mates are used to approximate the value of factor activity, I would throw out this residual as an element so patently unique that it cannot sensibly be included with the income shares. Mr. Warburton does not consider it so unique, and suggests that it may be kept in and called a monopoly return to government. I cannot see that much can be gained from this procedure. If it is desired to relate shares in the price of output to factor activity, I still think it can be done better by the method I suggest than by stretching the idea of monopoly to cover government.

Of course, another procedure can be followed: we can abandon the attempt to relate income shares and 'value added' to factor activity, and simply report the shares in the price of output without any correction. This would eliminate the necessity of rationalizing the inclusion of indirect taxes. It would also eliminate the question of incidence, which arises only if we are not satisfied with the reported shares as a measure of the return accruing to factors of production. I think this should be Mr. Warburton's position; furthermore, I think it is a reasonable and defensible position. But it does not answer the need for national income statistics that can be used in an analysis of (for example) the economic activity of the various industry groups.

Part Two

MEASURING THE ECONOMIC IMPACT OF ARMAMENT EXPENDITURES

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Discussion

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The first draft of this paper was prepared early in 1942. It was revised in September utilizing comments made at the meeting of the Conference as well as suggestions received from friends who were good enough to struggle through various forms of the manuscript. Pressure of other duties unfortunately has prevented me from taking as much advantage of these suggestions and of some of the recent literature on the subject as I should have liked. A few changes in the statistical material were made in March 1943.

Measuring the Economic Impact of Armament Expenditures

R. W. GOLDSMITH

THE HUMAN MIND, it seems, longs for neat and simple measures of complicated sets of facts and tends to use them as shorthand symbols. In economics examples of this tendency are quantitative concepts such as the national income, the volume of production, the level of prices, the balance of trade, and in more technical spheres, the Pareto coefficient of inequality of income distribution and the net reproduction rate of a population. It is, therefore, only natural that attempts have been made to find one figure that would in itself provide an indication of the economic impact, or, if a more colorful word is preferred, the economic burden of a rearmament or war effort on an economic system.

During the first World War there seems to have been an inclination to summarize the economic aspects of the war effort by the crude dollar figures of Treasury expenditures for military purposes. This time another figure seems to have caught public attention, the ratio of reported military expenditures to national income. Whether or not popular thinking about the subject has brought about this change in emphasis, it certainly constitutes a step in the right direction. Economists are still under the obligation, nevertheless, to determine whether this new shorthand symbol answers the questions it is supposed to answer. Moreover, if this figure is found wanting as a tool of economic analysis, we are left with the duty to find a more suitable figure. To conclude that matters are too difficult and complicated to be reduced to a relatively simple over-all measurement may salve our conscience, but does not discharge our obligation to the public.

Throughout the analysis we are interested not only or even primarily in the influence of defense and war on the government's accounts but in the influence on the nation's accounts. In other words, we want to see how preparation for war or the conduct of war affects the balance sheet and the income account of the nation regarding these as a combination of the accounts (kept by or reduced to methods as comparable as possible) of all the individuals, business enterprises, governmental, and nonprofit units within its boundaries. We must be aware that the economic impact of armament expenditures is not the same thing as the 'cost of war', which in the sense usually employed represents a broader concept. The

difference rests mainly in confining this discussion to the economic aspects which, by definition, exclude the human cost of war.

But we go even further. Three problems of great importance in any evaluation of the total economic cost of war are regarded as falling outside the scope of this paper: (a) The effect of the defense or war effort on the total resources used (see Sec. III H); (b) The reduction in consumers' satisfaction due to shifts within civilian disposable income, shifts due to curtailment of production through allocation, to consumers' rationing, to price fixing or to other regulations made on account of the defense or war emergency; (c) The reduction in productivity likely to follow from a large scale shift from civilian to armament production.[1]

I Definitions

'Measuring', as already explained, is interpreted as finding one quantitative expression for the impact on a country's economic system of the activities subsumed under armament expenditures.

The meaning of 'expenditures' is discussed in considerable detail in Section III. Suffice it to say here that the term is used in something like its accounting sense and that it is not identical with cash outlay.

The term 'armaments' is intended to cover every activity directly connected in peacetime with the military establishment or in wartime with the conduct of hostilities. There is always some question where such a direct connection ends, especially in modern 'total war'. Some will argue that under present conditions all economic activities except the small and quantitatively unimportant sphere of luxury production and services must be regarded as related to armaments. I prefer to continue interpreting the term more narrowly and to include under it only those commodities and services whose use is directly connected with or traceable to the defense or war effort, i.e., all expenditures on the armed forces and their auxiliaries, on materiel [2] and on the facilities that produce materiel. It seems preferable, particularly in the interest of comparability over time and between countries, to exclude indirect armament expenditures such as for the care of civilians (except quasi-military

[1] J. K. Horsefield, who has been bold enough to estimate this factor for Great Britain, calling it the 'inconvertible output', puts it at £600 million, or about 11 per cent of total output (*The Real Cost of War*, Penguin Books, 1940, pp. 28, 33, 34).

[2] For the difficult problem of civilian disinvestment see Sec. III C below.

items such as provision of air raid shelters), for subsidizing civilian consumption, or to expand facilities for the production of civilian commodities.

The difficulties of separating economic from other activities are familiar, but I feel justified in taking refuge in regarding as economic effects those usually so treated in economic theory, i.e., those which "can be brought directly or indirectly into relation with the measuring rod of money".[3] The effects of defense and war on human values, physical or moral, are thus excluded.

'Impact' is used in an over-all sense as the sum total of the effects of defense or war on the entire economic system so far as they are taken into account in the calculation. No consideration is given to differences in impact on classes, industries, or localities within the country.

II Purposes of Measurement

To say that any measurement depends on and must be shaped in accordance with the purposes it is intended to serve and the questions it is expected to answer is a truism. Foregoing detailed discussion I shall simply list what seem to be the major possible purposes of a measure of the economic impact of armament expenditures.

1) To ascertain whether the economic impact of a country's defense or war effort, as represented by its armament expenditures, is becoming heavier or lighter.

2) To compare the impact in different countries, in order to find out whether armament expenditures during a period impinge more heavily on the economic system of one country than on that of another.

3) To measure the degree to which the defense or war effort has brought about a change in the country's peacetime economic activities, i.e., the extent of the switch-over from civilian to military production.

4) To measure the degree of economic sacrifice the armament effort has involved, i.e., to determine the extent to which a country's economic welfare has been affected temporarily or permanently.

5) To measure the margin above the subsistence minimum that armament expenditures leave to a country, thus indicating how much room there is for further intensification of the defense or war effort.

6) To compare the economic cost of armament with its economic results, attempting thereby to see whether defense and war satisfy the economist's basic criterion of yielding a margin of revenue over cost, or more popularly speaking, whether war and preparation for it 'pay'.

The discussion in the next three sections will not be focused on the questions raised by this diversity of possible purposes of impact measurements. An attempt will be made, however, in Section VI to evaluate the extent to which the measurements developed in this paper answer each purpose.

[3] A. C. Pigou, *The Economics of Welfare* (London, 4th ed., 1932), p. 11.

III Basic Problems of Measurement

A The meaning of 'expenditure'

The interpretation of the term 'expenditure' is the central and at the same time the most difficult problem encountered in devising a measurement of the economic impact of defense and war that will be theoretically satisfactory and at the same time practicable.

Obviously, it is not possible to accept the reported figure of government payments for armaments as representing, without further adjustment, the measure of the economic impact of the defense or war effort. The types of economic effort paid for by the government and those which are not, as well as the principles governing the prices paid, are too much the result of custom and accident and vary too greatly from time to time and place to place to be usable as more than a starting point.

Any interpretation of the term 'expenditure' is bound to lead to serious difficulties unless the analysis is kept strictly within the field of economic concepts. If that is done, however, it seems possible to interpret 'expenditure' as the use of economic resources and to measure it by the value of their alternative products. This is merely an application of the customary opportunity cost concept to the problem.

This definition immediately eliminates from the sphere of armament expenditures in the economic sense all governmental outlay connected with the defense or war effort so far as it does not involve the use of resources (labor, entrepreneurship, capital equipment, natural resources). These non-exhaustive expenditures, as they are often called, include payments for existing assets (such as land and

buildings) that are to be used for military purposes; transfer payments (such as war pensions); and allowances for taxes and bad debts covered in the prices of armaments paid by the government.

The economic impact of armament expenditures (i.e., the economic cost of armaments), then, is equivalent to the value of the civilian goods and services that would otherwise have been produced by the resources actually used to provide armaments.[4] This formulation does not help matters unless two questions are answered: What resources are used in providing armaments? How can the value of their alternative civilian products be determined?

The first question is of interest and importance only so far as it is needed to answer the second; we cannot determine the alternative products or their value before we identify the resources from which they flow. This identification presents no problem, at least not in principle, though considerable difficulty will be encountered in any given case, depending on how detailed the factual information is. It must be noted, however, that not only the resources for which the government pays are to be included among armament expenditures, but also those used in the defense or war effort without compensation by the government. The extent of the uncompensated use of resources depends, of course, on the legal arrangements in force and on the fiscal policy followed by the government and therefore varies from period to period and country to country.[5]

The real difficulties begin with the determination of the alternative products and their value. If rigorous standards are applied, the problem is insoluble because we can never know with certainty or even a high degree of probability which civilian products would have been produced in the absence of the defense or war effort, in what quantities and by what combination of production factors, or to what extent absolute and relative prices would have been different had the armament expenditures not been made.

Lack of knowledge about the exact form and value of the alternative civilian products would not be too serious if we could assume the validity of the usual rule that the marginal value of a unit of resources is the same in each of its alternative uses so far as competition prevails. We could then use the prices these resources or

[4] The somewhat vague term 'provide' is used in order to indicate that armament expenditures include not only the resources used in producing new armaments and operating old and new armaments but also any other form of consumption of resources directly connected with the war or defense effort.

[5] The problems raised here are similar to the differences between social and private net product treated, e.g., by Pigou in Part II of his *Economics of Welfare*.

their services fetch in providing armaments as the expression of their value in alternative civilian occupations, i.e., as their opportunity cost. Such an assumption is justified in an economic system where competitive free enterprise predominates, so long as armament expenditures are so small that they use merely a minor proportion of total resources and that the process of shifting from civilian to armament production can reasonably be regarded as taking place at the margin of resource use. This condition is met, e.g., by the small wars of the *saeculum mirabile* between 1815 and 1914. However, when armament expenditures are as large as they have become in modern wars, we cannot blandly assume that the price paid for resources used in the defense or war effort is the equivalent of their value in civilian use. The point is reached here where a difference in quantity means a difference in kind. Marginal analysis is not strictly applicable to the macroscopic shifts from civilian to armament production that modern war involves.

Another reason why the customary type of analysis ceases to be valid unless considerably modified is the abandonment in wide fields of the determination of prices by the unfettered interplay of supply and demand and its replacement by price control, conscription, commandeering, priorities, allocations, and other methods that amount to an authoritative fixing of prices for commodities and services, including service in the armed forces and labor conscription.

We must reconcile ourselves, I think, to the fact that a theoretically satisfactory answer cannot be found, and we shall have to be content to devise a practicable solution that is not too different from what we would theoretically wish for and that is at least better, particularly for comparative purposes, than the crude figures given in the government's accounts. The only way I see to such a practicable compromise solution is to start from the assumption, admittedly not strictly valid, that actual armament expenditures represent the opportunity cost of the resources used in providing armaments, but to drop that assumption wherever the divergence between actual payment by the government and armament expenditures in the economic sense is obvious and amenable to quantitative adjustment. The practical problem then becomes one of locating significant instances of such divergency and of devising adjustments for them. Such an approach appears preferable to and more in keeping with economic theory than, the unquestioning acceptance of all the haphazard valuations and compensations deter-

mined by a market place and a governmental bureaucracy acting under the stress of war.[6]

B The standard of measurement

Problems arise also in connection with the unit in which armament expenditures are expressed. To conform as closely as possible to theoretical concepts, we would wish to have the figures expressed in physical units which would vary according to the type of resource employed and of goods produced. This approach, however, can be applied to a measurement of the total impact of a defense or war effort only if the different resources and goods are in terms of a common denominator.

Either one uniform set of prices must be applied to all quantities, or the crude monetary figures must be reduced to a common denominator with the help of price indexes. The first method is hardly practicable because we lack sufficient data on the types of armament produced or on the materials and other cost elements that go into making them. We are, therefore, restricted to the second method, making the unadjusted monetary figures as comparable as possible with the help of appropriate price indexes. The difficulties involved in the calculation and use of such indexes are too well known to need restatement. While no entirely satisfactory solution has yet been found, it should be possible to develop price indexes that would make the figures for any one country comparable, especially since the period of comparison is usually short. Separate indexes must be used for the prices of armaments and of civilian goods since it cannot be assumed that the two will move closely together. A reduction of armament expenditures of different countries to a common denominator, on the other hand, encounters extraordinary difficulties. A satisfactory comparison presupposes, among other things, knowledge of the prices of specific armaments and of wages and productivity in the armament industries, all of which, of course, are regarded as military secrets.

Many of the difficulties involved in reducing armament expenditures to a common denominator, or at least in making them more comparable than the crude data, can be overcome by the use of ratios (such as the ratio of armament expenditures to national income) instead of the absolute figures expressed in their respective monetary units. Resort to ratios, however, does not avoid all the

[6] Needless to say, many of the adjustments made in armament expenditures must be applied also to national income if the comparison between the two is to be valid.

difficulties because the relation between the prices of armaments and of civilian goods is likely to change and almost certainly differs from country to country, although generally much less than the levels of absolute prices.

C Uncompensated use of resources

Almost invariably armament expenditures in the economic sense include certain uses of resources in the defense or war effort for which the government does not pay at all.

a) One category of such uncompensated use of resources is represented by the donation of goods and services by citizens to their government (including contributions to relief organizations), or by one ally to another. Here both sides are aware of the nature of the transaction and agree on the omission of any compensation. Donations of this type must be regarded as forming part of armament expenditures so far as the goods or services donated flow from domestic resources (or foreign investments) that would otherwise have produced civilian goods. The donation of services by persons who are not regularly part of the economic system as usually defined in discussions of national income (such as housewives and debutantes), however, does not have to be counted as a hidden armament expenditure; nor do the activities of civilian defense workers so far as they do not impinge on their input of services into the economic system.

b) In other types of transaction the lack of compensation for the use of resources is due to arrangements made by the government on the basis of its legislative or police powers (either for the emergency only or as a part of the prewar scheme of things) not to a voluntary act of the resource owner. Uncompensated use of resources of this type is present to the extent that the government declines to reimburse property owners for damage through air raid or other enemy action. Other examples of this type of uncompensated resource uses are extraordinary wear and tear on equipment, provided the government does not pay for it in the form of higher prices for supplies. To the extent that compensation is paid not by the government but out of an extra-budgetary insurance fund to which all property owners are forced to contribute, as is the case in Great Britain, expenditures reflecting payments made by the fund should also be added to budgetary armament expenditures to approximate armament expenditures in the economic sense.

c) A special case of uncompensated use of resources, one that is at

the same time of considerable theoretical difficulty and of great quantitative importance, is disinvestment in civilian industries that is attributable to the defense or war effort.

Failure to make good the wear and tear on civilian plant and equipment constitutes a use of resources as it impairs the capacity to produce civilian goods in the future. The use of civilian resources is clearer still in the reduction of non-armament inventories. Nevertheless, two difficulties arise from the viewpoint of the definition of armament expenditures used in this paper. First, the business enterprises owning the deteriorating plant and equipment or the shrinking inventories generally have received payments for this resource-use as part of the sale price of their products. Second, the resources have been used to produce civilian goods, not armaments. Thus disinvestment in civilian industries would at first sight seem not to constitute an expenditure on armaments under the definition adopted and, even if it did, would seem to have been paid for.[7] These difficulties can be overcome, I believe, if we look realistically at the situation as it presents itself in most actual instances.

The owners of the resources in which disinvestment takes place have been paid for their use, but the economy has not, and that is what matters. We are here confronted with another instance of divergence between private and social net product. For the individual private enterprise all that has happened is a change in the form of its assets, the replacement of fixed assets or inventories by cash, bank deposits, securities, or other liquid assets. For the economic system, however, a net disappearance of assets may have occurred since capital has been transformed into goods that have been used up.

Whether civilian disinvestment is an armament expenditure in the economic sense then depends on the specific situation. A strong case can be made for regarding civilian disinvestment as part of armament expenditures when the part of civilian consumption that represents disinvestment is essential to providing the practical minimum of civilian consumption, i.e., when the production of armaments would have to be reduced if the extra consumption made possible by civilian disinvestment were unavailable so that civilian disinvestment may be said to be a source, though indirect, of armaments. Thus civilian disinvestment may be regarded as part of armament expenditures when civilian consumption (including the part representing disinvestment) is near the minimum, as is now probably the case in most European belligerent countries. The case is doubtful when a wide margin between actual consumption and practicable minimum consumption still exists, as in the United States in 1942 or in Great Britain before 1941. Since it is inadvisable, especially for comparative purposes, sometimes to include civilian disinvestment in armament expenditures and sometimes to omit it, and since civilian consumption tends to approach the practicable minimum as a total war effort gets into full swing, civilian disinvestment has been included under armament expenditures in the sample calculations presented in Section V. This decision, admittedly, is to a certain extent arbitrary, but it seems to constitute the most practicable solution of the difficulties raised.

[7] Disinvestment in civilian industries representing wear and tear on equipment producing goods purchased by the armed services is, of course, already included in reported armament expenditures. What is under discussion here is the disinvestment in types of equipment that continue to produce goods sold to civilian consumers.

D Valuation problems

A second type of divergence between opportunity cost and cost to the government is represented by the under- or overvaluation of resources used in the defense or war effort, in the sense that the price paid by the government is below or above the opportunity cost. The real difficulty here is to find a criterion for the existence and a measure of the extent of under- or overvaluation. Undervaluation will probably be admitted in cases such as the employment of (most though not all) men at a salary of $1 a year who have been highly paid in their former business positions. But how are we to determine the degree of the undervaluation?

Of larger quantitative importance is the problem of evaluating the services of the armed forces.[8] Any quantitative adjustment will always entail great difficulties and will remain in large degree arbitrary. But so long as the majority of all men are engaged in civilian employment we may take their earnings (particularly if they do not differ much from their prewar level) as an adequate measure of their opportunity cost. In that case the opportunity cost of the services of the armed personnel can be taken as roughly equal to the product of their number and the corresponding average earnings of adult males.

Another instance of undervaluation is presented by the acquisi-

[8] This problem would not arise in the case of mercenaries' armies, at least not so far as their members as well as the professional soldiers of modern armies can be assumed to be guided by economic motives in choosing their occupation.

tion of goods and services by the government through seizure or at prices fixed below those of a free market. Such measures lead to understatement of armament expenditures in the government's accounts since the opportunity cost of the resources used is higher than the price actually paid by the government.[9]

Usually it is not too difficult to identify the instances in which the government obtains the use of resources below their opportunity cost, but there are considerable difficulties in estimating the amount of the underpayment. Quantitatively speaking, however, this understatement of armament expenditures is probably small compared either with total armament expenditure or with the understatement involved in the uncompensated use of resources or in the payment of the armed forces.

Over against these undervaluations there is at least one important cause of overvaluation customarily associated with the war or defense effort: the increase in the remuneration of the factors engaged in war production relative to the remuneration of comparable factors actually engaged in civilian production.[10] In calculations of the impact of armament expenditures this overvaluation should be eliminated by subtracting from actual armament expenditures a fraction corresponding to the difference between the remuneration of the same skills or productive services in civilian and armament production. Any calculation of this sort will give rise to serious difficulties, of both a conceptual and a practical nature, once armament production accounts for the majority of total employment in a given industry or occupation. This instance of overvaluation is, nevertheless, of practical importance because it tends to offset more or less completely, or sometimes even overbalances, the effect of the aforementioned instances of undervaluation that cannot be expressed quantitatively.[11]

[9] In some cases, however, government interference of this nature will not result in an understatement of armament expenditures but rather bring the government's outlay nearer to the opportunity cost of the resources used; for instance, when the government reduces the price it would otherwise have paid to monopolists and moves the price nearer the competitive level.

[10] See Milton Gilbert and Robert Bangs, 'National Income and the War Effort—First Half of 1942', in *Survey of Current Business,* Aug. 1942, p. 11.

[11] To illustrate the possible overvaluation, assume a gross national product of 100 and armament expenditures of 50, both at the prewar rates of factor remuneration; further, assume a 10 per cent increase in the relative remuneration of factors engaged in war production. Then the actual remuneration of factors engaged in armament production would be 52½ and that of the factors remaining in civilian production 47½ provided total gross national product remained unchanged.

E Privately financed armament facilities

Private investment in armament facilities, including investment for the account of foreign governments and their agents, involves the use for military purposes of resources that would otherwise be currently available for civilian consumption or capital formation. Economically equivalent to armament expenditures by the government, it should be added to reported armament expenditures. Since the facilities remain the property of the private owners and the prices of their products presumably include adequate allowances for depreciation, obsolescence, and profit, the problem of uncompensated or undercompensated use of resources does not arise. If private investment in armament facilities is treated in this way any amortization payments for them (such as are provided under the Emergency Plant Facility Contracts) included in reported armament expenditures, as well as any payment for supplies that actually represent depreciation allowances on armament facilities built since the beginning of the war (or defense) effort, should be deducted in order to avoid double counting.[12]

There is some question, however, about the compass of privately financed armament facilities. In accordance with the tendency not to extend the scope of armaments more than necessary (see Sec. I) only private investment in plant and equipment producing finished armaments or material definitely going into armaments and in inventories destined to be incorporated in armaments should be included with armament expenditures made by the government.

F The treatment of foreign transactions

For the sake of completeness the treatment of armament expenditures involving transactions abroad or transactions with foreigners will be discussed briefly, although the general principles apply without change and no new problems are raised. There are four important types of such foreign transactions: the importation of

In the more likely case, that the shift is brought about by a rise in the actual price of factors engaged in war production to the full extent of the relative shift, total armament expenditure would rise to 55, while the remuneration of factors engaged in civilian production would remain at 50 and gross national product would rise to 105. The overvaluation under discussion, therefore, would amount to 2½ units or 5 per cent of armament expenditures in the first case and to 5 units or 10 per cent in the second.

[12] The payment of depreciation allowances on all facilities built before the war will, of course, continue to be included in armament expenditures.

armaments (including materials that go into armaments); military expenditures abroad (except on domestically produced armaments); export by the government of armaments for the use of its own forces and of its allies; and export of armaments on a commercial basis.

The cost of imported armaments is, of course, included in armament expenditures as usually reported. There is no reason to exclude it from the economic concept of armament expenditures, since we may regard as the opportunity cost of imported armaments the equivalent amount of civilian goods exported or, if such are wanting, the reduction in net foreign assets. Armaments imported without immediate payment or obligation of future payment obviously are not counted as armament expenditures in the receiving country.

Expenditures (other than on domestically produced armaments) made in other countries in connection with the defense or war effort are treated exactly like those on imported armaments. Their opportunity cost is represented either by the domestically produced civilian goods that must be exported to pay for them or by the net reduction in foreign assets that provides the means of payment. No adjustment, however, is necessary for uncompensated or undercompensated use of resources in foreign countries.

Armaments exported for the use of a country's own or its allies' forces similarly form part of reported and adjusted expenditures.[13] Their economic cost is represented by the civilian goods that could have been produced with the resources employed in manufacturing the exported armaments. However, if the armaments supplied to allies are not regarded as outright gifts or subsidies, the discounted value of the expected future repayments must be regarded as an offset. This will always be a very doubtful item. Experience suggests that it may be wiser to forego an attempt at a rough guess at its size and to forget about the offset.

A more difficult problem is raised by the export of armaments on a commercial basis, which, of course, does not appear among reported armament expenditures. From an economic point of view, however, such exports are similar to other armament expenditures in that they reduce the supply of civilian goods to the extent that they are not offset by a simultaneous net increase in the import of civilian commodities. The problem, therefore, arises only when

[13] It is assumed that such exports are not offset by additional imports of civilian commodities.

payment for armaments so exported is received in forms that constitute an addition to net foreign assets. In that case commercial exports of armaments may be regarded as an additional current armament expenditure offset on capital account by the value of the deferred payments of interest and capital. (The one case of practical importance is presented by the export of armaments by the United States, both from 1914 to 1916 and from 1939 to 1941 before the adoption of the lend-lease arrangement.)

G *The timing of debit entries*

Determination of armament expenditures for any given period requires a decision about the point at which resources used for armaments shall be debited, i.e., about the time at which their services shall be regarded as having left the civilian sector. There are four ways of handling the matter, two of which have superior theoretical merit while the other two possess the essential advantage of being simpler and more practicable.

One method, to enter the debit at the time of the 'production' of a given piece of armament, encounters theoretical difficulties due to the well known problems involved in determining the period or time of production of any commodity and practical difficulties due to the lack of many of the basic data. Any satisfactory calculation by this method would require data on the input of labor and materials of different types and on the use of existing equipment in the production of armaments. These data, if available at all, are largely independent of the figures reported as budgetary expenditures and great difficulties will arise in reconciling the two sets of figures, neither of which is ordinarily to be obtained in sufficient detail.

A second method, to enter the debit item at the time of actual use, requires the introduction of accounting for the stock of armaments existing at any one time and of depreciation for types of armament that last longer than the interval for which the calculation is made. The practical difficulties involved in this approach clearly outweigh its theoretical attractiveness.

A third method makes the debit entry at the time of the delivery of a finished piece of armament (or of rendering services not embodied in tangible armaments), and a fourth at the time of payment by the government. Both methods are practicable and the choice depends on which seems to approximate more closely the time at which the resources are taken from their alternative civilian use.

From this point of view the 'armaments delivered' base seems preferable. Its use implies exclusion from any period's armament expenditures of prepayments for armaments to be delivered after the close of the period and of payments for armaments delivered during preceding periods, and requires inclusion of any arrears of payments behind deliveries.

H Idle resources

Probably the most controversial and at the same time quantitatively the most important problem in measuring the economic impact of armament expenditures is raised by the fact that total resources used generally increase under the influence of the defense or war effort, reflecting the reduction or elimination of the under-utilization of productive factors before the start of large scale armament expenditures. In this situation, it has been argued, the economic cost of armaments is equal only to armament expenditures minus the value of product of the resources that were idle before the defense or war effort started and that would have remained idle except for it. (Armament expenditures thus could even be a negative quantity.) But if such an expansion of total resource-use is regarded as an offset to armament expenditures, consistency demands that the reduction of national income during the depression that usually follows the conclusion of hostilities—and by some students is attributed directly to the war—should be debited and treated as an additional impact of armament expenditures to the extent that such reduction is attributable to the war. Further, the disemployment of civilian resources due to the defense or war effort would have to be regarded as part of armament expenditures. Finally, allowance might have to be made for the reduction in valued leisure involved in the longer hours of war production. All this gets us too deeply into the quicksands of speculation. It would seem, therefore, that it is not advisable to allow for changes in the total utilization of resources in calculating armament expenditures, mainly because it is not possible to determine the increase or decrease in total production due to armament expenditures and to the aftermath of war.[14] Even if the increase in total utilization of resources during the defense or war effort is thus excluded from the measurement of armament expenditures, it should be taken into account, together with other factors not reflected in armament expenditures, in any final evaluation of the economic cost of war or defense.

[14] For an opposite conclusion see e.g., Gerhard Colm, 'The Cost of Arming America', *The Annals*, March 1941, pp. 10-11.

I The treatment of human resources

The last of the basic problems of measurement concerns the treatment of the use of human resources that constitutes part of armament expenditures. In a slave economy it might be appropriate to treat human resources in their economic aspects exactly like physical resources. Our system, however, lacks most of the market valuations of human resources that would be necessary for such a treatment and ingenious devices, such as capitalizing a man's earning power, are but unsatisfactory substitutes. The other theoretical extreme, to eliminate from the calculation the direct use of human resources in the defense or war effort, is even worse. We are, therefore, driven to the not too satisfactory compromise of valuing the use of the services of the armed forces at the prevailing average rates of civilians' earnings but of disregarding the compensation paid for death and disability that can be traced to military service. Consistent adherence to this stand would require elimination from armament expenditures of the outlay for the medical sections of the armed services as well as of governmental payments to private hospitals, physicians, etc., for the same purposes. The wisdom of such consistency is, however, doubtful.

J Summary

From a practical point of view the result of these considerations is that to approximate armament expenditures in the economic sense most closely, one should start from the reported figures of government outlay for armaments and try to make the following adjustments:

a) Shift to the basis of 'armaments delivered', if the accounts are kept on a different basis.

b) Add private investments in armament facilities.

c) Add the value of resources used for which the government has paid no compensation whatever, including disinvestment in equipment used for the production of civilian goods.

d) Deduct payments included in armament expenditures that do not represent the use of resources or that represent overpayments.

e) Eliminate compensation paid for losses of human resources.

f) Correct for the undervaluation involved in the compensation of the personnel of the armed forces.

Fortunately the adjustments listed, as well as corrections not specifically enumerated and other controversial adjustments that deserve serious consideration, are of very different practical importance. If the major adjustments are made inability to provide for the minor ones will usually not detract too seriously from the results. While exact data are lacking for almost all these adjustments the material is usually sufficient to present at least rough estimates of the more important items listed.

IV The Current and the Capital Impact

A Current versus capital armament expenditures

The resources producing armaments (or, more correctly, the resources giving off the services that produce armaments) are of two types: (1) Resources whose services become currently available and can be used without reducing the stock of resources and thereby the future supply of commodities and services; e.g., labor and the use of plant and equipment made good through maintenance, repair, and replacement.[15] (2) Resources that form part of the nation's wealth; e.g., irreplaceable natural resources and the use of plant and equipment and of foreign investments without simultaneous replacement.

The distinction is essential from the economic point of view because we must keep apart the impact of armament expenditures on current production and on national wealth. The two types depend on different factors, the current impact on the flow of net national income, the capital impact on the stock of accumulated domestic and foreign resources. Corresponding to the two types of resources a distinction must be made between two categories of armament expenditures. Current expenditures comprise all those reflecting the use of current resources; capital expenditures are those that lead to a change in the nation's capital. Together current and capital expenditures account for all armament expenditures as they have been defined for the purposes of this paper, and there is no overlapping between them.

The distinction between the two categories of armament expenditures leads to the calculation of two impact ratios, the current and

[15] If labor were treated on a par with other resources its use in such a way as to diminish the workman's productive or reproductive capacity would have to be included with the second type of resources as impairing a form of national wealth.

the capital. Since, as the following section shows, each requires its own denominator they are non-additive and cannot be combined into one over-all ratio measuring the total economic impact of armament expenditures. For that purpose both ratios are needed. In general, however, the current impact ratio may be regarded as the primary measure, showing the proportion of current resources diverted to the production of armaments. That the capital impact ratio is usually treated merely as a subsidiary measure is due largely to difficulties involved in its determination and to the omission from the calculation of the effect of war on human capital.

B The content of current and capital armament expenditures

In terms of the concept of opportunity cost, current armament expenditures are represented by the additional domestic production [16] that would be available for civilian use without impairing the nation's capital if the war expenditures had not been made. The current armament expenditure account, therefore, is to be debited with the following items of expenditure:

a) The value in civilian employment of the services of the men in the armed forces.

b) The expenditure (adjusted for over- or underpayments) on domestically produced armaments delivered to the country's own forces or exported, except so far as the exports are covered by additional imports of civilian goods.

c) The value of the additions to plant, equipment, and inventories of armament producers (partly offset by item k).

d) The cost of imported armaments so far as they are paid for by the export of home produced civilian goods.

e) The net export of commodities representing tribute and current interest on war loans paid to foreign countries. (In the receiving country the respective amounts are, of course, treated as credit on current account.) [17]

Non-current armament expenditures (or armament expenditures on capital account [18]) consist of the part of total armament expendi-

[16] Imports are treated as equivalent to domestic production so far as they are balanced by exports; to the extent that they are not so balanced they are regarded as net capital imports and therefore excluded from current account.

[17] This item may include in the case of tribute the consumption within the country of the foreign army of occupation and its train.

[18] This is a magnitude quite distinct from gross investment in the armament industries which, of course, is a part of current armament expenditures and is offset to some extent by item (k).

tures that impinges on the nation's civilian capital in the sense that it is a source of future services. They are measured strictly speaking by the (appropriately discounted) value of the alternative future civilian products of the source of services that is destroyed or impaired in providing armaments. In practice, however, the valuation is usually based on the depreciated cost or the market value of the assets representing these sources of future services. Debits to the armament capital account include:

f) Depreciation and depletion on plant and equipment in the civilian sector so far as they are not made good by simultaneous investment in civilian facilities.

g) Net reduction in inventories of civilian goods so far as attributable to the defense or war effort. Since it is extremely difficult to decide exactly which reductions in inventory are due to the defense or war effort, it is usually advisable to regard the aggregate net reduction in civilian inventories as part of armament expenditures.

h) Capital assets destroyed by enemy action. They should be entered at their full value, not at the price paid by the government.

i) Net reduction of foreign assets, so far as attributable to the defense or war effort.[19] (An increase in foreign indebtedness is a form of such reduction.) The same difficulties regarding imputation to the defense or war effort arise as under items (f) and (g). However, in actual calculation there is a possibility here of using a short cut, viz., to attribute to the defense or war effort, as indirectly reflecting armament expenditures, the difference between the net reduction in foreign assets during the period of defense or war and the corresponding magnitude during an appropriate preceding average period.

j) Assets (domestic tangible assets or foreign investments) appropriated directly or indirectly by the enemy.

It is quite possible that entries corresponding to items (g) and (i) and (j) will have to be made on the credit rather than on the debit side, reflecting, e.g., a net increase in foreign assets or in stocks. In fact, one additional item that will usually be on the credit side, constituting an offset to these debit entries, is:

k) Gross investment in armament industries (paid for by the government or by private interests) so far as the resulting plant, equipment, and inventories are usable for civilian production.[20]

[19] Armaments or other commodities and services received from abroad without the obligation of repayment are, of course, not regarded as a reduction in foreign assets. They do not appear at all among the armament expenditures of the receiving country but must be included among the current or capital armament expenditures, as the case may be, of the country providing the commodities and services.

Since human capital is not treated like physical capital, no debit to capital account should be made for loss of life or for disability.[21] Consequently it will be impossible to distinguish, through the measure of armament expenditures, between relatively bloody and bloodless wars; hence the expenditures of the less strongly armed and less industrialized combatants generally will seem smaller than they would from a broader point of view.

C *The choice of denominators*

a) Armament expenditures on current account, as defined here, constitute part of the nation's current supply of services of human and physical resources. The appropriate denominator, therefore, is national income. Obviously, if this ratio is to be unambiguous, the valuation of resources used, the treatment of the uncompensated use of resources, and the handling of certain deductions from gross income (such as depreciation allowances and business taxes) must be identical in the calculations of armament expenditures and of national income.

Both national income and current armament expenditures can be calculated on two bases, factor cost or market prices. If they are based on market prices, all commodities and services that form part of national income or of armament expenditures are entered at the prices for which they were actually sold or that were implied in actual sales. These sales prices cover, in addition to wages and salaries, interest and rent expenditures and total net profits (including profits arising in effect from inventory revaluation) of business enterprises, the taxes paid by them, their regular depreciation allowances, and their other charges to earned surplus such as special reserves and bad debt allowances. All these items, therefore, are included in national income and in total current armament expenditures respectively. On the other hand, if both national income and armament expenditures are based on factor cost, several of the items just enumerated are excluded since they do not constitute compensation for the use of current production factors: business

[20] See E. M. Hoover, Jr. and G. E. McLaughlin, 'Strategic Factors in Plant Location', *Harvard Business Review*, Winter 1942, p. 133.

[21] However, the actual cost of treating the wounded and disabled should be included among armament expenditures and debited to current account.

See also J. M. Clark, *The Costs of the World War to the American People* (Yale University Press, 1931), pp. 180-204.

taxes, bad debt allowances, deductions for extraordinary depreciation and depletion, special reserve allocations, and profits or losses from inventory revaluations.[22] National income and armament expenditures can be compared directly only if both are reduced to the same basis.

Practical considerations usually decide which basis to adopt. Since in the available statistical material national income is almost always calculated at factor cost, and armament expenditures are necessarily reported on the basis of market prices, we must either increase national income to a market price basis or reduce reported armament expenditures to factor cost. With our present information we can make neither adjustment in an altogether satisfactory fashion, chiefly because of the absence of current estimates of national income on a final product basis. However, we can step up national income more easily, and probably with a smaller margin of error, than reduce armament expenditures.

The two methods will not yield the same ratio since the items included in the calculation based on market prices but excluded from that based on factor cost differ relative to total armament expenditures and to national income. There is little doubt that certain items in the difference, such as allocations to special reserves and allowances for extraordinary wear and tear, are larger constituents of armament expenditures while others, such as bad debt allowances and excise taxes, bulk larger in national income. It is difficult to say, however, in which direction the net difference will lie and how large it is likely to be.

b) As armament expenditures on capital account reflect the inroads on the stock of civilian physical capital (the use of human capital being disregarded in the calculation) they must be compared either with the cost (depreciated original cost or cost of reproduction) or with the discounted future income from depreciable capital assets, depending upon the method followed in estimating armament expenditures on capital account. The value of unimproved land is thus excluded from the denominator, but net foreign assets are included.[23]

[22] Most of these were classified above (Sec. III A) as non-exhaustive expenditures.

[23] Armament expenditures on capital account may be compared also with the average gross and net investment under peacetime conditions for a period of equal length. Such a comparison is illuminating but is not strictly parallel in its construction to the capital impact ratio.

The shortcomings of even the best national wealth estimates are too well known by this time to require restatement. Any ratio that uses wealth as the denominator obviously must be handled with great care and cannot purport to yield exact results. Both reservations, moreover, apply with equal force to the numerator, armament expenditure on capital account. The ratio is, therefore, doubly problematical. Nevertheless, its limitations seem not serious enough to render it useless. If handled with sufficient caution, it should at least give an idea of the magnitudes involved. For example, the higher the capital impact ratio the shorter the time, other things being equal, it can be maintained. Any more significant statement requires knowledge of capital impact ratios for specific types of assets, notably those employed in the production of armaments and civilian necessities. But even a rough over-all ratio is better than none, since the inroad on the stock of resources is often too large to be neglected in calculations of the economic impact of armament expenditures or to be lumped with expenditures basically different in that they were on resources that become currently available.

c) The current impact ratio and the capital impact ratio cannot be combined unless we are ready to perform several statistical *tours de force* which do not recommend themselves. Theoretically, of course, it would be possible to capitalize current armament expenditures that are not for human resources, add them to armament expenditures on capital account, and compare the sum with national wealth. Alternatively one might express non-current armament expenditure in terms of the expected reduction in future income and discount this reduction to the present day, add it to current expenditures, and compare the sum with national income. However, the difficulties are such as to render either procedure impracticable. We are thus left with two measures of the economic impact of armament expenditures that cannot be added, but we may get an idea of their approximate relative importance since the quantitative relation between national income and national wealth is known, if only in a very rough way.

V Illustrations

During recent years the economic impact of armament expenditures has been calculated frequently by different methods, yielding

widely divergent results. Instead of making another set of calculations, five outstanding 'cases'—the United States, Great Britain, Canada, Germany, and Japan during the calendar or the fiscal year 1941—are used to illustrate some of the basic problems encountered in measuring the economic burden of armament expenditures. Because this material is presented for illustrative purposes, no attempt has been made to put the figures on as comparable a basis as might be possible with more research, or even to strive for the most accurate figures the material might yield. All too often no material is available to make the adjustments theoretical considerations demand. When, as here, interest lies in the problem of measurement, not in the precise figures, this deficiency is not too serious.[24]

A United States

Since the available data are more plentiful and reliable for the United States than for any other country (except possibly Great Britain) we are in a better position to observe here the effects of various alternative calculations, particularly the use of the gross or the net basis in calculating the impact ratios.

Total defense and war expenditures by the United States Government during the calendar year 1941 (including expenditures on armaments shipped abroad under lend-lease arrangements) amounted to slightly over $13 billion.[25] This includes payments made outside the United States, probably in relatively small amounts, which should be deducted. Expenditures on existing assets in the United States apparently were small. Prepayments on war contracts seem to have been substantial but were offset to an unknown extent by lags of payments behind deliveries on other contracts.[26] Private investment in armament facilities, including increases in war plant inventories, was considerable while the off-

[24] The manuscript of this paper was completed early in 1942; it has been impossible to take into account all the data since published that might have been utilized in improving the rough estimates presented in the following pages. All quantitative estimates given are based on or derived from public figures.

[25] The figures for national income, gross national product, and unadjusted war expenditures are taken from Milton Gilbert and George Jaszi, 'National Income and National Product in 1942', *Survey of Current Business*, March 1943.

[26] 'Net Prepayments, Purchase of Existing Assets, Off-Shore Expenditures, etc.' are estimated (*op. cit.*) at $0.8 billion; this figure does not allow for the payments implicit in lags of payments behind deliveries.

setting amortization payments by the government remained small.[27] Armament expenditures (not covered by lend-lease arrangements) made in the United States by foreign governments totaled about one and a half billion dollars.[28] Uncompensated use of current resources in war production seems to have been small. Corrections for the undervaluation of resources used by the government apparently were quantitatively minor.

After these adjustments are made, often very tentatively, current armament expenditures are increased to about $17 billion. If this figure is compared, as it often is, with net national income of $96 billion a current impact ratio of nearly 18 per cent is obtained. Since, however, armament expenditures are on a gross basis the appropriate denominator is not national income but gross national product at market prices which has been calculated by the Department of Commerce at $123 billion. The correct current impact ratio is thus nearly 14 per cent.

Armament expenditures on capital account during 1941 are a negative rather than a positive quantity, i.e., they have resulted in a net addition to the nation's stock of capital. Lend-lease production and services (which may be regarded either as a loan, repayment of which is expected, or as a gift) amounted to slightly over $1 billion.[29] The reduction of British assets in the United States used to pay for armaments and materials and the conversion value of war plants built during 1941 [30] constitute two important credit items. Debits to capital armament account seem to be lacking, except air raid damage and shipping losses in December, both of which certainly have been very small relative to total armament expenditures. A very tentative evaluation of these items indicates that the increase in the armament capital account during 1941 may have

[27] Value of construction of privately financed industrial facilities, most of which were war plants, was estimated at $0.7 billion (*Survey of Current Business*, Feb. 1942, p. 11). Machinery and equipment installed in these plants was probably considerably in excess of construction costs. The increase in durable goods inventories, only part of which can be regarded as connected with war production, is estimated at about $2 billion (*ibid.*, p. 43).

[28] Milton Gilbert, 'Measuring National Income as Affected by the War', *Journal of the American Statistical Association*, June 1942, p. 194.

[29] Report to the 78th Congress on Lend-Lease Operations, January 25, 1943, p. 24.

[30] Military construction amounted to about $2 billion (*Survey of Current Business*, Jan. 1943, p. 11). Construction of industrial plants was valued at slightly over $2 billion (*loc. cit.*) plant and equipment probably adding considerably more than this total. If it is assumed that as little as 1/10 of military construction and ⅓ of war plants have potential civilian uses, total conversion value would amount to about $2 billion.

been in the order of $4 billion, even if the credits on lend-lease account are disregarded.

The situation was, of course, quite different in 1942. Total war expenditures reached $52 billion. Prepayments, payments for existing assets, and off-shore expenditures are estimated to have reduced the total by nearly $3 billion.[31] Refunds following renegotiation may reduce it by a further as yet unknown but certainly relatively minor amount. Private investment in armament facilities was small and partly offset by amortization payments made by the government.[32] The increase in armament manufacturers' inventories, however, may have been considerable. It is impossible to estimate the extent to which uncompensated use of resources was made by the government. The extent of undercompensation certainly increased in 1942 but remained a minor item quantitatively. Adjusted current armament expenditures in 1942 then should not have been much lower than the reported crude total, aggregating about $50 billion. With a national income of nearly $120 billion and gross national product at market prices of slightly in excess of $150 billion, the current impact ratio for 1942 may be estimated at about 33 per cent, more than double the 1941 ratio.[33, 34]

The capital impact ratio for 1942 depends largely on the treatment of lend-lease aid which aggregated $7 billion. Outlay on civilian construction and equipment and on consumer durable goods together seems to have been below $10 billion.[35] Since the usual depreciation allowances run to about $14 billion a consider-

[31] Gilbert and Jaszi, *op. cit.*

[32] Value of construction of privately financed industrial facilities amounted to only $0.3 billion (*Survey of Current Business,* Jan. 1943, p. 11).

[33] No strictly comparable figures are available for World War I. Clark (*op. cit.,* pp. 33-4) estimates "war expenses representing actual economic effort" for 1918 at somewhat over 25 per cent of national income. Calculated on the basis of gross national product at market prices, to make the figure comparable with those in the text, the ratio should not have exceeded 20 per cent. It certainly remained far below the ratios of 1942 and 1943.

[34] Chiefly because of the extraordinary rise of gross business profits and of the direct taxes levied on them it makes a considerable difference whether the calculation of the current impact ratio is done on the market price or the factor cost basis (Cf. IV A above). While the calculation in the text that proceeds on the market price basis yields a 1942 ratio of 33 per cent the factor cost method would lead to a slightly smaller figure, probably not over 30 per cent.

[35] Outlay on consumer durable goods is estimated at $6.4 billion and that on private residential construction at $1.5 billion (Gilbert and Jaszi, *op. cit.,* p. 21). The value of civilian construction and equipment not connected with the war effort and not included in these figures was small.

able civilian disinvestment is indicated.[36] This was partly offset by the conversion value of armament plants.[37] If lend-lease production is treated as a gift the capital impact ratio for 1942 thus was probably slightly positive.[38]

B Great Britain

The case of Great Britain is of particular interest because it illustrates very clearly the importance of the distinction between current impact and capital impact, and the necessity for a correct treatment of the draft on foreign resources.[39]

The national income of the United Kingdom in the fiscal year ending March 31, 1942 may be estimated at £6,800 million; [40] gross national product at market prices may be put at about £8,500 million.[41] Total reported armament expenditures (represented by the expenditures of the Supplies Service less Civil Votes) have amounted to slightly over £4,000 million. This figure seems to include the payments for all munitions imported from the United States and Canada except those received under lend-lease arrangements. Private investment in munitions facilities appears to have been very small. Civilian disinvestment, on the other hand, was undoubtedly of considerable proportions although its size is very difficult to estimate; the official estimate is £200 million.[42] Adding these items to the expenditures of the Supplies Service gives total armament expenditures of about £4,200 million, about 62 per

[36] Business depreciation and depletion charges are estimated at $7.8 billion (Gilbert and Jaszi, *op. cit.,* p. 19). Very rough allowances for depreciation on homes and other consumer durable goods account for the rest.

[37] Military construction amounted to about $5 billion; construction and equipment of war factories to nearly $6 billion (*War Production in 1942,* issued by the War Production Board, Division of Information, p. 15). Again assuming 1/10 of direct military construction and ⅓ of war plant expenditures to represent conversion value, a total of about $2½ billion is obtained.

[38] Should lend-lease exports and services be regarded as full valued claims the capital account would show a considerable net increase (i.e., a negative capital impact ratio) possibly of as much as 2 per cent of national wealth (excluding value of unimproved land).

[39] Most of the figures used to illustrate the British situation are taken from the Treasury White Paper of April 1942 (An Analysis of the Sources of War Finance and an Estimate of the National Income and Expenditures in 1938, 1940 and 1941) and from the summary of the White Paper (*The Economist,* April 17, 1943).

[40] The official estimate for the calendar year 1941 is £6,619 million (*The Economist,* p. 499).

[41] The sum of estimates for business taxes, war risk insurance premiums, ordinary depreciation allowance, and net national income.

[42] *The Economist, loc. cit.*

cent of net national income and 50 per cent of gross national product.

These figures do not yet allow for losses from enemy action of British owned assets in the Far East, which would raise the ratio another few points. Allowance for the relatively low pay of the armed forces and for the savings to the government through certain types of price fixing would further increase armament expenditures in the economic sense, though probably only by a small amount. On the other hand the total contains certain relatively small sums paid as compensation for loss of human resources that should be deducted to conform to the economic concept of armament expenditures.

The riddle of this high percentage of armament expenditures, which contradicts what is otherwise known about the trends of production and consumption in the United Kingdom, is solved by a look at the capital account. Funds accumulated by the British Government for the payment of existing orders in the United States are estimated to have provided about £300 million, advances by the Canadian Government over £150 million, and other overseas sources about £350 million,[43] while domestic disinvestment is estimated at about £200 million. Destruction and confiscation of property by enemy action would add another considerable though unspecified amount to the draft on capital. Taking all these items in account (but without allowance for destruction and confiscation or for American lend-lease aid) the armament capital account seems to show a debit of nearly £1,000 million for 1941-42 if Canadian aid is treated as a debt.

After deducting this sum from the aggregate armament expenditures in the economic sense, there remains to be debited to the current account only about £3,200 million. The current impact ratio, therefore, is somewhat under 40 per cent, a figure so far from the 60 per cent ratio resulting from the usual method of calculation [44]

[43] Expenditures in the United States, estimated at £300 million (*The Economist,* Dec. 1941, p. 746), probably do not include munitions received under lend-lease arrangements. Canadian advances during the fiscal year 1941-42 were given as nearly $700 million (Budget Speech of the Canadian Minister of Finance, June 23, 1942, p. 60). The total reduction in overseas assets, estimated at £800 million for the calendar year 1941 (An Analysis . . . p. 9), probably includes assets used to pay for munitions imported from the United States and Canada except those received under lend-lease arrangements.

[44] £4,000 million reported armament expenditures: £6,800 million net national income. The ratio rises to about 70 per cent if armaments received from North America are regarded as a capital obligation.

as to show quite a different situation.[45] Obviously the higher figure may give an incorrect impression of the scale of the British war effort, the possibility of its undiminished continuation or further increase, and the extent of the switch-over from civilian to armament production.[46]

C Canada

Calculations of the impact ratio for Canada are interesting mainly because of the importance of inter-allied transactions and the problems involved in their treatment. Reported armament expenditures during the fiscal year ending March 31, 1942 amounted to about $1.4 billion.[47] Expenditures on armaments and other material for the account of the United Kingdom added about $0.9 billion. Private investment in armament facilities seems to have been minor but the reduction in civilian inventories has been considerable.[48] Adjustments for uncompensated or undercompensated use of resources are apparently small. Total current armament expenditures in the economic sense seem to have amounted to fully $2.5 billion. With a net national income of about $6.5 billion [49] and a gross national product at market prices of about $8 billion, the current impact ratio somewhat exceeded 30 per cent.[50]

Debits to capital account seem to have been very small. On the other hand, the repatriation of Canadian securities, aggregating about $0.4 billion for the fiscal year 1941-42,[51] gives rise to a con-

[45] Income, gross national product, and total reported armament expenditures in 1942 were only slightly above the preceding year, all three probably about 10 per cent. In 1942, however, reported armament expenditures included only a relatively small amount for munitions produced abroad and paid out of British assets. Current armament expenditures therefore rose to well over £3,500 million, reflecting the considerable increase in domestic armament production in Great Britain. The current impact ratio consequently increased slightly to fully 40 per cent. The capital impact ratio appears to have been fairly substantial again and may not have been lower than in 1941 if account is taken of losses of British assets in the Far East.

[46] Again no strictly comparable figures exist for World War I. A. J. Brown estimated that "consumption fell in the worst year of the war . . . probably . . . to 65-70 per cent" of its immediate prewar level ('Resources Available for War: A Comparison', *Oxford Economic Papers,* Feb. 1940, p. 19).

[47] See Budget Speech of the Canadian Minister of Finance, June 23, 1942, pp. 51 and 60. This figure includes about $120 million of 'recoverable advances' to allies.

[48] It is estimated roughly by A. F. W. Plumptre at about $150 million (*Mobilizing Canada's Resources for War,* Toronto, 1941, p. 289).

[49] *Ibid.,* p. 289.

[50] Gross national product seems to have risen about 10 per cent in 1942, i.e., to about $9 billion. With reported armament expenditures exceeding $3.5 billion, the current impact ratio appears to have increased to about 40 per cent.

[51] See Budget Speech, p. 60.

siderable credit on capital account. There is doubt, however, about the treatment of the sterling balance of $0.7 billion accumulated in London by the Canadian Government during the fiscal year and funded into a loan not to bear interest until after the war. If this loan were regarded as an asset, total net credits to capital account would aggregate over $1.0 billion or something like 4 per cent of national wealth (excluding land).[52] If it is treated as the equivalent of a gift, the net increase in capital attributable to war expenditures amounts to only $0.4 billion.

D Germany

Measurement of the economic impact of Germany's armament expenditures illustrates especially well two major points: (a) the difficulties of obtaining for the numerator and denominator of the impact ratio data covering the same territory, and (b) the importance of booty and tribute.

The net national income of Germany (including Austria and the incorporated parts of Czechoslovakia, Poland, and France) has been estimated at about RM115 billion for the fiscal year ending March 31, 1942.[53] Gross national product at market prices has been put at around RM155 billion.[54] Military expenditures (which must be approximated very roughly by combining figures on tax receipts, increases in the government's indebtedness, and non-military governmental expenditures) seem to have amounted to about RM90 billion.[55] They contain the contributions of occupied territories which have been estimated at about RM15 billion including the protectorate of Bohemia and Moravia but probably excluding contributions exacted from the occupied part of the U.S.S.R.[56] No allowance is made in either set of figures for the contribution to

[52] If the excess of the increase in foreign assets over the prewar balance is alone regarded as attributable to the war effort, as suggested above, total net credits are reduced to about $0.8 billion.

[53] An estimate by the German Minister of Finance in an address before the Berlin Academy for the Administration of War Finances runs to RM110-115 billion; another estimate cited by H. W. Singer, 'The German War Economy', VI, *Economic Journal*, June-Sept. 1942, p. 202, gives RM120 billion.

[54] See Guenter Keiser, *Bankarchiv*, 1942, pp. 78-9; the figure given in the text is exclusive of contributions from occupied countries.

[55] Keiser, *op. cit.*, puts total public expenditures at RM100 billion. O. Schwarz (*Bankarchiv*, 1942, p. 258) estimates extraordinary military expenditures at RM75 billion, possibly excluding contributions from occupied countries.

[56] Singer, *op. cit.*, p. 201; Keiser, *op. cit.*, p. 78 gives RM15-17 billion.

armament expenditures in the form of the labor of war prisoners and of workmen imported from occupied and allied countries, and certainly none has been made for materials bought at artificially low prices or without immediate payment from these countries.[57] To these items must be added estimates of net civilian disinvestment which undoubtedly has been of considerable proportions, possibly reaching RM10 billion in 1941,[58] and of private investment in armament plants which may be assumed to have been small. Total armament expenditures in 1941, then, seem to have been around RM85 billion [59] for Germany proper and about RM105 billion for the entire German occupied area.

The current impact ratio can be calculated in two ways.[60] One is to treat the contributions made by occupied countries as gifts, paralleling the treatment of British receipts under lend-lease arrangements. The current armament expenditures provided by German resources, amounting to about RM75 billion, would then have to be compared with a gross national product at market prices of Germany proper of about RM155 billion, yielding a current impact ratio of about 50 per cent. The alternative, to equalize the territorial coverage of armament expenditures and of national income, requires a comparison of Germany's total current armament expenditures (including those borne by the occupied countries) of about RM90 billion [61] and the gross national product of the entire area under German control (excluding occupied parts of the

[57] Singer (*op cit.*, p. 202) estimates them as at least RM6 billion.

[58] Disinvestment in plant and equipment has been estimated for 1940 at RM3-4 billion (K. M. Hettlage, Wer Bezahlt den Krieg?, *Deutscher Volkswirt*, Dec. 20, 1940, p. 476), the reduction in civilian inventories adding another RM5-6 billion. Keiser (*op. cit.*, p. 79) puts disinvestment for 1941 at RM5 to RM10 billion. An official estimate of 'capital consumption' in 1941 cited by Singer (*op. cit.*, p. 201) of RM30 billion seems to be based on a broader definition, but even then it is difficult to accept since it would put disinvestment at about one quarter of national income.

[59] This figure makes no adjustment for the undervaluation involved in the low pay of the armed forces and the limitation on prices paid by the government to domestic suppliers. It is doubted, however, that either adjustment could be of great quantitative importance.

[60] For purposes of this calculation we assume RM75 billion of current armament expenditures by Germany (RM85 billion total expenditures minus RM10 billion disinvestment) and RM15 billion by occupied countries (RM15 billion total contribution plus RM5 billion underpayments for labor and commodities minus RM5 billion estimated to come out of capital).

[61] No allowance is made for the contributions from the occupied countries that came out of accumulated resources, and not from current income, and therefore constituted a capital impact.

U.S.S.R.) of about RM250 billion.[62] This comparison gives a current impact ratio of fully 35 per cent.[63]

The method used should depend largely on the purpose to which the ratio is to be put. If one is interested primarily in the impact on the current income of the German people, the first ratio, about 50 per cent, is applicable. If, however, the purpose is to determine the impact of armament expenditures on the total area under German occupation, the second ratio, about 35 per cent, is appropriate. In any comparison of the enduring burden of armament expenditures and the margin available for further expansion of total German military expenditures, the lower of the two should form the basis of the argument.[64]

In calculating a capital impact ratio for Germany, it must probably be assumed that the booty in the form of inventories of raw materials and finished commodities and confiscated machinery and equipment constitute a valid credit on capital armament account, fully or partly offsetting disinvestment in Germany. On the other hand, it may be better to disregard the booty in the form of confiscated precious metals, stocks, and other titles to wealth in the occupied and neutral countries as well as the confiscation of real estate outside Germany since it is doubtful that capital gains of this type will be more than temporary. On these assumptions, the capital impact ratio was probably negative in 1940 as a result of large scale plundering in western Europe. In 1941, however, dis-

[62] The gross national product of the countries occupied by Germany has been approximated on the basis of the national income estimates presented by Colin Clark, *The Conditions of Economic Progress* (London, 1940), p. 40, for the decade 1925-34. It has been assumed, however, that the relation between the national product of Germany and that of the occupied countries (not including 'allies' such as Rumania and Hungary or unoccupied France because they had separate armament expenditures, and omitting occupied parts of the U.S.S.R.) was in 1941 considerably (25 per cent) more favorable to Germany than the corresponding national income relation was in the base period.

[63] Additional data for 1942 are not available. Indications, however, point to another increase in armament expenditures, particularly the part financed by the occupied countries. Since gross national product seems to have risen only very slightly, if at all, the current impact ratio must have increased, possibly to about 55 per cent for Germany proper and to over 40 per cent for the entire German occupied territory (excluding occupied parts of the U.S.S.R.).

[64] For World War I the average ratio of unadjusted armament expenditures to prewar national income seems to have been about 40 per cent (see Leo Grebler, *The Cost of the World War to Germany*, Yale University Press, 1940, pp. 96-7), indicating a ratio to gross national product of not over 35 per cent. The current impact ratio was probably somewhat lower. All the ratios, of course, were higher than the average during the later years of the conflict and lower in 1914 and 1915.

investment in Germany is likely to have exceeded additional loot, although probably not by much. Material is lacking for calculating the capital impact ratio in the occupied countries. There is, however, little doubt that on account of physical destruction and of abduction as well as deterioration of the remaining stock of capital it would be considerably higher than for any of the countries for which figures have been given here.

E Japan

Calculation of the impact ratio for Japan is especially difficult. Not only are most of the problems encountered in the other countries present, but the basic figures of armament expenditures and national income and product are still more uncertain. Estimates using the most reliable material available, but nevertheless representing not much more than rough guesses,[65] place military expenditures at about 25 per cent of national income for both 1938-39 and 1939-40, and at about 20 per cent of gross national product at market prices. From the few scraps of evidence available for the more recent period we may infer that the proportion had not risen much until the war with the United States started and for the year 1941 probably did not exceed 25 per cent of gross national product.[66] The ratio would be lowered if the national income estimates included not only Japan proper, but also dependencies such as Korea and occupied territories such as Manchukuo and sections of China proper which without compensation provide part of the economic resources for the military expenditures. However, information about the national income of these territories is much too uncertain,[67] and the methods by which contributions not appearing in Japan's military budget are extracted from them are not well enough known to permit adjustment of the crude ratio between the national income of Japan and the total reported or inferred military expenditures.

[65] Taken from an unpublished report by Kurt Bloch for the Office of Price Administration; see also Leon Henderson's testimony in Hearings on Revenue Revision of 1941 (House), p. 641.

[66] The current impact ratio certainly was considerably higher in 1942. It may have amounted to 40 per cent of gross national product. This estimate, however, is subject to a wide margin of error as the available information on total armament expenditures is very scanty and unreliable and it is not clear to what extent colonies and occupied territories may have contributed to them.

[67] The national income of both the dependencies (Korea, Formosa, Southern Sakhalin, Kwantung, and South Sea Islands) and Manchukuo seems to be about 15 to 20 per cent of that of Japan proper.

VI Conclusions

The search for a summary expression of the economic impact of armament expenditures has led to the conclusion that two separate, non-additive measures are required: (1) the current impact ratio, calculated by dividing adjusted armament expenditures on current account by gross national product at market prices, and (2) the capital impact ratio, obtained by dividing armament expenditures on capital account by the value of the nation's stock of depreciable physical assets. The conceptual, analytical, and practical difficulties of measurement are so serious that no entirely satisfactory solution is in sight. The best that can be claimed for any actual attempt at measurement, and all that is claimed for the one presented in this paper, is that the figures are somewhat more satisfactory and illuminating than the still cruder measures now in use.

Both the current and the capital impact ratios are well adapted for comparison of the impact of armament expenditures over time. In that respect they are superior to unadjusted figures for armament expenditures which are unsuitable in the presence of large changes in price level or national product. The use of the ratios entirely obviates the necessity of an adjustment for price changes so long as we may assume that the price levels of armaments and of civilian goods move along parallel lines. If the facts depart too violently from these assumptions, an adjustment of the original data underlying the ratios by the use of appropriate price indexes may still be necessary.[68]

The current impact ratio does not provide an adequate measure of the degree of switch-over from civilian to military production unless full employment of resources existed when the defense or war effort started.[69] In that case the ratio of armament expenditures

[68] Unfortunately there is no statistical material on the actual relations. Some important factors will generally make for a sharper rise in the prices of armaments; for instance, the small regard for prices in government contracts; the predominance of cost plus or similar arrangements; the necessity of bidding factors away from civilian occupation. On the other hand, the increase in armament output may decrease its unit cost while the accompanying restriction of civilian production will raise it. It is difficult to say in which direction the balance will lie. It would seem, however, that the factors raising the prices of armaments relatively to those of civilian goods will generally overbalance them, working in the opposite direction. If so, the ratio unadjusted for these price shifts will tend to overstate the impact of armament expenditures, other things being equal. (This overstatement appears to be particularly pronounced for the United States.)

[69] The capital impact ratio is not relevant to this problem.

to national income will with fair accuracy measure the proportion of resources shifted from the production of civilian goods to that of armaments provided allowance is made for the higher level of factor remuneration in the field of armament production. Otherwise, a special investigation is necessary to determine what proportion of armament expenditures represents a switch-over from civilian production and what proportion is due to the reemployment of formerly idle resources without involving a lowering of the previous level of civilian activity.[70]

The two impact ratios together give a better idea of the degree of economic sacrifice involved in a defense or war effort than the absolute figures of armament expenditures. They should, however, be supplemented by a figure indicating the change in real civilian consumption per head.[71] Their usefulness as measures of economic sacrifice is limited by the factors that have prevented any satisfactory quantitative measurement of economic welfare. As in the broader problem, the main difficulty arises from the difference in the degree of sacrifice of economic welfare according to the income level that is lowered. The same impact ratio may, therefore, be obtained although the degree of economic sacrifice differs. Thus, economic sacrifices may be assumed to be larger, yet have the same current impact ratio, the smaller a country's income per head and the more unequal the distribution of income. Similarly, a given capital impact ratio will imply increasingly smaller economic sacrifices the higher the real wealth per head.

Neither impact ratio by itself measures the margin available for a further expansion of armament expenditures. When resources are utilized to the full, this margin is given by the difference between the portion of total national product that constitutes the subsistence minimum of the population (in the sense that the defense or war effort would suffer if current consumption fell below it) [72] and total

[70] How great the difference between the current impact ratio and the reduction of civilian consumption and investment can be is illustrated by the case of the United States. In the third quarter of 1942, e.g., the current ratio was as high as 40 per cent, but civilian consumption (roughly adjusted for price changes) was only slightly below the level of the first half of 1940, just before the real start of the defense program (cf. *Survey of Current Business*, Feb. 1943, pp. 11 and 21).

[71] This figure is not simply a complement to the current impact ratio, as it includes the effects of numerous factors other than armament expenditures.

[72] The subsistence minimum can be estimated on the basis of technological and nutritional considerations or on that of historical evidence, i.e., as the minimum of a not too distant period in the past (as A. J. Brown, *op. cit.*, has done for Great Britain on the basis of the situation in World War I).

actual armament expenditures. It depends, apart from the size of the subsistence minimum, on the real income and wealth per head of the population and the technical possibilities of transforming the stock of resources into currently consumable goods and services. The ratios provide information on the subtrahend of the difference alone.

Nor can the ratios serve as the basis for the comparison between the cost and the revenue of the war, even if both terms are limited strictly to the economic aspects. They do not even provide the one side needed for the comparison, viz., a summary of the economic cost of the war. Such a calculation, as has been said repeatedly, would have to go considerably beyond the sphere of armament expenditures in the sense used here. This shortcoming need not distress us too much as it seems utterly impossible anyhow to arrive at any quantitative expression for the other side of the comparison, the economic yield of a defense or war effort.

The worth of the ratios is probably greatest for the purpose of international comparison and that is the purpose for which they have usually been employed. There is no doubt that they are much better suited to that purpose than absolute figures on armament expenditures.[73] But they should be used for that purpose only with great caution and it may be worth while to restate the precautions which must be taken before such a comparison can validly be made:

a) The scope of armament expenditures must be the same in all countries included in the comparison.

b) The original data should be adjusted throughout to the 'armament delivered' basis.

c) The figures must be corrected for any differences in the original data regarding armament expenditures made by persons and organizations other than the central government and not paid for by the Treasury.

[73] There is one obvious exception: when we want to know something about the absolute size of the defense or war effort in different countries, none of the ratios will give us the answer, but neither will the unadjusted expenditure figures. It is then necessary to go back to a common denominator of military significance. If this is not feasible there are two other measures which, while less satisfactory and not easy to calculate or estimate, are preferable to unadjusted absolute armament expenditures: (a) the hours of labor engaged in defense or war work after rough adjustment for differences in the level of productivity, and (b) the absolute armament expenditures roughly adjusted for differences in the price level (for an example of this type of comparison see *The Economist,* Jan. 17, 1942, pp. 66 and 77).

d) Identical principles must be followed for all countries in evaluating the services of the armed forces.

e) Care must be taken that contributions by allied and occupied countries are treated in the same manner in each country.

f) The same principles must be followed in all countries in evaluating the use of accumulated past resources, particularly uncompensated depreciation and depletion.

g) The denominators of the fractions, gross national product or national wealth, must be calculated by uniform methods.

h) The comparison must take into account both the current and the capital impact ratio.

Even if these precautions are observed, the ratios, as we have just seen, do not answer two of the most important questions, the relative degree of economic sacrifice involved and the margin available for a further increase in the defense or war effort.

The same ratio, of course, does not necessarily involve the same degree of economic sacrifice. Even if we abstract from possible differences in the importance of non-economic sacrifices and satisfactions, the same ratio may mean different things depending on the average real income per head. Obviously an impact ratio of, say, 30 per cent involves a greater sacrifice, other things being equal, in a country with an average real income per occupied person of not much over $100 (China) or $350 (Japan), than in one with nearly $1,100 (Great Britain) or nearly $1,400 (the United States).[74] Similarly, the margin for an increase in defense or war expenditures is wider the higher the real income and wealth per head of population, assuming an equal willingness for economic sacrifice[75] and absence of physical difference in subsistence level (on account of climate, physique of population, etc.), and abstracting from the possibility of covering war expenditures by booty.

These considerations should be kept in mind in comparing the situation in the United States with that of our allies and enemies. In 1941 the difference between the current impact ratio in this country (about 14 per cent) and in the main other belligerent countries (Great Britain about 40 per cent; Canada 30 per cent;

[74] Colin Clark, *The Conditions of Economic Progress,* pp. 40-2. The figures are in so-called international units (dollars of 1925-34 purchasing power) and reflect the situation for the average of 1925-34.

[75] This is a very important point. The same relative level of armament expenditures as expressed in the impact ratio may lead to an impairment (through non-cooperation or passive resistance) of war production in one country but not in another.

Germany about 35 per cent; Japan 25 per cent) was so large that there is no doubt about the degree of economic sacrifice having been much smaller and the margin for a further increase in armament expenditures much wider in the United States than abroad.

In 1942 the current impact ratio for the United States rose to about 35 per cent, reaching the range observed abroad in countries engaged in total war. The ratio also rose in all foreign countries, although more slowly than in the United States, and reached around 40 per cent in Great Britain and Canada as well as in Germany (including occupied countries) and Japan. This does not mean, however, that we had achieved equality of sacrifice or that our margin for further intensification of the war effort was as limited as that of other countries. On the contrary, there is little doubt that in 1942 we were making less of an economic sacrifice than any of the major belligerents because the reduction of civilian consumption was small and hit non-essentials to a much larger degree. Any comparison of per capita consumption of staple foods, clothing, and basic services will show that clearly. More important, there is every reason to assume that the margin available for an increase in armament expenditures after 1942 will be far wider for this country than for any of the other major belligerents.

If present plans are carried out, the current impact ratio for 1943 should be around 50 per cent; in addition we should expect for the first time a not inconsiderable capital impact. We shall then be near the upper limit of the ratio hitherto observed abroad,[76] but will still be left with a sizable margin because of our higher real income and real wealth per head. Where the upper limit lies is difficult to estimate with any degree of accuracy for the United States or for the other major belligerents. The guess may, however, be ventured that a current impact ratio of between 50 and 60 per cent represents the maximum that can be sustained for long and that for most countries the maximum will be lower than this.[77] The United States should be able to support such a load, corresponding at present prices to current armament expenditures of between $100 and $120 billion a year, longer and with less serious sacrifice of economic welfare than any of the other major belligerents.

[76] By 1943 the impact ratio for most of the other belligerents will, of course, also have risen above the 1942 figures discussed in the text. However, it is unlikely that the current impact ratio will exceed 50 per cent in 1943 in any foreign country except Germany proper. By that time, as a matter of fact, the differences between the current impact ratios in the five countries discussed should have become relatively small.

[77] The armament effort can, of course, be supplemented for some time by a draft on capital and by booty. The scope of such a supplementation is relatively limited for the United States because of the practical impossibility of either drawing on foreign assets or of borrowing abroad on a substantial scale.

Discussion

CLARK WARBURTON

My comments on Mr. Goldsmith's paper relate to the following aspects of measuring the impact of the defense and war programs upon the economy: (a) Mr. Goldsmith's starting point in the concept of opportunity cost; b) an ambiguous characteristic of Mr. Goldsmith's 'current impact ratio' and his discussion; (c) adequacy of data to compute the 'current impact ratio'; and (d) devices not discussed by Mr. Goldsmith that are needed to measure the economic impact of the defense and war programs.

a Opportunity cost vs. the de facto price system as a point of departure

Mr. Goldsmith's reverent treatment of opportunity cost is like the procedure of the mythical supply engineer who was assigned the task of estimating the number of trucks necessary to carry supplies from Cairo and Suez to the North African battlefront. Standing on the west bank of the Nile, he saw a great city far to the west, through which apparently all supplies must pass on their route to the place of battle. In that city, he said, will be our zero milestone from which we will measure all distances forward to the armies in action and backward to the docks and warehouses where the trucks are loaded. After traveling three days in a jeep without getting any nearer the city, the engineer returned with his zero milestone to the bank of the Nile and set it up at the end of the bridge leading to Cairo. He estimated his mileages from that point, labeling them in his official record: 'Distance from the nearest point to the mirage'.

The set of prices used in actual transactions is necessarily the point of departure in estimating national income and in dealing with related problems such as the value of government output and the impact of armament expenditures. Existing prices form a system in the sense that they are related and are continually being

adjusted to one another and to various economic forces such as changes in the character of the demand for goods, in supplies, and in production techniques. Some price adjustments are made through a competitive market, some by administrative decisions of officials of business enterprise, some by administrative decisions of government, and some by legislative enactment. All price adjustments, regardless of the method by which they are brought about, are designed to modify the amount or direction of the flow of commodities and services through the economy, either (a) directly or (b) indirectly by affecting the incomes of some people.

The current dollar evaluations of commodities and services that result from the *de facto* price system have a reality that is absent from the theoretical notions derived from price theory, competitive or otherwise. They have reality not only because they are compilations of values embodied in transactions, but also because they represent the composite of the decisions of all the people in the nation in providing themselves with economic goods as well as the relative values upon which future choices, plans, and decisions are based. This would still be true though competitive price procedures were abolished and all prices were set by a central committee and its staff.

Since market prices, rather than factor costs in the traditional sense, represent the composite of the decisions of people with respect to the relative values of various kinds of economic goods, the most direct and simplest method of measuring the economic impact of armament expenditures is to compare their amount with the total expenditures on all types of final products. Since the ratio of armament expenditures to total expenditures for all final products has validity as representing the result of the decisions of people in their individual and collective capacities, it is not necessary to justify the use of this ratio, as Mr. Goldsmith does, as a substitute for a ratio based on factor costs. Under our price system it is the selection of evaluations based on factor costs that requires justification.

The chief difference between the ratio of armament expenditures to total expenditures on final products and the ratio proposed by Mr. Goldsmith is that the former uses actual outlays on the pay and subsistence of the men in the armed forces and does not assume that they should be raised to the level of the civilian earnings of the enlisted or drafted personnel.[1] If the current impact ratio is to be

[1] See Mr. Goldsmith's paper, Sec. III B. In illustrating the computation of the current impact ratio (Sec. V A) Goldsmith omits this adjustment because of paucity of data and an assumption that it would be small.

calculated by some method that allows for changes in the valuation of human services, such as the difference between civilian earnings and pay in the armed forces, allowance should be made also for other important changes in relative values induced by the defense or war effort. The adjustments proposed by Mr. Goldsmith are not enough if we desire a current impact ratio that reflects changes in the methods of evaluation resulting from the shift from a peace to a war economy. Differences between the methods of establishing prices for armaments and for consumers' goods probably affect the values of commodities as much as the difference between the methods of establishing army and civilian pay affects the valuation of human services.

The best procedure is to take the actual prices paid as the basis for computing the current value of final products, both for armaments and for other commodities and services, and to handle all valuation adjustments together in transforming current values into series representing constant prices, or some theoretical set of prices.

In international comparisons it may be desirable also to allow for substantial differences among countries in the relative levels of pay in the armed forces and in civilian employment. This kind of adjustment is similar to the problem encountered in attempts to compare the cost of living in countries with wide variations in relative prices of the various kinds of consumers' goods. To make any adjustment of this kind is so difficult that it will usually not be attempted in comparisons of armament expenditures in various countries, but may be essential for some uses of the figures.

b The nature of the economic impact

The character of the current impact ratio recommended by Mr. Goldsmith is ambiguous, partly because the data are not clearly defined, but primarily because he does not state precisely what kind of impact he is discussing. To illustrate the most important ambiguity in the current impact ratio, as calculated by Mr. Goldsmith, take the case of food consumed by the American army. Its cost is included in armament expenditures, as used in the numerator of Mr. Goldsmith's ratio. Most of this cost represents a shift from individual to governmental purchasing rather than a shift in the character or volume of production. In view of the importance of purchases for war purposes of the same kinds of products as were formerly purchased by civilians, we must be clear about what kind of impact we are considering, i.e., the impact on the

character of production and the use of resources or the impact on the division of payments for final products between those made by individuals and those made by government. Distinctly separate concepts, both are important.

Another differentiation in the character of the economic impact of armament expenditures, which Mr. Goldsmith recognizes but tends to underemphasize, is the difference between the impact upon the value and upon the physical quantity of production. As Mr. Goldsmith points out (Sec. VI), the use of the current impact ratio he recommends eliminates the necessity of adjusting for changes in the general price level, but involves the assumption that the price levels of armaments and of civilian goods move along parallel lines. We should examine the facts very carefully to see whether they do, because powerful forces tend to create divergences between the price levels of armaments and those of civilian goods. One of these forces is the greater degree of centralized purchasing for war supplies than for civilian; another is that a large part of both military and civilian production is carried out under conditions of diminishing cost, and as the war proceeds the output for war purposes mounts while that for civilian purposes declines.

Another factor that may cause a difference between the impact of armament expenditures upon the value of production and their impact upon the physical quantity of production is a difference in the wage rates in armament and civilian industries. If, for example, mechanics and other workmen are induced to shift from the production of civilian goods to production of ordnance by a higher rate of wages, and if this differential is maintained, the impact upon the value of the production of armaments and of civilian goods respectively will be greater than the impact upon the physical quantity of the two types of goods, regardless whether the price levels of armaments and civilian goods are constant or shifting.

This problem of adjusting the values in current dollars for divergent price trends and differing wage levels may turn out to be of great importance if the figures are designed to indicate reasonably well the change in the proportion of the national product devoted to defense or war.

c Adequacy of data

For the data used in calculating the current impact ratio in the United States, Mr. Goldsmith depends upon estimates prepared by the National Income Unit of the Department of Commerce.

My comments on the adequacy of data for the computation of the current impact ratio are therefore directed in part to the procedures followed by the National Income Unit.[2]

A reasonably accurate current impact ratio of the type Mr. Goldsmith recommends requires reasonably reliable estimates of the aggregate value, at current market prices or their most appropriate substitute, of the final products of the economy. The total value of all final products is the denominator of the current impact ratio, and the subtotal of the items that constitute armament expenditures is the numerator. The classification of final products used in preparing the estimates must be twofold in order that the two major aspects of economic impact, changes in type of product and changes in purchaser, may be determined.

The estimates now published by the National Income Unit of the Department of Commerce under the title, 'gross national expenditures' or 'gross national product', are, as Mr. Goldsmith points out, far better figures than have hitherto been available for the denominator of the current impact ratio. They are superior to the figures previously published under the title 'national income', because they are designed to represent market prices rather than factor costs, they include armament and other governmental expenditures, and they are computed on a gross rather than on a net basis with respect to depreciation.[3] The figures of the National Income Unit for armament expenditures are also better than any other now available for the numerator of the current impact ratio.

However, neither set of figures is derived by the procedure best adapted to the calculation of the current impact ratio. The denominator is obtained by making various adjustments to the old series of 'national income' estimates. The numerator is a Treasury figure for defense expenditures adjusted for certain items, but not prepared as part of a general classification of government expenditures for final products. Further, it does not differentiate between expenditures that reflect changes in the character of production and

[2] Milton Gilbert, 'Measuring National Income as Affected by the War', *Journal of the American Statistical Association*, June 1942; 'War Expenditures and National Production', *Survey of Current Business*, March 1942; and Milton Gilbert and R. B. Bangs, 'Preliminary Estimates of Gross National Product, 1929-41', *ibid.*, May 1942.

[3] The problem of depreciation, not treated in Mr. Lindeman's paper or in my comments, will be ignored also in these comments, except to register my agreement with Messrs. Goldsmith and Gilbert that the gross figure should be used for the computation of ratios designed to indicate the impact of defense and war expenditures.

those that reflect purchases by government in lieu of purchases by individuals.

The new estimates of values of final products the National Income Unit is preparing, of which preliminary figures have been in part released, may meet these objections. However, the estimates published to date or announced for future publication will not provide the best numerators for computing the current impact ratios of armament expenditures, because the major groups, by which the final products of the economy are being classified, are not well adapted to this purpose. (1) The traditional twofold classification of all final products between consumers' goods, on the one hand, and capital formation, on the other hand, is not appropriate for the classification of war goods and in fact of certain other products of government. Modification of this classification, by segregating the final product of government as a third category, is not sufficient, since the final product of government consists in part of consumers' services, and armaments are in part the product of nongovernment enterprise.[4] (2) Categories based on the principle of durability are less significant than categories of the type used in surveys of family expenditures; and in fact, break down when applied to armaments. Tanks, planes, and ordnance produced for use in this war do not have a life expectancy of more than three years. Though made of steel and other durable materials, they are more akin to consumers' perishable commodities or to such industrial supplies as sandpaper, files, and shipping containers than to consumers' or producers' durable commodities. (3) Classification must be made by both purchaser and type of product.

The proposed classification of final products is designed to provide the figures needed to compute the two ratios for measuring the current economic impact of armaments expenditures and to be useful in other analyses of economic data for which a classification of final products is desirable.

d Other measures of the economic impact of defense or war

Mr. Goldsmith's paper is devoted to the attempt to find the most appropriate and practicable single measure for the economic impact of armament expenditures, but concludes that at least two ratios, a current impact ratio and a capital impact ratio, are necessary. His suggestion of the ratio of armament expenditures to

[4] See Section 'Classification of final products' in my comments on Mr. Lindeman's paper.

total expenditures on final products is undoubtedly a leading candidate for the most appropriate and practicable single measure of the current economic impact of the war effort. However, the fact that this ratio, as discussed by Mr. Goldsmith, is ambiguous and

Proposed Classification of Final Products

TYPE OF PRODUCT [1]	CLASS OF PURCHASER [2]				
	Individuals		Nonprofit social organizations [3]	Business enterprises	Government
	Purchased items	Imputed items			
Consumer goods [4]					
Food					
Household maintenance					
Attire					
Transportation					
Education					
Medical services & supplies					
Etc.					
Capital goods					
Residences					
Other buildings [5]					
Other construction [5]					
Machinery & equipment [5]					
Inventories (net change)					
Government services & related products not classified as consumer or capital goods [6]					
Courts & legislative establishments					
Government administration					
Services of armed forces					
Equipment of armed forces					
Foreign claims (net change)					

[1] The items listed here are designed to indicate the character of categories to be developed; they are not a definite suggestion for categories.

[2] In the case of items not actually purchased in final form (e.g., education in public schools), the classification is based on the purchaser of the materials and services used in providing the item.

[3] Includes universities, foundations, and other endowed institutions; community chests and other philanthropic organizations; religious societies; trade unions; fraternal organizations; etc.

[4] Classification of consumer goods to be such that national estimates can be correlated with estimates based on data from surveys of family and individual expenditures.

[5] With subcategories (a) for purposes other than armament production, and (b) for armament production.

[6] Excluding government services identified as services to business enterprises and therefore excluded from final products of the economy (see Section 'Segregation of final products of government from intermediate products' in my comments on Mr. Lindeman's paper). In the procedure of the National Income Unit, no such exclusions are made.

must be separated into two ratios, and the difficult valuation adjustments encountered in comparing the ratios for various periods and various countries make the question acute whether some measure in physical terms might be preferable to a ratio computed from monetary evaluations.

As another candidate for a single measure of the current impact of the armaments program or of war upon the economy, may I suggest an employment ratio based upon an analysis of labor usage prepared in accordance with a classification of final products similar to that suggested above. The estimates of labor usage should be prepared in terms of person-years (or person-weeks or person-days) employed in the production and sale of the various types of final products, and of the idle portion of the labor force. Fewer data are available for such estimates than for estimates of the values of final products, and they could be classified in less detail. However, if as much effort were devoted to an analysis of the use of the labor force, in terms of direct and indirect employment associated with various categories of final products, as has been devoted during the last few years to estimates of expenditures on final products, results of comparable reliability might be obtained. Furthermore, sufficient data are available at present to make possible an estimate of the number in the armed forces and the number employed in enterprises producing armaments or directly associated therewith (including a suitable proportion of the personnel of transportation and communication agencies), and to relate this figure to total employment, or to the total labor force. These estimates might provide a measure of the impact of the armaments program on the economy that would be as reliable as the ratio Mr. Goldsmith computes from the expenditures estimates now available.

Estimates of armament expenditures, civilian expenditures, and labor usage that could be related, with respect to both the whole economy and its major segments, would be far more useful than such estimates prepared independently, as is the case with the estimates now available. If the former, together with price indexes, production indexes, and estimates of use of the principal resources and basic materials—all calculated on the basis of a uniform classification of the final products into which data from surveys of family expenditures as well as data for the nation as a whole could be fitted —had been available at the beginning of the defense program, they would have been of enormous value in planning the transition to a war economy. If developed now, they would provide us with

several valuable measures of the impact of defense and war operations upon the economy, and would be extremely helpful in the development of policy for the transition to a peacetime economy and for the postwar era.

M. A. COPELAND

Mr. Goldsmith's distinction between the current ratio and the capital ratio is an important contribution. I suggest that the two ratios are not to be thought of as resulting from a split of the common sense concept; rather the capital ratio is an additional concept, the current ratio is a refinement of the common sense concept. It would seem desirable to provide a current ratio along the lines proposed by Mr. Goldsmith as a standard basic measurement, then to offer as supplementary information data on existing plant and equipment that may be converted to war purposes along the lines suggested by Mr. Kuznets.

Mr. Goldsmith apparently did not use the 'opportunity cost' concept in defining his ratio. To do so would call for inclusion rather than exclusion of sites and of convertible plant and equipment since the opportunity for alternative uses exists. For statistical purposes the 'opportunity cost' doctrine in actual application has the disadvantage of being subjective, that is, the measurement becomes dependent upon the alternative opportunity one may have in mind. When Mr. Goldsmith speaks of excluding from our war effort exported munitions that are offset by civilian imports and including imported munitions paid for by civilian exports, he introduces two such types of subjectivity. One must decide what imports and exports are to be so matched. Apparently he does not take account of such offsets in computing his ratio.

Mr. Goldsmith, like some others, implies that government cash payments for the war program have thus far substantially exceeded the value of munitions delivered and war construction work put in place. From the viewpoint of the federal budget, the lead of payments over deliveries and value in place in the cumulative totals has been substantial although it has been narrowing in recent months. This lead of down payments, chiefly in the field of ordnance and planes, is partly offset in ship construction and other construction where value in place has tended to lead cash payments. Moreover, there has been a substantial increase in the inventory of war work in process to which private enterprises have title.

Presumably this increase is a part of our war effort and is at least as large as the cumulative excess of down payments over deliveries in the case of planes and ordnance.

CHARLES L. MERWIN

To the comparison of war expenditures with national income Mr. Goldsmith's paper provides an important contribution. His breakdown of the impact relationship into that on current and that on capital account, in particular, makes clearer what is implied in the ordinary procedure whereby total war expenditures and national income are compared without any adjustment. Moreover, his insistence on reducing to a comparable basis the numerator and denominator of the impact ratios is a welcome respite from the slipshod manner in which such comparisons are frequently made.

In one important respect, however, I wish to submit that Mr. Goldsmith, although recognizing as an important problem the under- or overvaluation of resources used for war, has suggested an illogical solution in his measurement of armament expenditures as the value of the alternative products of the resources used in producing armaments. He admits that the problem of determining these alternative products and their value is insoluble "if rigorous standards are applied" (Sec. III), and concludes that a practicable solution lies between using without adjustment "the crude figures given in the government's accounts" and applying throughout the principle of alternative costs (Sec. III). As a practical matter, therefore, he applies the principle of opportunity cost only in "significant instances" of "divergence between actual payment by the government and armament expenditures in the economic sense" (Sec. III). Although he shies away from trying to list these instances, he seems to consider the application of this principle necessary, for example, in the valuation of the services of the armed personnel, which he would take "as roughly equal to the product of their number and the corresponding average earnings of adult males" (Sec. III).

I submit that the principle of alternative cost is inapplicable, in the manner proposed, to wartime conditions. Properly applied, this principle requires, among other things, that there be alternatives for which given resources may be used, and that there be at least some mobility in shifting resources from one use to another. The latter condition is usually not present in a wartime economy. In

particular, members of the armed forces are not at liberty to shift their human resources to other uses. Moreover, a large part of the capital equipment is not freely transferable to other uses, and, in some foreign countries, the mobility of even civilian labor is negligible.

Government fiat may of course influence the monetary value put upon these resources, and the monetary cost of the war depends to some extent on whether the government elects, say, to pay privates $30 or $50 per month. But the peacetime earnings of the private are no measure of the economic cost of using him in the army. The application of the alternative cost principle in the present comparison runs up against the hard fact that there are, practically speaking, no alternative uses for the resources.

Although, as pointed out above, Mr. Goldsmith stresses limitations in using the alternative cost principle in the present situation, he misses the fundamental difficulty—the lack of alternative uses, once we are in a war—and views the problem almost entirely as an alternative between war and peace. That is to say, he considers the principal difficulty to be that "we can never know with certainty or even a high degree of probability which civilian products would have been produced in the absence of the defense or war effort . . ." (Sec. III). Even if we did know this, we would still not have the alternative costs of the resources devoted to the war. I doubt that Mr. Goldsmith means to imply that we had freedom of choice between getting into and staying out of this war. Yet his application of the alternative costs procedure to the economy as a whole implies just that, and its narrower application to particular resources during wartime completely ignores the institutional structure of wartime economy.

To say that the alternative cost principle is inapplicable to the situation under discussion does not deny the existence of the problem Mr. Goldsmith set out to solve by means of this principle. On the contrary, there is a genuine problem, in computing the impact ratio, of adjusting war expenditures for the under- or overvaluation of those resources devoted to war. Although I am not able to suggest a solution I am sure the alternative cost principle is not the key, and that its application to the present situation necessarily gives fictitious results.

Part Three

THE CONCEPT OF INCOME PARITY FOR AGRICULTURE

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