

~~CONFIDENTIAL~~

*Theoretical analysis of a
difficult estimative problem*

THE MANY BURDENS OF DEFENSE IN THE SOVIET UNION

Rush V. Greenslade

Rubles, dollars,
Computers, collars,
Engineers, chemists,
Male or feminist,
Capital and labor
For plough or saber,
Opportunity cost,
Steel capacity lost;
We'd choose a measure if we knew how!
Burden, burden, who's got the burden now?

Those who have followed the writings and estimates on Soviet military expenditures over the years are aware of considerable difference of opinion as to how much of a burden on the Soviet economy military programs are and as to the correct way to measure the burden. Ways of measuring burden have, indeed, proliferated in recent years. To illustrate this point, consider the following statements, all of which have been used to express the burden of defense on the Soviet economy.

- a. Defense expenditures are about eight percent of GNP,¹ when both are measured in ruble prices.
- b. Defense expenditures are 11 percent of GNP when measured in dollar prices.
- c. The ruble cost of defense in the USSR understates the burden on the economy because defense programs use especially high quality, scarce resources which are badly needed by the economy.
- d. Military R and D is about $\frac{1}{4}$ of total R & D.
- e. Military procurement of machinery and equipment is about 20 percent of all final uses of machinery and equipment.
- f. Finally, it is possible to calculate, but with very uncertain accuracy, that defense uses directly or indirectly nine percent of total labor, five percent of fixed capital, eight percent of total steel production, five percent of electric power, nine percent of chemicals, five percent of transportation, etc.

¹ Gross National Product.

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

Burdens of Defense

In the United States no one is particularly reluctant to use dollar cost as the measure of the burden of defense.² The objection to the use of ruble cost in the case of the USSR stems in part from a widespread and well-founded suspicion of the usefulness or significance of prices in the Soviet economy. One can conclude from the haphazard incidence of shortages of industrial as well as consumers' goods in the USSR that the prices do not represent relative priorities either of consumers or of planners. The artificiality of Soviet prices is, however, only a symptom of a much more fundamental disability of that bureaucratized system. The Soviet productive system is in a state of gross and pervasive "disequilibrium," in the sense of the word as defined in conventional equilibrium theory of economics. This paper attempts to explain how this theory applies to the USSR, and why, as a consequence, the ruble measure of Soviet defense has a very uncertain meaning.

It is to be hoped that this discussion does not strike a blow for ignorance. Nevertheless, it is a plea for recognition that we are in the presence of uncertainty. The problem is a briar patch of complexity. If the reader finishes this paper with the feeling that he understands the problem clearly, he is ahead of the author. The following simplified and condensed outline of the argument may help the reader to muddle through.

- i. The proper measure of the burden of defense is its *opportunity cost*, that is, the value of alternative goods and services done without in order to acquire defense.
- ii. In a perfectly competitive market economy in "equilibrium," the *opportunity cost* of defense is the same as its *resource cost* or cost of production, that is, the sum of costs of all inputs used to produce the defense goods and services.
- iii. The bureaucratic nature of the Soviet system, the physical allocation of resources by bureaus instead of market allocation, keeps the economy in chronic "disequilibrium."
- iv. In an economy in a state of chronic "disequilibrium," *opportunity cost* has several different values, depending on which alternative goods are valued, and it is quite uncertain which of the many *opportunity costs*, if any, is measured by *resource cost*.
- v. Our ruble estimate of defense expenditures in the USSR is, more or less, a *resource cost* estimate and is a very uncertain measure of burden.
- vi. Any other measure, such as the dollar cost of Soviet defense, is an even worse measure of burden.
- vii. Effective transfer of research and development investment resources out of defense would require some drastic administrative reform.

² Whenever I speak of cost as a measure of burden, I mean defense cost relative to some other aggregate such as GNP, e.g., the dollar value of defense as a percent of GNP in dollars or the ruble value of defense as a percent of the GNP in rubles.

viii. The impact of a change in defense in the USSR, like the burden of defense as a whole, should be considered to be multi-valued. The value of a shift to investment, as measured by the effect on growth, may be much less than for a shift to consumption, or at least some kinds of consumption.

The Burden of Defense in Equilibrium

The burden of defense or any other portion of final demand in a market economy is, according to conventional economic theory, measured by the market value of the goods and services purchased (as a share of GNP), provided we assume the economy is in equilibrium. Equilibrium is defined precisely in general equilibrium theory. It states that a dollar's worth of defense (or any end use) foregone would release resources that could be transferred to produce a dollar's worth of any other good or service. The necessary condition for this is that the value of the product of any resource at the margin is the same in all possible industries. Thus, if a given kind of labor is used in both the blue jean industry and the integrated circuit industry, the value of the product of one man-month of that labor will be the same in each industry.³ These statements are the basis for the definition of opportunity cost. The opportunity cost of one good is the value of other goods foregone. Hence the burden of defense is its opportunity cost—not its cost of production but the value of the other goods that could have been produced alternatively. In equilibrium, these two, the cost of production and the value of goods that could have been produced, are the same.

The key aspect of equilibrium is that opportunity cost, or value foregone, is single and unique; no matter what goods are thought to be given up, their exchange value is the same. A gun that costs \$10 would be produced by resources that could produce various other goods. Suppose those resources could have produced 11 lbs. of butter, or 4 pipe wrenches. In equilibrium, 11 lbs. of butter and 4 pipe wrenches would both have a market value of \$10. In the absence of equilibrium, opportunity cost (or burden) is ambiguous. The 4 wrenches might be worth \$8 and the 11 lbs. of butter \$6, or \$12. In that case there are two possible measures of opportunity cost, or as many measures as there are possible alternative goods.

Perfect equilibrium in a market economy requires perfect competition! This happy condition does not exist in practice—certainly not in the US. However, the usefulness of the concept, in spite of the

³ The product of labor referred to here is its net product (or marginal product), product net of the costs of capital, materials and other resources used in production.

stringency of the assumption, can be clarified by some examples. In the US, engineers must be hired in the market, and Revlon Corporation can, by paying a similar price, acquire just as good a chemist as Dow Chemical Corporation. Or a small computer service can hire just as good a programmer as IBM uses on its fattest defense projects. Auto producers can buy stainless or high strength steel alloys at no price premium and as easily as military aircraft producers. Finally, government, businesses, and individuals pay the same prices for the same products by and large (allowing for such things as volume discounts). On the other hand, equilibrium is far from universal. Uranium is pre-emptively controlled by the government. Excise taxes, price supports, tariffs, and monopolies exert their influence. Nevertheless, in the United States, as in most market economies, there are strong private incentives for moving resources in the direction of equilibrium. The characteristic of equilibrium or a reasonable approach to it which is crucial both for the health of an economy and for measuring values in it is that resources can and do, given some time, transfer at small cost from one use to almost any other. This does not necessarily occur by direct transfer but by multiple, successive, and indirect shifts.⁴

The Burden in Disequilibrium

In an economy in disequilibrium the opportunity cost of a program may have many possible values or it may not even be measurable. For example, consider one part of the US economy, which is surely not in equilibrium—social services for the poor. Would \$5 billion taken from defense expenditures produce the same value of production in health services via some national health insurance, or would a large part of the funds be dissipated in higher incomes for doctors, hospitals and associated enterprises? Or would \$5 billion transferred into an anti-poverty program produce an equivalent value of output? In the latter case, there is no known way of measuring output.

⁴ The easiest way of transferring resources to new or different uses is by preferential direction of new investment and new workers to the new uses, combined with depreciation and attrition of resources in the old uses. Most transfers of resources probably take place at this evolutionary rate. Frequently, however, changes in demand require a much more rapid and radical change. Then existing resources as well as new resources must be redirected. It should be noted that most physical assets cannot be easily moved to different locations. Transfer in that case means using the assets to produce a different product. The argument of this section and the succeeding one implies that for any degree or rate of reallocation of resources, including even full mobilization for war, the response of a market economy is likely to be more efficient than that of a centrally directed socialist economy.

The Soviet economy is in a state of pervasive disequilibrium. Resources in some activities are used very much more efficiently than in others. A few conspicuous examples are: the wide disparity in efficiency (output per worker) between agriculture and manufacturing; the great disparity in profits (negative and positive) between firms; the widespread production of tools and spare parts by enterprise for their own use at high cost compared to the cost of producing them in specialized tool and spare part enterprises; the surplus of some consumers' goods coincidental with the chronic shortages of many other kinds; the enormous resources tied up in unfinished construction and uninstalled equipment. Not by the greatest reach of abstraction can one assume that resources are used in all industries at about the same level of productivity.

In the centrally planned and administered economy of the USSR, resources do not transfer easily from *low* value uses to *high* value uses. They do not transfer at all except by official plan or bureaucratic needs. Even under officially planned fiat, the shift of resources from their accustomed uses to new ones is often painful. Witness Khrushchev's difficulty in accelerating the chemical industry at the expense of steel. When anyone below the top political leader seeks to change things, the results are likely to be nil. Gosplan and various ministers have been inveighing for decades against low product quality, excessive construction time, and inefficient small-scale production of spare parts and castings, and in favor of specialization of production and the introduction of new and improved designs. Yet none of these deficiencies have been noticeably remedied.

The burden of defense or of its major parts varies according to what use one assumes the resources might otherwise be put. When in 1955 Khrushchev reduced the number of personnel in the armed forces and sent their equivalent to the Virgin Lands, he achieved a gain in output very much larger than the reduction in defense cost. That opportunity was, however, unique. Other allocations of the resources released would have come out differing from the Virgin Lands result and differing from each other.

Any economy is in disequilibrium to one degree or another in the sense that transitional adjustments are always in progress and new developments are continually initiating additional adjustments. So long as resources can move in response to economic demands, the assumption of equilibrium can be usefully made. In such cases, monetary values are a reasonable measure of opportunity cost. But the Soviet economy does not respond like a market economy and ruble costs are an uncertain measure of the burden of defense.

~~CONFIDENTIAL~~

Burdens of Defense

At this point it should be emphasized that the CIA estimate of defense cost is not based on direct information about the prices the Soviet armed forces actually pay, except in the case of the pay of personnel. There is conflicting evidence on whether the armed forces procure material and equipment at low, subsidized prices or whether the prices cover cost of production, as defined by Soviet accounting. The defense line in the published National Budget is not detailed or defined enough to resolve the issue, but when adjusted for its probable coverage it does not contradict the hypothesis that for the most part the prices paid by the armed forces cover cost of production. The estimated ruble costs are based mainly on civilian costs of identical or similar materials, or dollar costs converted to rubles by ruble-dollar ratios that were derived from similar civilian equipment. For comparison with GNP, and as a measure of burden, the costs are adjusted to a factor cost basis by removal of excise taxes, and addition of subsidies, interest, and other missing capital charges.

Thus the uncertainties in the CIA estimates are not on account of possible subsidies, direct or indirect, in the transfer prices paid by the armed forces.⁵ There are data problems enough in estimating quantities and specifications of Soviet military procurement, its dollar cost and thence its ruble resource cost. This paper calls attention to the additional uncertainty that arises because resource cost in the USSR, even if correctly estimated, does not necessarily equal opportunity cost.

I shall argue that the Soviet economic system should be analyzed like an administrative bureaucracy. In such a system the value of an alternative use of resources depends on what that use is, and furthermore, on what resources are to be transferred. A single ruble total for defense cannot convey these multiple values. However, none of the alternative measures are better, and indeed, are perhaps worse.

Alternative Measures of Burden

Let us consider first the significance of the dollar value of Soviet defense as a share of GNP, measured in dollars. If rubles are not to be trusted, then dollar valuation has an *a priori* attractiveness. The estimated dollar cost of Soviet defense programs serves the legitimate function of facilitating a comparison of the aggregative size of Soviet

⁵ The prices actually paid by the armed forces for various types of procurement would, of course, have a bearing on the allocation decisions of Soviet leadership; but how much, is uncertain. The leaders have been long accustomed to think in terms of the physical allocation of manpower, steel, fuels, trucks, etc.

~~CONFIDENTIAL~~

and US expenditures or components thereof. It does not, however, reflect the resource cost, much less the opportunity cost within the USSR.

In a recent newspaper column by Marquis Childs,⁶ an anonymous Pentagon source was quoted to the effect that Soviet defense measured in dollars was nearly 20 percent of GNP⁷ and that percent is a better measure of burden on the Soviet economy than the percent in rubles, less than 10 percent. But, to repeat, the dollar percent is a wrong indicator of burden. It is wrong because it implies that resources transferred out of defense would produce a cornucopia of civilian goods. For example, half of Soviet defense expenditure in dollars might be approximately \$30 billion—more than 11 percent of consumption. If the transfer of resources from defense to consumption took place at American relative prices and efficiencies, consumption would increase that much. However, at ruble prices, which more nearly measure the relative efficiencies of Soviet industries, half of defense would add less than 6 percent to consumption. Even the 6 percent figure may be too high, as I argue below.

The difficulty with applying US prices to the USSR is illustrated by the case of military personnel costs, including subsistence and quarters, and other outlays. In this case, the ruble cost is reasonably well-known or easily estimated. That is not to say that the Soviet armed forces necessarily pay full resource cost on everything they purchase, but these full costs (e.g., of food and uniforms) can be approximately estimated. The pay and subsistence of Soviet enlisted men is very much lower than that of American enlisted men. While not conceding that the pay and subsistence of military manpower reflects its opportunity cost within the USSR, one can conclude that there is no justification for using the very high US pay and subsistence rates as a measure of the burden on Soviet economy.

The rationale for using dollar prices applies, if at all, to the valuation of Soviet military equipment. The CIA has explained that the low ruble price of military equipment relative to its dollar price is mainly a reflection of the high cost of food and textiles in the USSR rather than of the efficiency of the Soviet arms industries. However, the feeling persists that the burden on the Soviet economy of producing such a substantial quantity of sophisticated equipment must be more than the estimated ruble costs imply. The dollar costs are surely not the right measure, but the Agency has implicitly concurred

⁶ *The Washington Post*, 9 February 1970.

⁷ The basis of the dollar percent quoted is unknown. It is a great deal higher than CIA's estimate of Soviet defense in dollars—about 11 percent of GNP in dollars.

~~CONFIDENTIAL~~

Burdens of Defense

in the criticism of ruble prices by advancing a hypothesis about scarce, high quality resources. Thus, we have said the military establishment pre-empts especially high quality resources, both men and materials, which are badly needed for the modernization of Soviet industry, and that on this account the ruble costs of defense understate its effect on the rest of the economy. The discussion which follows suggests that this hypothesis may be misleading and should be re-examined in the light of the opportunity costs of these scarce resources.

In the first instance the high quality resource hypothesis implies that our estimates of cost per unit of weapons including research and development costs are too low. That may be true, but even if full resource costs were correctly estimated, there still might be a kind of understatement which would be significant. If the resources are badly needed in the civilian economy, then their productivity in civilian uses would be higher than resource cost. In this sense, the opportunity cost would be greater than the estimated ruble cost. If the Soviet economy is in disequilibrium, as argued above, this might be true. However, is it true in fact? For this question, the nature of the disequilibrium is crucial.

It is plausible to suggest that the rapid expansion of expenditures on advanced weapons in the early 1960's disrupted civilian programs of investment and research and development, and that it created shortages and bottlenecks of specialized types of materials and equipment. This argument is at least consistent with the very abrupt reduction in the rate of economic growth after 1960. But has this remained the case in recent years? The passage of time has made this bottleneck explanation less credible. Given time, specific bottlenecks can be broken simply by an adjustment of allocations within the overall civilian/military division of funds. But the continuing decline of the output-capital ratio and of the rate of growth of factor productivity despite rising civilian research and development, and strenuous administrative efforts to stimulate new technology, argue that the economic problems are probably chronic and more deep-seated, than the bottleneck hypothesis comprehends.⁸

The problems of transferring resources from military to civilian uses, from investment to research and development, from any of those to consumption or vice versa are institutional in nature. The disequilibrium in the USSR is institutional rather than allocational. By this I mean that significant improvements in the Soviet economy

⁸ For a detailed analysis of diminishing returns to investment, see *Investment and Growth in the USSR*, ER IR 70-10, March 1970.

cannot be achieved simply by reallocating funds, or even by changing physical plans and allocations. The existing state of affairs is entrenched in a bureaucratic administrative structure whose rigidities are an imposing barrier to change. The widespread belief that the Soviet leadership can reallocate resources at will in large quantities in any desired direction is not borne out by experience. They can reallocate some resources in some directions. The New Lands campaign was an impressive movement of labor and agricultural equipment. However, Khrushchev's campaign to expand the chemical industry had faltering and mediocre results, and is still not swinging in spite of continued support by Brezhnev and Kosygin. Moving labor around is much easier in the USSR than redirecting the use of plant and equipment.

The relation of administrative arrangements to the burden of defense can perhaps be clarified by an extreme example from history.

The Burden of Defense in Sparta

Suppose we were to ask what was the burden of defense in ancient Sparta. The question could not be answered in economic terms. The Spartan society and government existed primarily for war. Whether peace or war prevailed at any given time, the Spartans were perpetually mobilized. Resources did not shift between defense uses and civilian uses. On the contrary, the labor was permanently divided into two classes, the Spartans who devoted themselves to a military life, making war, or training for the next war, and the Helots who were forcibly assigned to the job of supporting the Spartans and making their weapons. The Helots could not fight very well and did not want to fight anyone, except perhaps the Spartans, which they did when they thought there was a chance to rebel. The Spartans could not farm or shoe horses and certainly wouldn't want to.

The case of Sparta points up two problems in extreme form. First, it would have been very difficult to discover what share defense absorbed of Sparta's GNP, because the resources for defense, either the Spartan's activities or that part of the Helot's work devoted to supporting them, were not, in general, purchased in the market, but were pre-empted by command. (Estimating Sparta's civilian GNP would, of course, be no trick for economic intelligence officers.) The second problem is that even if the cost of production of defense in Sparta were estimable, its opportunity cost was not. An alternative use of resources and an estimate of its value could be achieved only by a radical institutional overhaul of the Spartan state and body politic, and all its tradition and ideology.

~~CONFIDENTIAL~~

Burdens of Defense

The Redirection of Bureaus

The Soviet economic administration resembles the Spartan one in interesting ways. Large parts of the military production are separated from civilian production not only by opaque security curtains, but different organizational subordination, and by different sets of rules and *modus operandi*. Under what conditions and in what condition can resources shift out of military work to civilian? Some can shift quite easily; noncommissioned soldiers can shift to civilian employment at no loss in ruble value produced. The aircraft industry can shift from military to civilian aircraft fairly efficiently as it did in 1956-1958. The same is true for those parts of the civilian equipment industries that are producing land armaments or related equipment, so long as they shift to similar types of civilian equipment. The difficulties center in the advanced weapons systems, both R & D, production and deployment.

It is evident that the Soviet military establishment has achieved a much more impressive record in fostering the development of new products, and bringing them into serial production, than has civilian industry. At least three conditions seem to favor these military activities. First, the familiar and ubiquitous supply difficulties of Soviet industry succumb much more easily to the gentle coaxing of military priority and expediting. Second, Communist party interference is at a minimum in military work. Third, and most important, military R & D and production benefit from the close, interested, and demanding supervision of the consumers of the product. This effective communication of users with producers is missing at all stages of civilian production.

The degree of difficulty of transferring the high quality performance of the military productive organizations to civilian objectives is impossible to estimate. When the US wished to launch itself into space, it set up an entirely new agency, gave it a goal, priority, slogans, and resources. Perhaps the relative failure of the Soviet space program may be in part due to the fact that it was left under the control of the armed forces for whom space was a secondary goal. Recent efforts of the Soviet government to improve civilian R & D issuing more and still more instructions as to managing, training, paying bonuses, contracting with consumers, etc., have not been and are not likely to be very useful. A major institutional overhaul as well as a reallocation of resources would be required. The mills of Gods and Bureaucracies grind exceedingly small, but only if the product stays the same. If you wish to change from grinding flour to grinding lenses, or vice versa, then you need to get a new bureau.

The Burden of Defense in the USSR

The conclusion to be drawn from the arguments above is that the burden of defense, that is, the opportunity cost of the resources used in defense, depends on which alternative uses the resources would be transferred to and which resources are to be transferred. Even with accurate data no single measure will be accurate. However, the ruble measure, allowing for a generous margin of error, is less misleading than any other single measure. Thus, the share of defense in total R & D, the defense share of machinery production, or of electronics production, while interesting in themselves do not justify conclusions about burden. Each would suggest a much heavier burden than the actual total cost of defense in rubles as a share of GNP. None of these specifics has any more implication for the burden of defense than the share of titanium used in defense. In each case, as with ruble costs, the question to be asked is whether the opportunity cost of the resources, or the value of the marginal product in alternate uses is more, equal to, or less than their cost in military use.

Because of the institutional disequilibrium of the Soviet economy, multiple and quite different answers can be expected as the opportunity cost of different kinds of resources. In research and development there is reason to believe that civilian industries could not effectively use large amounts of these resources without a substantial and unspecified institutional reform. Resources that could be shifted to civilian investment probably could do so at no loss in ruble value of product. However, the utility of investment depends on its rate of return, that is, its effect on growth. An accumulation of evidence indicates that the return on investment in its *present pattern and distribution* has gotten very low. This means that, barring some drastic institutional reform, a large transfer of resources from defense to investment is likely to increase the rate of economic growth by a disproportionately small percent. In both cases the suggestion is that the opportunity cost is probably less than the resource cost of the military resources.

How this might work out for various different kinds of consumers' goods, for agriculture, for housing, for consumer durables, would have to be examined case by case. One supposes that consumer durables (including automobiles) could be expanded fairly readily by resources now used in defense production, but that consumer services, highways, repair services, and agriculture might quickly run into diminishing returns.

An important application of these views, if they are correct, is to the analysis of the economic impact of a change in defense spending such as might result from an arms limitation agreement. The argu-

~~CONFIDENTIAL~~

Burdens of Defense

ment here is that there is no standard or routine calculation that will give a useful answer. Each proposed change in defense spending must be studied as a special and unique case with due regard to plans of the leadership, the alternative economic opportunities, and the possibilities for organizational change which might be in the offing. And for each change several alternative impacts could be estimated. How this research might proceed is the subject for another article.