonableness of the results depends, to a large extent, upon the validity of the order-of-battle estimates."⁶ But the objective in costing was to validate and set economic limits on the order of battle. If the validity of the cost estimates depends upon validity of the order of battle, how can the order of battle be validated by the cost estimates?⁷

Let us now consider estimating future costs. The question of future technology is immediately raised. There is of course great intrinsic uncertainty in projecting technology into the future, whether in foreign

⁶E. D. Brunner, *op. cit.*, p. 1.

⁷The objection that costs so derived may be measured against economic capabilities will be met below.

or domestic, military or civilian application. Charles J. Hitch, DoD Comptroller 1961-1965, has observed:

. . . the most important thing to understand about R and D is the dominant role played by uncertainty. . . . Predictions by "experts" of the results or usefulness of particular R and D projects are highly unreliable. . . . Developments almost always take longer and cost more than predicted (by factors of 2 to 50), . . . most fail in whole or in part . . . In addition to technological uncertainty, R and D shares with other kinds of time-consuming investment what is called environmental uncertainty—uncertainty about the kind of new product that will be saleable or useful in the unknown environment of the future years in which it will be available.⁹

The matter of military R&D and system cost prediction has received a considerable amount of study because of glaring mistakes in cost estimates associated with U.S. weapon system proposals. It has been found that estimates of total system costs made early in a development program may be less than the estimate made when the system is ready to be introduced into the active inventory by a ratio of 1.5, 2, 3 or even higher. Studies indicate that a primary and overriding cause for underestimating U.S. weapon system costs has been the tendency to change performance characteristics or the configuration of systems after the cost estimates have been completed.⁹

In the use of highly uncertain data for purposes of comparative analysis or evaluation, it is desirable that the uncertainties be of the same order or otherwise comparable. It may then be possible, in a very rough or crude way, to "factor out" such uncertainties on the basis of their comparability. Perhaps enough has been said to suggest that methods used in costing Soviet military forces may not yield the required comparability with U.S. costs. The estimated costs of Soviet forces so derived may thus not express the true cost relationships, either internally or with respect to those of U.S. forces, implied by the manner in which they are presented in intelligence estimates. This possibility may be enhanced by the problem of ruble-dollar conversion.

⁹ Charles Hitch, *The Character of Research and Development in a Competitive Economy* (Santa Monica, California: The Rand Corporation, P-1297, 13 May 1958), p. 4.

⁹ G. H. Fisher, *A Discussion of Uncertainty in Cost Analysis*, RM-3071-PR, The Rand Corporation, April 1962, p. 5 *et passim*. A study of 12 DoD weapon programs made in DoD some time ago revealed that they were underbid by a factor of 3.4.

The Ruble-Dollar Problem

Let us suppose that after some difficulty in arriving at a reliable cost estimate for a Soviet weapon system (and knowing that it is reliable), we have in hand such an estimate expressed in dollars (or partly in dollars). The next problem is to convert the dollars into rubles. Although there are a number of bad ways to do this, there is no completely satisfactory way. There is no single conversion factor by any method of calculation (except of course the Moscow-pegged exchange rate), and all methods of calculation have difficulties.¹⁰ The way this has been done in costing Soviet forces, and indeed the most nearly satisfactory way, is to relate elements of the military costs to Soviet economic sectors for which ruble-dollar ratios have been established and to compute ruble costs by use of these ratios.

The same problem in reverse cannot of course be avoided in interpreting the economic meaning of the aggregated costs derived through conversion factors. If they are summed and related to costs calculated for previous Soviet defense budgets, we run into the problems we have discussed in costing methodology, costing uncertainty, determination of how and when costs are incurred,¹¹ real costs, etc. It is quite difficult to draw simple, accurate, and useful inferences from comparing such costs, say costs of Soviet general-purpose forces with those of strategic offensive forces or with data on other economic sectors, not to mention U.S. costs of similar forces.

Cost-Effectiveness Comparison

Finally, there is a perplexing problem as to how to compare U.S. and Soviet forces in terms of costs and effectiveness by any system of analysis when their relative composition, sophistication of equipment, relative austerity, and requirements for support are so different. Secretary McNamara has inquired "whether the Soviet military estab-

¹⁰ See Rush V. Greenslade, "Rubles vs. Dollars," *Studies* VI 1, p. 1-11, for a succinct explanation of the problem of ruble-dollar relationships in connection with the comparison of U.S. and USSR GNP's.

¹¹ The fact that in 1965 it was discovered that Airframe Plant No. 30 at Moscow Central Airfield had been producing MIG 21/FISHBED aircraft since about 1960, together with the fact that not enough information is available to establish a production rate, is illustrative of the degree to which distribution of costs, including distribution in time, must be based on assumptions.

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ishment has certain expenditure patterns which, as compared to our own, provide more military capability for the same cost."¹²

Intelligence has long remarked that the Soviets tolerate crude workmanship where technical excellence is not required. In the first Soviet-produced jet engine the turbine blades were well made but other workmanship was inferior by U.S. standards. In Soviet systems the instrumentation and auxiliary equipment also tend to be simpler than in the U.S. equivalents. Their space vehicles, although larger, are believed to be simpler than ours. Because they are larger they also avoid the costs of miniaturization and associated problems of quality control and reliability.

It is well known that the Soviets have standards of austerity in military forces different from ours. Probably less well understood is that they also have different needs for supporting forces and facilities. As the most obvious illustration of this, Soviet general-purpose forces are for the most part deployed in Soviet border areas or in proximity to the homeland, whereas a substantial portion of U.S. general-purpose forces are deployed at great distances from the continental United States. This implies substantial differences in support requirements of all kinds. In short, the Soviet military problem is not symmetrical with the U.S. military problem, and this asymmetry has implications beyond the costs of differing mixes of combat arms.

These two differences—in standards of austerity and in requirements for support forces and facilities—are in some degree complementary, as suggested by Major General Deane, the senior U.S. military representative in Russia during much of World War II, in his description of a trip to the Soviet front after the Battle of Vilna:

On the following day we were first driven to the headquarters of the Fifth Army, which was about fifteen miles west of Vilna. Colonel General Krylov was in command and he received us with his entire staff. It was certainly a far cry from the American conception of an Army headquarters. The entire staff consisted of fifteen to twenty officers who lived and worked in a few small trailers scattered through the woods. There was one huge hospital tent, well camouflaged, which served both as a conference room and as a headquarters mess. Some offices had stenographers at work, but most of them did not. We could not help but think of the enormous installation and all the office space and facilities found at an American Army headquarters. It highlighted some very different concepts in our methods of operating. . . .

¹² Memorandum 12 January 1963 to the Joint Chiefs.

Of course the Russian problem was considerably different from ours. In the matter of supply they had only one theater to consider as opposed to the many all over the world in which we were fighting. Their supply lines were confined to an east and west rail and road net, whereas ours extended back across the ocean. To them a supply deficiency meant a few days' delay, whereas we had to wait for the availability of convoys. In the matter of personnel all Russia's manpower was close at hand, and her willingness to accept losses allowed the Red army to rely on sheer force of numbers rather than careful planning in order to achieve objectives with the least loss of life. In the matter of training Russia had the advantage of an agrarian population already hardened and for whom the rigors of battle were little more severe than the rigors of peace. Post Exchanges, United Service Organizations, doughnut wagons and other morale agencies which call for overhead were unheard of."

This, from the Russian point of view, was a successful army which had accomplished everything necessary to win a great victory. The Russians possibly still carry something of this image in their minds as they build new military capabilities in a new era. What this means in terms of combat capability has not been tested.

Let us review what we have covered. We know that the Soviets have important resource allocation problems. Military expenditures can be made only at the sacrifice of other desiderata competing for the same resources. But the problem of measuring constraints on such expenditures, we have found, runs into a number of conceptual and technical problems having to do with erratic trends in military budgets, inability to derive mission breakdown from Soviet budget figures, methodology of estimating costs, translation of costs into rubles, and forming judgments about them in the framework of the Soviet economy.

It takes a certain optimism to expect intelligence to be able to cost weapon systems which cannot be described in detailed cost-generating terms, to do it by methods which have proved to be quite uncertain, to arrive at dollar costs and translate these into ruble costs without a satisfactory methodology, and to extrapolate all this, by any method, into an uncertain future—perhaps five or seven or ten years—and arrive at system and force costs which have any useful precision. Or whose precision can be guessed.

After the costs have been derived, they must be related to something which serves as a gauge of the "strain" they engender in the economy or a measure of economic feasibility. They must be meas-

" John Russell Deane, *The Strange Alliance* (New York: Viking Press, 1947), p. 210 f.

ured against some such standard as GNP growth projected into the future, or in terms of the sacrifice they would require in some other Soviet objective, such as investment for GNP growth. The most impressive effort to date to assess the impact of future Soviet military expenditures has in fact adopted the latter standard. Let us now examine the attempt to make such assessments in practice.

The Intelligence Effort

The forces postulated in "Intelligence Assumptions for Planning" have been costed and found feasible and reasonable from an economic point of view. The forces listed in "Alternative Ten Year Projections of Soviet Military Forces," a group of documents produced by a CIA/DIA Joint Analysis Group,¹⁴ have been costed and described as feasible. The most impressive and comprehensive effort to date, however, is the report "Soviet Defense Expenditures and Their Economic Impact Through 1970."¹⁵

Inasmuch as this latter document is the first attempt to go beyond simply costing Soviet forces and declaring them feasible,¹⁶ it is important to scrutinize its methods¹⁷ and results. Its ultimate measurement of the cost of estimated future Soviet forces is in terms of sacrifice in economic growth. How good is our understanding of economic growth?

Intuitively, there can be no question that competing expenditure programs have an influence on economic growth, and growth on expenditure programs. How much is another matter. In 1964 the intelligence community, noting that "new extensions of Soviet economic assistance to 25 non-bloc countries . . . fell to a low of \$77 million in 1962 and did not exceed \$200 million in 1963," declared, "This marked decline cannot, of course, be attributed solely to a resource squeeze within the USSR but has almost certainly been reinforced by the domestic competition for increasingly scarce resources and by the overall slowdown in Soviet economic growth . . . Economic aid to

¹⁴ The establishment of this group was discussed by W. E. Seidel in his article "Intelligence for Defense Planning," *loc. cit.*

¹⁵ CIA/RR MR 64-1, dated December 1964.

¹⁶ No forces otherwise estimated by the intelligence community as feasible have yet been declared infeasible on the basis of intelligence cost analysis.

¹⁷ Parts of the methodology are informally discussed by George Ecklund in his "Guns or Butter Problems of the Cold War," *Studies IX 4*, p. 1 ff.

nonbloc countries is unlikely to recover the momentum of earlier years."

But in 1965 it had to acknowledge that "the hiatus in Soviet extension of economic aid to less developed countries of the Free World was ended as new credits rose . . . [to] some \$800 million during 1964 . . . The rate of expenditure has been rising rapidly." And the dour outlook for the Soviet economy of 1964, with "chronic mismanagement," "programs too ambitious for available resources," and an economy "too large, too clumsily managed, and too complex to change gears overnight" became rapidly more cheerful.

Another example suggests the depth of our understanding of growth in the Soviet economy.¹⁸ On January 10, 1964, the *New York Times* reported that ". . . the once impressive 6 percent annual economic growth rate of the Soviet Union had slipped to 2.5 percent in the last two years . . ." This news became available through an unprecedented CIA statement to the press following a succession of massive grain purchases by the Soviet Union. It was greeted with satisfaction by the press but suffered a mixed reception among U.S. and British academic specialists on the Soviet economy.

To quite a number of the specialists, the statement said both too much and too little. A central problem was the role played by Soviet agriculture in the economic downturn. Part of the commentary involved more arithmetic than economics. The agricultural sector has been counted as 25 to 33 percent of Soviet GNP, depending on the omission or inclusion of a land rent adjustment.¹⁹ With massive crop failures resulting in a severe depression of so large a sector of the economy, one might expect the GNP to drop severely. Then it might rise even more dramatically with a good crop year. "What a very bad harvest can wreck," one observer remarked, "a quite moderate harvest can mend. If in 1964 agricultural production [in the Soviet Union] equals that of 1961, and other things grow as they did this year, except that trade and light industry expand slightly along with

¹⁸ The quite large misestimate of China's economic growth during the "Great Leap Forward" period is well known. See, for example, B. B. Rebbechi, "Post-Mortem: The Chinese Economy," in *Studies* VII 1, and Edward L. Allen, "Chinese Growth Estimates Revisited," *Studies* VII 2.

¹⁹ Stanley Cohn, "The Agriculture Sector Weight in an Index of Soviet Gross National Product," *The ASTE Bulletin*, Winter 1964, p. 13. The same sector in the U.S. GNP is only about 4.2 percent.

the increased agricultural supplies, the national income will rise by 7%." ²⁰ It did rise, according to CIA, about six percent. The important point—that the Soviet Union is faced with a problem of resource allocation—was obscured rather than illuminated by the 2.5 percent growth figure. ²¹

The general downward trend in the growth of the Soviet economy has been attributed largely to increased investment in military and space programs. ²² Intelligence has taken note of the enormous costs of our own modern weapon system and space programs, which sharpen our appreciation of the economic constraints on the Soviets in similar endeavors. Thus the general intelligence judgment is that the Soviets are indeed faced with resource limitations and difficult resource allocation choices. How much farther can intelligence go? Let us see how much farther it has gone in "Soviet Defense Expenditures and Their Economic Impact Through 1970."

Quantification

Two forces, a high and a low, along with the programs they imply, are costed on the basis of "a quantitative, physical description" contained in "NIEs and related documents." "However, because many of the official estimates were not expressed in sufficient detail or did not conform to the desired probability criteria, it was necessary to make a variety of assumptions in order to provide descriptions adequate for costing purposes." ²³

²⁰ Peter Wiles, "CIA Bono—Reflections on the CIA's Statement of January 10, 1964, on the Soviet Economy." *The ASTE Bulletin*, Winter, 1964.

²¹ Cf. Alec Nove, "2½ Per Cent and All That," *Soviet Studies*, July 1964, and Stanley H. Cohn, "Comment on '2½ Per Cent and All That,'" *Soviet Studies*, January 1965.

²² "... perhaps the single most important factor [contributing to the lag in Soviet productivity] is the demand of the defense program since 1958 for scarce resources and highly trained manpower." NIE 11-5-65. It is noteworthy that two USIB agencies (one non-military) have joined in a footnote to the subsequent *Note to Holders* of NIE 11-5-65 and NIE 11-6-65 stating that Soviet defense spending uncertainties are "too great to support a judgment as to the general trend of Soviet defense expenditures particularly in recent years."

²³ p. 5. It must be emphasized that the high and low forces are not represented as limits or bounds in a mathematical sense. Yet the synthesized costs of these forces have been introduced into NIE 11-5-65 as the range of Soviet military expenditures, as we see below.

Neither the systems costed nor the variety of assumptions used in costing are described in the report. However, the basis for selection of systems is described as follows:

If the judgment was that there was a probability of 75 percent that an item would appear, it was included in both the high and the low "assumptions." If, however, the probability was only 50 percent that an item would appear, it was included in the high side only, and if the probability of its appearance was less than 50 percent, it was omitted from both sides. Then a second judgment was made concerning the number of items that would be deployed. This second judgment was ranged to reflect a probability of 75 percent.

The costs of the high forces and the low forces were arrived at "by simply summarizing the expenditures for all of the high force 'assumptions' on the one hand and all the low force 'assumptions' on the other."

Also, no attempt was made to take explicit account of uncertainties about the prices used in the costing exercise. This decision was governed by practical considerations, particularly by the desire not to obscure the effects resulting from uncertainty as to physical posture by introducing ranges that reflect uncertainty as to cost or price. This decision should not be interpreted to imply a judgment that the range of uncertainty as to Soviet costs or prices is sufficiently narrow that it can be ignored.

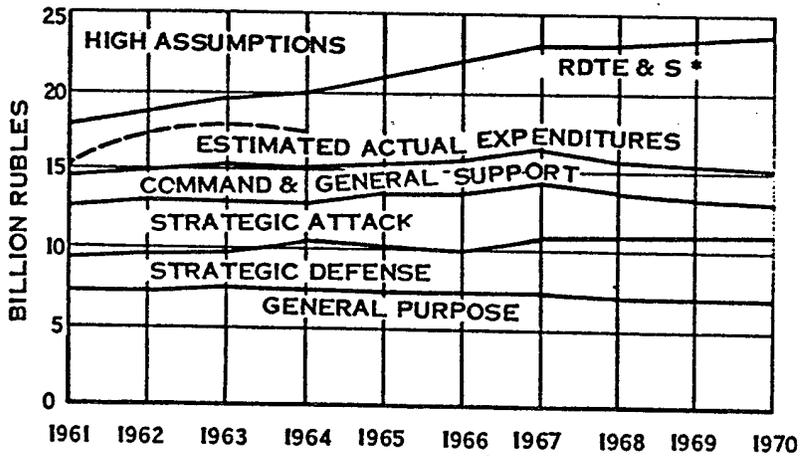
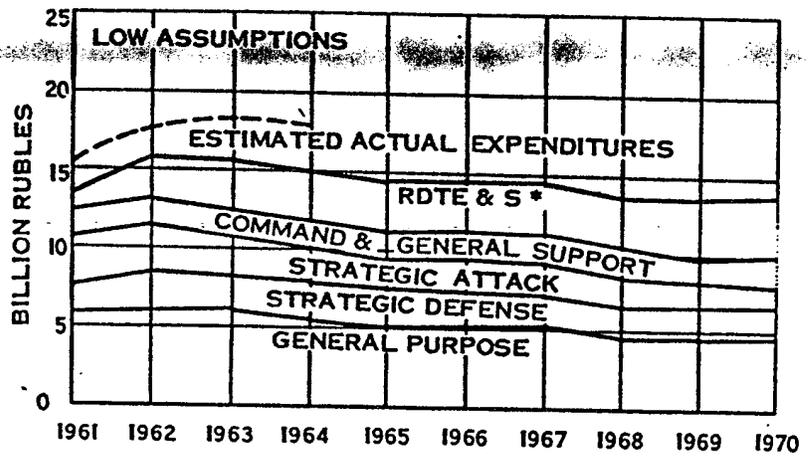
This, on one page, is all that is told the consumer about the forces costed, the methods used, the reliability of the data, or the problems arising out of expressing costs in U.S. dollars and Soviet rubles. The remainder of the report is taken up with summarizing "expenditure implications" of the high and low forces, discussing the "potential impact of the expenditure series on the Soviet economy," and comparing the "dollar equivalents of Soviet defense expenditures."

We shall not try to summarize the 41 pages of text, tables, and charts. The following extract and the charts in Figure 2 are enough for an understanding of the general conclusions.

A possible rate of growth of GNP consistent with the high assumption might average about 5 percent for the whole period; however, the rate for the period through 1967 might be confined to 4 percent per year. A rate of growth for GNP of 6 percent, however, would be consistent with the low assumption. The empirical basis for these projections is not extensively or rigorously developed as yet, and the Soviet economy may do either significantly better or worse than projected.²⁴

²⁴ p. 17. These judgments were later introduced into NIE 11-5-65 without the qualification in the last sentence.

USSR: Comparison of Total Defense Expenditures
for Low and High Assumptions of
Military Forces, by Mission, 1961-70



*Research, development, test, evaluation, & space programs

FIGURE 2

The two charts in Figure 2, from the report in question, show the implied costs of the two programs. The present writer has added the later estimated expenditures to each chart.²⁵ It may be noticed that the implied costs of the forces with the high and the low assumptions extend back before 1961; how far, one has no way of determining from the charts. This is as one would expect, because the cost implications of different future force levels do extend backwards in time.

There is a certain difficulty here, though. The cost implication of the high assumption is as much as 22 percent higher than the low four years ago and becomes 45 percent higher in 1965. Now the estimated actual expenditures curve falls between the high and low assumptions, which seems reasonable. But logic demands that the estimated actual expenditures embrace both the high and low assumptions in the present and past, as either of these assumed forces could be the actual program at the time, according to the assumptions by which they were constituted. Thus the uncertainty in the estimate of actual expenditures must be at least as large as the difference between the high and low assumptions,²⁶ 45 percent of the low in 1965. If this degree of uncertainty is accepted in the estimated expenditures which have been "straining" the economy in the past and present, what basis is there for assessing a future "strain"?

Nevertheless, we find these judgments concerning the effects on economic growth of different levels of defense expenditures appearing in NIE 11-5-65 without the qualifications (which themselves seemed inadequate) that appeared in the study from which they were taken. Moreover, we note data on the absolute magnitude of military expenditures appearing without appropriate qualification. For example, NIE 11-5-65 gives for the 1964 expenditures a range from 15.0 to 19.9 billion rubles,²⁷ but this range reflects only uncertainty about

²⁵ From "Soviet Defense Expenditures," CIA/RR MP 65-1, 2 June 1965. The data are the same as those in Figure 1. It is perhaps worth noting that this current estimate of Soviet military expenditures for recent years varies considerably from previous estimates for the same years.

²⁶ Not to take into account the further uncertainties in the costing of the high and low assumptions, or in the high and low forces themselves.

²⁷ These and other data concerning military expenditures since 1961, appearing in Table 4 on page 24 of the NIE, are taken from the study we have just discussed.

the forces costed, not the costing uncertainties with which this essay is concerned. This fact is not noted in the estimate, nor does any expression of the tenuous nature of this expenditure data appear there. It is not surprising that misconceptions concerning the data arise.

Summary of Uncertainties

In discussing the means by which intelligence seeks a quantified expression of Soviet economic limitations to produce advanced weapons, we have noticed a variety of uncertainties. It may be worth while to review them. Military budgets, representing a compromise among contrary interests, show erratic trends. The U.S. budget has fluctuated to a very considerable extent and in an unpredictable pattern. The Soviet budget has also fluctuated, we are quite uncertain how much. Extrapolation does not seem a warranted method of estimating future budgets.

Increments of the Soviet military budget are hidden, so that we have no "pie" to slice into mission forces or elements. The pie must be analytically created by costing assumed elements. Meaningful costs of modern Soviet weapon systems cannot be derived from Soviet economic data; most costs must be estimated by analogy with U.S. costs. The basis for analog costing appears uncertain, and the methods used may produce costs not representative of the real costs of Soviet forces, especially in the light of incomparable features of the respective forces.

The method involves use of both rubles and dollars. These are not homogeneous units, and conversion from one to the other presents an anomaly which translates to uncertainty. Having arrived at dollar/ruble costs, there is difficulty relating these to some expression of strain or economic limitation. Intelligence has enjoyed no particular success in predicting GNP growth. Nevertheless it is in terms of limitations on GNP growth that intelligence has attempted to measure the impact of military programs.

Use in Defense Planning

It is to be assumed that economic intelligence data and judgments contained in National Intelligence Estimates, and costs of Soviet forces synthesized by intelligence at the military planner's request, are to be used in defense planning, the purpose for which they were requested. We should then not be surprised to find the following reasoning advanced in a certain sensitive military planning document of considerable importance: The United States and its NATO allies

are spending about the same amount on general-purpose forces as are the Soviet Union and the Warsaw Pact forces.²⁸ This fiscal equivalence is a basis for judging future necessities from a force planning point of view. If the spending is the same, the essential problem is to see to the more effective use of the military resources, including more effective organization for employment, rather than adjusting expenditure levels to military needs otherwise determined.

Comparative economic measurements involving Soviet and U.S. military equipment and forces are appearing with increasing frequency in military planning documents. One finds statements like "replacement costs [of U.S. and Soviet equipment] ought to express the relative effectiveness of various aircraft," and charts relating to all kinds of forces with abscissas and ordinates labeled "Soviet costs" and "U.S. costs."

In a study which combined and summarized extensive substudies undertaken by the three services at the request of the Department of Defense we find the following as a description of its focus:

If the Soviets spend x dollars to create damage to the US and the US spends y dollars to limit damage, what is the percentage US population and industry surviving? . . . This can be expressed in terms of exchange rates—the cost for the US to maintain a given "% surviving" per dollar of Soviet expenditure to overcome it.²⁹

The current trend in the Department of Defense seems to be in the direction of increasing use of Soviet forces costing and more reliance on economic intelligence judgments. Indeed, this is a natural evolution in the use of systems analysis for defense planning. An objective of systems analysis is to explore or to refine successively a military problem so that marginal advantages in terms of some cost-effectiveness yardstick are identified and can form the basis of conclusions. Marginal utility, a concept familiar to any student of

²⁸ The following statement is from an explanatory footnote in Memorandum to Holders of NIE 11-4-65 and NIE 11-5-65: ". . . [Since] the evidence is not adequate for an estimate of land armaments production [in the Soviet Union] within useful ranges of confidence, the production figures used for computing expenditures for such production were developed from assumed requirements in order to permit inclusion of expenditures for land armaments in the gross total."

²⁹ "A Summary Study of Strategic Offensive and Defensive Forces of the US and USSR," Office of the Director of Defense Research and Engineering, 8 September 1964, p. 14 f. It should be noted that this study was distributed for information only. Nevertheless, data from it have been used as input to other weapon system studies.

elementary economics, is thus a primary concern of the systems analyst. He is interested in the range of diminishing returns, and he seeks to determine where marginal advantages and points of indifference between the cost-effectiveness of alternatives should influence decision making.

It is quite clear that important insights into military relationships and the tradeoff nature of various military measures may be derived through using economic data in systems analysis. It seems equally clear that conclusions may, under some circumstances, be critically influenced by inadequacies in the economic inputs. Even when findings are not sensitive to such inputs or even related to them, intuitive comparisons of economic capabilities can scarcely be avoided. Indeed, they are encouraged by the present circumstance in which data on Soviet military expenditures and costs of categories of Soviet forces appear in intelligence publications at the highest national level, often without the slightest qualification. A part of the problem is the compartmentation of the intelligence from the planning function and a failure of communication between intelligence and the military planner with respect to the adequacy of the data.

But the basic trouble is not simply a matter of communication. Nor is the difficulty of estimating Soviet defense expenditures and of understanding and measuring economic limitations wholly a matter of accessibility of data or competence in analysis. Some of it is due to the difficulty of the science of economics. Economic theory is not well developed—certainly not in a way to allow transfer of data from one economic frame of reference to another with rigor, or even to understand fully its meaning in one frame of reference. Otherwise how would it be possible for two such distinguished economists as Galbraith and Myrdal to draw opposing inferences concerning economic production in the United States from the same set of data?

Von Neumann and Morgenstern, who have made an extensive effort to express basic economic relationships in mathematical form, have remarked:

... we may also observe that part of the feeling of dissatisfaction with the mathematical treatment of economic theory derives largely from the fact that frequently one is offered not proofs but mere assertions which are really no better than the same assertions given in literary form. Very frequently the proofs are lacking because a mathematical treatment has been attempted of fields which are so vast and so complicated that for a long time to come—until much more empirical knowledge is acquired—there is hardly any reason at all to expect progress *more mathematico*.²⁰

²⁰ John Von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton: Princeton University Press, 1953), p. 5.

In the making of wine, more pressure on the marc may not improve the product. It may be that squeezing harder the available Soviet economic data, or the economic intelligence analyst, will not achieve the kind of product envisioned by the requester. In fact, it may not be too much to say that the pressure has already been excessive, judging from the product. At least it may be time to consider the matter.

Some Recommendations

It would seem that the expectations of Defense consumers concerning the usefulness of economic intelligence on the Soviet Union in force planning are quite high and the prospects of satisfying these expectations quite low. But, far from being informed that the prospects are low, the consumers are being provided data on costs of Soviet forces in NIEs and other intelligence products in a way that can only create misapprehensions concerning its precision. It may be that some Defense consumers have already been extensively misled concerning the basis for intelligence-supplied data on Soviet military defense expenditures, judging by their statements quoted above and others making use of it. It has been included in weapon system studies in the Pentagon, and there is every indication that it will continue to be used in such studies and accepted at face value.

It would be invidious to imply that those doing the economic intelligence analysis do not understand the limitations of the economic figures appearing in finished intelligence. Yet these are not suitably qualified when cited in estimates and studies, and no coherent, organized statement of their limitations has appeared.²¹ Rather, when requirements for such data are voiced, intelligence uncomplainingly (and unqualifyingly) seeks to meet them. Why this is so cannot easily be understood outside the framework of a group of dubious propositions about the relationship of intelligence to planning ensconced in the folklore of the business. But if this analysis of the nature and uses of economic intelligence on Soviet military forces is not completely awry, it is clear that the intelligence consumer is ill served by the resulting products.

²¹ Moreover, there exists no study elaborating the methods by which such data are derived, so an independent evaluation of their precision could be made. Even the ruble-dollar ratios employed have not been published.

For intelligence, three conclusions suggest themselves. First, there appears to be an important need for a comprehensive statement about the precision of costing Soviet forces and the limitations of economic intelligence judgments made on the basis of such costing. This could take the form of a published study on methodological problems in the production and use of economic intelligence and might include a detailed examination and assessment of the confidence limits of various categories of data. The importance of such a study suggests that it might be published under the aegis of the USIB.

Second, there should be a serious reconsideration of the utility of including costing data in National Estimates and allied documents. This is not to say that study of the problem of deriving a mission breakdown of Soviet defense expenditures precise enough to be useful should not be continued. But it is a serious question whether synthesized data for which there is no direct evidence should be certified by inclusion in National Estimates and accorded the stature of national intelligence in planning.

Third, if such data is included in NIEs, it should be properly qualified, even if the qualification destroys or greatly reduces its utility to the Defense planner. Possibly it should also be cross-referenced to other papers which more extensively discuss and qualify it. It should be a rule of intelligence that information be set into a context that, at a minimum, accords the consumer an appreciation of its limits, of what is not meant as well as what is meant. There seems to be a principle analogous to Murphy's law in industry²² which states that if intelligence can be misinterpreted, it will be.

Of course these three conclusions imply a fourth. A concomitant study by the planners themselves of the uses of economic intelligence in defense planning in the light of problems associated with its production might be worth while. It might be found that Soviet defense expenditure data received by DoD from the intelligence community does not have the character anticipated when it was asked for—or the utility. It is in the spirit of systems analysis that there should be an evaluation of alternatives in analysis methods as well as in what is analyzed. It seems clear that there is a set of potential uses of economic intelligence in defense planning for which the presently produced data are not satisfactory. There may be a set of uses for which such data, produced in the form of assumptions, may prove satisfactory. In any case, the utility of presently produced economic intelligence should not be a matter of presumption.

²² Murphy's law: If a machine can be assembled wrong, it will be.