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# The Product Side: Some Theoretical Aspects

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## *Introduction*

DURING the depression of the 1930's and the period of World War II, the purposes for which national income data are used underwent revolutionary change. The demand for central management of the magnitude of output during the depression, and of both the magnitude and the composition of output during the war, pointed up the need for a better understanding of the structure of the economy and the relationships among its component sectors. During the war, moreover, it became important to determine the limits to gross productive capacity. These new demands on national income measurement gave rise to a ferment of analysis. The major developments which bubbled out of that ferment have been incorporated in current national income concepts.

The postwar use of national income data has not led to suggestions for change of comparable conceptual importance. However, we believe that certain suggestions for change in present practice are worth making, and we present them here.

These suggestions arise from three sources. First, some proposals for the elaboration and revision of the structure of national income ac-

. NOTE: Mr. Budd is the younger but in no other sense the junior author. He has not only done much the larger share of the work of preparing the manuscript (a division of labor not infrequently imposed on junior authors, and necessitated in this case by my acceptance on extremely short notice of another and urgent assignment), but has contributed a share at least as great as mine to the intellectual content of the article. The section concerning the boundary between economic and noneconomic activity and that concerning government intermediate product are primarily mine. Other sections, except for the conclusion, are primarily his. Concerning government intermediate product, the reader should note the "replies" by Budd and me, which restate the problem. E.E.H.

counts are currently being put forward,<sup>1</sup> and these in turn lead to suggestions for marginal change in concepts of aggregate output or income. Second, study of underdeveloped economies abroad indicates a need for further examination of the problems of intereconomy comparisons of output. Third, continuing use of United States national income data as now presented by the National Income Division (NID) of the Department of Commerce appears to warrant certain refinements in concepts or data.

Our discussion concerns only measures of the nation's aggregate output. Two related topics of interest are thus not discussed: the structure of the social accounts and series measuring other aggregates (e.g. total sales on the market).

### *The Distinction Between Economic and Noneconomic Activity*

The attempt to locate the line between economic (productive) and noneconomic human activity has been a perennial source of controversy. One recurring issue concerns "necessary evils." Activity is economic if the consumption of the product moves the consumer upward on a scale of satisfaction. There is no logical reason to distinguish between upward movements above and below zero on the scale. Activities which are "necessary evils" (e.g. defense or protection against fire) are economic.<sup>2</sup>

A more difficult issue is presented by the attempt to draw a line between work and play. Apart from activity performed under coercion—which raises no problem in the present context—human beings, it is said, act for one or both of two purposes: because the performance of the process is satisfying, and because of the utility of the resulting product. Activity of the second type is productive; activity of the first type is not.

But almost everything that men do is both play and work, in varying proportions. We believe, therefore, that the only sound approach is to classify an activity as economic if its end product has a significant amount of utility, regardless of the degree to which the activity has noneconomic motivation as well. This principle, of course, does not establish a clear line of demarcation: there is no sharp line.

<sup>1</sup> For a competent set of proposals of this sort, see the paper by Morris A. Copeland, "The Feasibility of a Standard Comprehensive System of Social Accounts," *Problems in the International Comparison of Economic Accounts*, Studies in Income and Wealth, Volume Twenty. Princeton University Press for National Bureau of Economic Research, 1957.

<sup>2</sup> The view that they are not arises, we believe, from confusion between production and welfare. Concerning this confusion, see page 234 below.

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Some definitions which seek for a sharp line rely largely on some concept of market transactions.<sup>3</sup> Thus the NID states, "The basic criterion used for distinguishing an activity as economic production is whether it is reflected in the sales and purchase transactions of the market economy."<sup>4</sup> In terms of the NID's own practice, however, this statement is incomplete. In the important cases of home rental and food production, the rental value of owner-occupied homes and the value of food produced on farms for own use or furnished free by employers to employees are lumped with home rentals on the market and the production of food which passes through the market respectively. Other imputations are also made by the NID. Such imputed items amount in total to some 8 to 9 per cent of personal consumption expenditures. In our opinion the NID should continue its practice of including an imputed value for these items. Although valuation is difficult, we have no suggestions to put forward for improvement in the current NID methods of imputing such goods and services.

Even if the NID were to apply its criterion of money exchange rigorously, the resulting measure would not embrace total economic activity; nor would it be able to meet in any adequate fashion the invariance test discussed below. We consider the current NID practice defensible and acceptable because no closer approach to coverage is readily feasible.

Even the NID usage omits quantitatively important economic activities. For example, the work of housewives is performed both because it is satisfying and because the result is wanted; it is therefore economic. Its value is omitted from measurement because it cannot be measured very accurately; its omission should not be rationalized on other grounds.

Another definition of economic activity narrower than ours has been proposed by Gilbert and Kravis, who urge that "the concept of economic production or economic activity . . . be restricted to those things which require the use of scarce factors of production . . . which have alternative uses in the production process. The precise difference between economic and noneconomic activity is not that one is useful and the other is not, but that the effort spent in noneconomic activity is not available for an alternative use in the economic sphere."<sup>5</sup> On the basis of this criterion the value of home shaves, for example, should

<sup>3</sup> Measurement of market transactions is of course important for other purposes.

<sup>4</sup> *National Income Supplement, 1954, Survey of Current Business*, Dept. of Commerce, p. 30.

<sup>5</sup> Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies*, Organization for European Economic Cooperation, Paris, 1954, p. 67.

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be excluded, since they do not reduce the amount of time spent on the job, whereas the value of services furnished by housewives who would otherwise be working at a paid occupation should be counted.<sup>6</sup> We believe that this criterion rests implicitly on a market standard for defining the "economic sphere," and meets the test of invariance scarcely more successfully than does an exchange criterion. Insofar as opportunities for paid employment (e.g. employment of housewives, overtime by already employed workers) are subject to cyclical fluctuations, the scope of economic activity will be subject to short-run as well as long-run shifts.

Errors in defining the scope of economic activity create two problems in interspatial or intertemporal comparisons of aggregate output. One of these problems arises from faulty identification of economic activity with economic welfare, the other from the different scope of market activity in the two situations.

## PRODUCTION AND WELFARE

The chief source of confusion between production and material welfare relates to the treatment of free goods. Clearly, if the comparison sought is that of welfare, satisfactions rendered by free goods in one situation and by produced goods in another must be included or excluded in both situations. If the comparison is made from the viewpoint of the group of individuals that obtains them only at a cost, these goods must be included in both situations with weights reflecting their importance to that group. If the comparison is from the viewpoint of the other group, the goods must be included with zero weights (i.e. excluded for both groups). Examples are warmth, provided by the sun and the location on the earth's surface in some cases, and provided in other cases only at considerable cost in housing construction and consumption of fuel; other types of utility rendered by the sun in Florida but not in New York; or the consumption of foods, most of whose utility is contributed by nature without cost in one situation but obtained only at the cost of human effort in the other.

If, on the other hand, the comparison has to do with the relative flow of economic activity in the two situations, a different procedure is called for. Activities such as those cited by way of example are productive in the one situation; they are not productive in the other. Therefore, if the volume of production in the two situations is to be com-

<sup>6</sup> The desire of Gilbert and Kravis to exclude the value of housewives' services under all circumstances hardly seems consistent with their own basic criterion of economic activity (*ibid.*, pp. 68-69).

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pared, these activities should certainly be included in the one and not in the other.<sup>7</sup>

Since the line to be drawn around economic activity will vary both over time and from country to country, national income estimators should present their data in such a way as to make it readily possible to separate off the fields of activity which may be in question in inter-temporal or interspatial comparisons of production and welfare.

### MARKET VERSUS NONMARKET ACTIVITY

The measurement of national income should be invariant to purely institutional changes.<sup>8</sup> According to this principle, activities should be included if they are productive, regardless of whether or not they enter into market transactions. Or, to state the principle in a weaker form, they should be treated alike in comparing two situations, even though in one they enter into market transactions and in the other do not. Pigou's statement that national income should not change because a man marries his cook has its parallel in many other circumstances. The housing a man constructs for himself, from bamboo and thatch which he obtains without cost from areas near his village, should be included, as should also the housing a man builds for himself commercially. Similarly, the food a family raises for itself should be included as well as the food that is purchased. So also for clothing. We should like to see the NID do some bold estimating of such segments of nonmarket economic activity now outside the scope of its work. The national income estimator should provide all the information feasible, showing its breakdown into categories, so that a given type of activity can be included or omitted, depending on the purpose of the comparison.

### *Intermediate Output*

Under this heading we shall discuss three problems: the problem of occupational expense; the problem of radio broadcasting and television; and the problem of the intermediate output of government.

<sup>7</sup> Similarly, if productive activity is being compared, activities which are purely play in one situation and are work in the other should be excluded in the one and included in the other. But such activities are quantitatively unimportant. Conceptually, in measuring material welfare they should be treated alike in the two situations.

<sup>8</sup> Ingvar Ohlsson emphasizes the invariance test in considering the adequacy of the exchange or market transaction criterion as a basis for selecting activities to be included in output. He does not, however, attempt to formulate a general rule for activities to be covered. (*On National Accounting*, Konjunkturinstitutet, Stockholm, 1953, pp. 194-195.)

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### OCCUPATIONAL EXPENSE

A significant fraction of the urban consumer's expenditure of money and effort consists of costs of pursuing his occupation, such as getting himself to his place of work and back again. It has sometimes been asserted that these services are not consumption at all, and that if only our statistics permitted their elimination they should not be included in national income.<sup>9</sup> Take, for example, the case of a worker who lives in the suburbs because he cannot afford space in town or because he dislikes living in the city, and who goes to considerable expense in money, to say nothing of time, traveling to and from his work. The suggestion is that this expenditure should be charged as a cost of performing his job, and the implication is that the worker's "value added" is less than his salary. In effect, the worker is considered as a separate productive unit, whose net value added is measured by the difference between the salary paid him by his employer and the intermediate products (e.g. transportation services) he purchases from business firms.

From the standpoint of measuring production, this whole approach is, we believe, mistaken. The value of the product that one worker helps to create is not less than that of another (assuming both receive equal salaries) merely because the cost of traveling to work is greater for the first than for the second. The location of the worker's home and the cost he incurs for travel are a matter of his choice as a consumer. There are, for example, a number of individuals who work at Rockefeller Center in New York City and who live near enough to be able to walk to work. Other persons who work there choose not to afford this living cost and instead pay transportation costs. The cost involved is in essence comparable to the cost of defense, or of obtaining warmth which must be expended in some situations and not in others.

If, however, a comparison is made of the *welfare* of the individuals in the urban situation and the *welfare* of individuals elsewhere, the cost of travel should certainly be subtracted from the income of individuals in the urban situation. Alternatively, depending on the viewpoint, it should be added to the income of the individuals in the other situation.

If an employee's travel cost were paid by his employer, then it should be credited as a part of his salary and treated as though he in turn had paid it to the transportation company, like the food the government provides to members of the armed forces, or the food and

<sup>9</sup> Simon Kuznets suggests such a treatment in his basic work, *National Income and Its Composition, 1919-1938*, NBER, 1941, pp. 36-40.

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lodging which in certain industries are furnished free by employers to employees.

The above argument is, we believe, applicable to most cases of so-called occupational expense (e.g. travel, clothes worn on the job). There may, however, be certain examples of purely business expenses which are borne uniformly by all workers in a particular occupation, and which under more usual circumstances would be paid by enterprises and charged to current costs. One cited by the NID is "miner's expenditures for explosives, lamps, and smithing."<sup>10</sup> Such cases are not likely to be numerous: the income tax law has stimulated the assumption of such expenses by enterprises themselves. The bias, as a matter of fact, may well be in the *opposite* direction; businesses are increasingly furnishing to their employees free services in the nature of final consumption and charging the cost to current expense. As an extreme example, we may mention a firm which provides its female employees with free hairdressing and beauty parlor services after hours. Hence the problem of imputing wages in kind (as in our transportation example above) may well be a more pressing one than that of determining the relatively few cases of true business expense borne by workers. We believe, therefore, that no essential revision is called for in the NID treatment of occupational expense.

## RADIO BROADCASTING AND TELEVISION

The working distinction between final and intermediate products is highly institutional in character, the usual practice being to treat as an intermediate product any item that is purchased by business enterprises and charged to current account. In certain cases, the most important being radio broadcasting and television, institutional differences between countries lead to conceptually different measures of output.

We believe that a sound case can be made for the inclusion of radio broadcasting and television in the NID measure of output. It is quite unrealistic to argue that the value of such services is included in the value of the advertised products the consumer buys, since his consumption of these entertainment services, as free goods, is largely independent of his consumption of other products. It is true that no factor income can be found to correspond to the value of such services, but this does not justify their exclusion from the product side.<sup>11</sup>

<sup>10</sup> *National Income Supplement, 1954*, p. 38.

<sup>11</sup> The NID mentions the factor income argument as a reason for exclusion, but does not stress it (*National Income Supplement, 1954*, pp. 38-39). If such services are to be included, there is, of course, a valuation problem similar to that raised

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### THE INTERMEDIATE SERVICES OF GOVERNMENT

A familiar problem concerning government is whether certain of its services should be regarded as merely instruments toward the production of goods and services by private enterprises, and for this reason excluded from separate enumeration in the national product.<sup>12</sup>

In the context of the present discussion the purpose of national income accounting is to measure the value of aggregate output (in current or constant prices). The relevant concept of value is market value (i.e. market prices).<sup>13</sup> When government production of goods enters the picture, there is a deviation from market pricing insofar as government output is not sold at a price, or is sold at a price that is only nominal. Valuation, then, must be by some analogue to market valuation, and the analyst faces the question: which of the possible alternative analogues is preferable?

This is one example of the general problem which is the source of almost all controversy concerning national income measurement. All national income measurement is implicitly based on an analytical model of a private market economy. There is no government; no taxes; no institutional change; no technological change. Controversies arise when we must apply measurement to conditions which violate these assumptions. We must then reason by analogy, and reasonable men may employ inconsistent analogies.

With respect to government intermediate production, there are at least four possible alternative methods of valuation. There may well be others.

1. Kuznets in his basic work in this field proposed the elegant assumption that the total value of government output equals tax revenues accruing minus transfers. Thus the value of intermediate and

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for other types of goods and services furnished free to consumers. Since a market price to consumers cannot be used, an adequate alternative would be valuation at cost (including profits), similar to the method now employed for determining the value of services furnished by financial intermediaries to consumers. Similar considerations do not apply to newspaper and magazine advertising, since market prices (subscription rates and sales prices) are available. If such advertising were to be viewed as a "subsidy" to such publications, an evaluation at factor cost would be different. Cost valuations need to be relied on only when market prices for final products are unavailable.

<sup>12</sup> Jaszi regards some proposals to exclude some government services as based on the contention that activities which are necessary evils should be excluded (see his "National Income: Status and Prospects as Seen by an Estimator," *Journal of the American Statistical Association*, September 1951, p. 354). We of course agree that there should be no exclusion on these grounds.

<sup>13</sup> We do not exclude use of weights other than prices for special purposes.

final product would be taxes owed by business firms and consumers respectively. We agree with those national income analysts who hold that this model is empirically weak. Government deficits or surpluses are incurred for reasons which make it inappropriate to regard the total value of government services as equal to total taxes minus transfers, or the value of any segment of government services as equal to tax revenues of a given sort. The choices among types of taxes, and between taxes and borrowing or money creation to finance government expenditures, are made for many reasons which have no connection with the type of goods in production or with the total volume produced. Moreover, crude cost accounting to divide total government services into services to consumers and to business does not show up proportions parallel to those prevailing for direct and indirect taxes. The analogue used for valuing government output should not flout this set of considerations.<sup>14</sup>

2. We therefore accept the principle that government output should be valued at factor cost, which in this case equals total cost of production.<sup>15</sup> This method has its analogue in private production in cases where there is no market price to set a value on goods. For example, in the case of inventories conventional accounting uses cost of production as the measure of value.

Acceptance of this principle does not settle the problem of the valuation of government intermediate product. The remaining question is: Which government services if any are intermediate? A consumer buys a good on the market. Part of its value has been produced by a private business enterprise, and part by the government through its intermediate services to business. Does the value that the consumer pays on the market represent the total value of the product, or is there an added value which is being paid for separately? If the latter were true, it would be proper to show the government service as part of final product, in addition to the value of the product purchased from private business.

The NID answers this question by adopting a principle as elegant in its own way as Kuznets'. All government services are final services; there is no need to search for the dividing line.

<sup>14</sup> Tax payments can never be viewed as strictly analogous to market prices. The analogy between market prices and taxes has been attacked by Earl Rolph ("The Concept of Transfers in National Income Estimates," *Quarterly Journal of Economics*, May 1948, pp. 345-347).

<sup>15</sup> "Total cost of production" should, we believe, include an imputed allowance for the services of government-owned capital, as well as net purchases from business and employee compensation (cf. note 21 and our discussion in the section on government services below).

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We believe that this principle has not always been fully understood. It does not deny implicitly that some government services have been involved in the production of goods on the private market. Rather, the argument seems to be as follows: The persons making up an economy choose to have some of the costs of the goods they buy defrayed by private producers; these they pay for in the market price of the goods. They choose to have other costs of production of the goods they buy defrayed by government. These they pay for in other ways. These services in effect might be referred to as "complementary products of government" rather than intermediate products.

There is nothing inherently illogical in using a model which operates as though consumers choose to obtain from the government protection against fire or theft for a factory, apart from and in addition to the value of the factory's products which they obtain by purchase on the market.

We do not believe however that the correctness of the procedure used by the NID follows. The difficulty can be perceived if we note a basic rule of valuation which the NID procedure violates. This violation, in turn, testifies to the weakness of the procedure. We are referring to the rule of invariance to purely institutional changes. If in the operations of the private economy the identity of the producer of a good changes, or if the buyer changes, these shifts as such should cause no alteration in the value recorded. If the same is not true when the government sector is included in the valuation, then the method of valuation is basically defective.

Suppose that a manufacturing concern employs its own night guards, or that a logging company has constructed a road on which it hauls its logs. Suppose now that in the first case the government assigns enough policemen to the area where the manufacturing concern is located to make private guards superfluous, or in the second, builds a road through the forest which makes it unnecessary for the logging company to continue to maintain its own. In either case, even though no change whatever occurs in the productive processes or the goods available to the economy, the NID method would show an increase in the real national product.<sup>16</sup>

The rationale of acceptance of the market price system as a basis for valuation is that quantities are weighted by their relative marginal importance to the buyer or, more precisely, by their relative marginal rates of substitution, as reflected in their relative prices. When we value a government service at its factor cost, we are implicitly assuming that

<sup>16</sup> The change indicated in the national product in current dollars would depend upon the effect of the change on prices and factor money incomes, respectively.

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it is not subsidized (i.e. that its full factor cost to the government is a correct analogue of a private market price). Unless this is our assumption, use of the full factor cost violates the invariance test. Now in the case of government intermediate products, we cannot make this assumption. We have a market price which embodies the marginal rate of substitution, and to maintain our analogue we must regard the intermediate product as a subsidy *in natura*.<sup>17</sup> We may formally include it in final product if we wish, but if we do so we must weight it by its price in the private market, namely zero.

3. We therefore turn to the method that Kuznets characterizes as the "specific" approach,<sup>18</sup> and assume that we are able to separate services rendered by government directly to consumers from government services to business. We would count as intermediate, for example, services of highways and airports to business users, fire and police protection of business property, business information and regulative activities. Some borderline cases are conceptually difficult, even though a somewhat narrow interpretation of "intermediate services" is used. Even where the conceptual line is clear, statistical problems occur in connection with activities which serve both consumer and business interests (e.g. highways), although these problems may be no greater than those disposed of by cost accounting in a great variety of private business enterprises.<sup>19</sup>

With the intermediate and final products of government thus separated by specific examination, the value of net national product<sup>20</sup> may be computed as the sum of four parts: consumer purchases on the market; net private domestic investment; net investment abroad; and the value of the final products of government, that is, the total value of government output minus the value of that share of it which consists of intermediate products.<sup>21</sup>

<sup>17</sup> This term, used to refer to the "production-promoting services" of the government sector, is borrowed from Ingvar Ohlsson (*op. cit.*, p. 98). The NID also recognizes that intermediate government services could be considered as "subsidies in kind," a treatment which implies they should be eliminated from a market price measure of output (*National Income Supplement, 1954*, p. 39).

<sup>18</sup> *Income and Wealth*, Cambridge, Eng., Bowes and Bowes, Series I, 1951, p. 190.

<sup>19</sup> The method of valuing those services selected as intermediate must, of course, be consistent with the method of valuing government output as a whole. For example, if imputed interest on government-owned capital is included in government output, the amount of such interest which is attributable to the government's intermediate services must be excluded from final product.

<sup>20</sup> In the following discussion, we assume the desirability of using an output concept net of depreciation (see below, the section on domestic capital formation).

<sup>21</sup> Ideally, the value of the government sector ("government purchases of goods and services") in net output would be equal to the sum of purchases of goods and services from business, compensation of government employees, and imputed interest

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Net national product as measured by the sum of the four components listed above may be less than, equal to, or greater than national income as currently defined by the NID. In other words, it would be net national income as defined by the NID minus the intermediate services of government plus indirect business taxes.<sup>22</sup> It will be less than national income if the intermediate services of government are greater in value than the amount of indirect business taxes, and greater than national income if intermediate services of government to business are less than indirect business taxes. In the former case, it may be argued that consumers are being "overcharged" in relation to the costs of the products they buy. We may put it this way: their "surplus" from consuming the commodity is less than it would be if the indirect taxes merely covered the cost of the intermediate services. For the market price approach, however, this is an irrelevant consideration, regardless of the disposition of the extra revenue obtained from the taxes, since we do not need to know why market prices are what they are, nor do we attempt to take into account any change in "buyers' surplus" occasioned by a change in market prices. All that matters is that consumers have adjusted their purchases of goods so that market prices reflect the relative (marginal) worth of each good to them.

In the latter case (where intermediate services exceed indirect taxes), the implication is that the buyers of the goods on the private market are being subsidized, either from direct taxes or from government borrowing. Again, however, a consistent valuation on the basis of market prices requires that subsidies to private producers (whether in the form of money payments or *in natura*) should not be included in net output.

We conclude, therefore, that the third method discussed above is the one that is preferable. We believe that although the statistical problems it poses are considerable, they are no more insuperable than many others with which cost accountants deal constantly, and that an acceptable separation between intermediate and final product of government can be achieved. We would propose, then, that the Depart-

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on government-owned capital (net of depreciation), minus the share of each government intermediate service valued in the same fashion. In the discussion in this section we ignore government interest and follow the NID valuation of "government purchases" (see the discussion of government final product, below).

<sup>22</sup> We assume here that the indirect business taxes are taken net of subsidy payments, and ignore two minor items of adjustment between the NID net national product and national income—the statistical discrepancy (we assume that the measurement is from the product side) and business transfer payments. In addition, we suppose that capital consumption has been "correctly" measured. See below, the discussion of domestic capital formation.

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ment of Commerce or the National Bureau of Economic Research initiate studies in the separation of government intermediate from final product.

The proposal that the value of intermediate government services be deducted from the NID net national product is by no means new. The principle was stated by Gerhard Colm in Volume One of *Studies in Income and Wealth* (page 195), though he assumed that the intermediate services of government are financed by non-income taxes. We hold that this is an unnecessarily restrictive assumption. The same principle was later stated clearly by John Lindeman in Volume Six of *Studies in Income and Wealth*.<sup>23</sup> It was elaborated in a system of equations and accompanying text by Gottfried Haberler and Everett Hagen in Volume Eight of *Studies in Income and Wealth*.

4. A fourth way in which measurement of government product can be fitted into measurement of total output is not directly comparable with the three we have already discussed. This method consists of including government output in an evaluation of total output at factor cost.

Market prices are not the only possible means of evaluating total output. An alternative method is in terms of factor cost, which would modify market values for indirect taxes, subsidies, and, ideally at least, monopoly rents and the rents of completely specialized resources.<sup>24</sup> As noted above, intermediate government services can be viewed essentially as subsidies in kind to private business and should therefore be added to monetary subsidy payments to produce total subsidies. To obtain "realized" factor costs, we should deduct indirect taxes from the market value of final output and add all subsidies. Since intermediate government services are *already* included in the NID net national product, application of this rule gives us what is essentially the NID national income.<sup>25</sup> On this line of argument, then, national in-

<sup>23</sup> Lindeman does, however, express doubts similar to those of the NID concerning the practical possibility of separating intermediate from final services (see his discussion on pp. 17-18).

<sup>24</sup> In the ensuing discussion we shall restrict our attention to what Ohlsson terms "realized factor costs," i.e. market prices adjusted for indirect taxes and subsidies only, ignoring other sources of divergence between prices and marginal costs, (*op. cit.*, p. 99). The rationale of the factor cost (as contrasted with the market price) approach is, of course, the weighting of quantities by relative marginal rates of transformation between commodities, as measured by marginal costs. Although this measure is perhaps conceptually superior as a gauge of the productivity of resources, we believe the practical difficulties associated with a strict application of the factor cost method are so serious that a market price measure is a better "all purpose" valuation scheme.

<sup>25</sup> See, however, note 22 above.

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come produces a consistent measure of net output, valued at (realized) factor cost, which does not involve the double-counting of intermediate government services. Since the value of the latter has not been included in the value of private output, it must be counted separately under government production.

### *Measures of Final Product*

If the measure of final product proposed above is not calculated, or until such time as it is calculated, net national product as now defined is, we believe, a better measure of the nation's output than national income. We base this preference simply on the observation that the intermediate services of government tend to be a more stable proportion of the nation's output than indirect business taxes. This is, of course, a purely empirical, and not in the least conceptual, judgment.

Another choice among measures of final product is that between geographic and national product. In an economy like ours, the difference between the two is so small that this question has received little consideration. National product is the almost universally accepted measure. We believe, however, that geographic product will receive increasing consideration as international comparisons become ever more important. There are many countries from which a significant fraction of the income from domestic activities flows abroad, or to which income flows in significant amounts from activities located outside their borders. We recommend that relevant data be presented to show the difference between geographic and national product. It would be desirable, we believe, to enter gross geographic product as a separate line in the national income publications of the Department of Commerce.

### *National Product in Real Terms*

We doubt that much controversy still prevails concerning the appropriate method of deflation of the national product in a closed economy. The view, for example, that deflation by consumer prices indicates change in consumer purchasing power is probably not widely held at the present time. In a closed economy the conventional method, whereby the value of each final product is deflated by the price series for that product, or by the closest approximate substitute, obviously shows correctly the trend in the purchasing power or real product of the total economy. If the purchasing power of any sector of the economy is to be measured, then the income of that sector may well be deflated by a price series appropriate to the types of goods it buys, including of course the types it may expect to buy with its savings. If, for

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example, household savings were viewed entirely as deferred consumption, a consumers' price index would be appropriate for deflating disposable income of households.<sup>26</sup>

A problem of deflation does, however, arise when the economy is open. Change in internal prices without other change simply alters the distribution of income without any alteration in the total purchasing power of the economy. But change in the prices of exports or imports of an economy alters the distribution of income between this economy and the rest of the world (i.e. alters the real income of the economy).

It follows that when the values of all final products of an open economy are deflated by the appropriate price series, the deflated series does not truly show the trend in real income. The increase or decrease in real income arising from the alteration in the terms of an economy's trade with the rest of the world will have been deflated out. Within the limits of the difficulties caused by aggregation, the product series so deflated is relevant only if the purpose of deflation is to analyze the productivity of the economy. If, however, the goal is analysis of the purchasing power of the economy, the effect of alteration in the terms of trade should not be eliminated in the deflation of national product.

At times, this point is of some significance even for the United States, and it is of crucial importance for many smaller economies. It should therefore not be slurred over in the deflation process.

### *Components of Final Product*

#### DOMESTIC CAPITAL FORMATION

##### *Gross versus Net National Product*

We believe with many other economists that net national product is conceptually a more meaningful measure of output than gross national product. The latter includes a form of double counting, since the consumption of existing durable assets is included in the value of final products, while at the same time the value of newly produced assets necessary to offset the consumption of old assets is included in gross investment. The analogy of the treatment of "durable-use" goods to that for "single-use" goods, to borrow Hicks' terminology,<sup>27</sup> is complete if we take a period for the calculation of output which extends

<sup>26</sup> If consumers anticipate a change in prices before the period when they plan to buy goods, a complication is raised which we ignore here, and which it would be extremely difficult to deal with in practice.

<sup>27</sup> J. R. Hicks and A. G. Hart, *The Social Framework of the American Economy*, Oxford University Press, 1945, p. 34.

## THE PRODUCT SIDE

over the life of durable-use assets.<sup>28</sup> Further, the applicability of gross national product as a measure of short-run productive potential is subject to serious limitations. As the NID itself points out, "the use envisaged calls for estimation of the capital stock that is consumable in the short run, including the stock of business inventories as well as consumer and government held tangible assets; it cannot be served adequately by a fixed capital formation series defined on the gross basis used in the national income and product accounts."<sup>29</sup>

An alternative view of the usefulness of gross national product as compared with net national product, has been presented by Richard Ruggles.<sup>30</sup> This view is based on considerations of technological change. If capital consumption is interpreted as measuring the loss in productive capacity due to the deterioration of existing capital goods during a given year, this loss may be smaller than is usually calculated, or may even be nonexistent, since technical progress generally results in the replacement of old assets with more efficient ones. Suppose, for example, that an invention results in the scrapping of an old machine and its replacement by a new one (of the same cost) capable of doubling the output of the former.<sup>31</sup> In this case, no loss in productive capacity has occurred, and hence no deduction for depreciation over the life of the original machine would be justified. In fact, a deduction for capital consumption would result in an *understatement* of net output during the years in which the original machine was in use. As an even more extreme example, we might imagine the introduction of a new method which requires the use of no equipment but at the same time displaces an old machine, and which yields the same product without the machine but with the same quantity of other inputs as before. Again, the technical improvement has resulted in maintaining productive capacity intact, and no deduction for depreciation would be indicated. In short, in an economy characterized by unremitting technical change and ac-

<sup>28</sup> "In addition, the considerations dictating elimination of intermediate production to achieve output measures without duplication also call for the statement of fixed capital formation on a net basis, since, broadly viewed, capital outlays for replacement purposes are really a species of intermediate product" (*National Income Supplement, 1954*, p. 43).

<sup>29</sup> *Ibid.* Cf. also Carl S. Shoup, *Principles of National Income Analysis*, Houghton Mifflin, 1947, pp. 198-200.

<sup>30</sup> In discussions with the authors.

<sup>31</sup> In the ensuing discussion, it will be assumed that technical progress is, in some sense, foreseen, so that assets are written off over their economic (rather than their technical or physical) lives. Depreciation allowances used in arriving at net national product (as usually computed) would then contain a full allowance for obsolescence. If the obsolescence were not foreseen, there would be capital losses on existing assets irrelevant to the calculation of net output. This point is discussed further in the section on capital consumption.

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cretions to the body of accumulated knowledge, we can obtain larger and larger outputs from a given stock of resources (both human and physical), so that deduction of allowances for capital consumption results in a continuous understatement of net output. It should be noted that this argument does not apply merely to obsolescence allowances. Improvements resulting from technical change may be sufficient only to compensate for obsolescence allowances; on the other hand, they may make the deduction of any depreciation allowance, however computed, entirely unnecessary.<sup>32</sup>

The conclusion we believe can be drawn from the above argument is merely that less error is involved with gross national product as a measure of output than with net. This is not to say that gross national product itself gives a theoretically correct measure, for the value of the improvement factor in any year may be more or less than the year's capital consumption. In a sense, the gross measure represents an uneasy compromise between an understated net national product and an ideal measure of output which would include a full allowance for the improvement factor on the one hand, and would deduct for the capital consumption of existing assets (as usually computed) on the other.<sup>33</sup>

We shall analyze Ruggles' position first on the assumption that the technical improvements that are occurring are just sufficient to maintain productive capacity without replacement of existing capital, so that, accepting his logic, gross national product gives a correct measure of net output. The essence of Ruggles' argument is this: The purpose of deduction for depreciation is to record the value of the capital formation needed to maintain productive capacity. Since none is needed, no deduction is appropriate. The counter argument would run as follows: For each capital good taken separately, during the period to which the deduction applies, there has occurred a decline in productive capacity (of the capital good and cooperating inputs) and hence in capital value, i.e. in the present value of the future stream of income that the capital will yield. *Later*, an improved method of production is discovered. This increase in the productive capacity of a given quan-

<sup>32</sup> In an earlier version of this argument, Ruggles applied it only to the obsolescence element in depreciation (cf. his "Concepts, Sources and Methods of United States National Income Accounts," *Econometrica*, July 1952, pp. 469-470). This idea has also been expressed by other writers. Ohlsson, for example, urges the exclusion of obsolescence allowances from capital consumption in the computation of net output for the purpose of productivity comparisons (*op. cit.*, p. 182).

<sup>33</sup> This latter method is analogous to a possible treatment of exhaustible natural resources in the national accounts. The discovery value (over and above development costs, which are now included) of new resources would be included in gross investment in the year of discovery, and depletion equal to discovery value would be deducted over the life of the resource (see the section "depletion," below).

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tity of inputs is analogous to a capital gain, and should not be recorded as output. Or, if we look at the economy as a whole, in some parts of it gains from increased productivity are offsetting the capital depreciation that is occurring elsewhere. But these gains are not output, and should not be recorded in the output account.

To clarify the analysis, it is useful to consider the analytical model of a market economy in which no technical change is occurring. It is for such a model as this that the traditional method of treating capital formation and capital consumption in national income estimates can most easily be interpreted and understood. Since such an analytical model is not directly applicable to our constantly changing economy, uncertainty exists as to the proper method of handling such changes, and improvisation is required.

The problem may be put as follows: we are considering two models with differing parameters, representing two different sets of production functions, one set applicable before the technical change, one after it. But our measure of output must bridge the change. Should we adapt the pre-change model in anticipation of the post-change model, so that we make a smooth transition from the one to the other? Or should we preserve consistency in the pre-change model, then shift at the moment of the technological change to the post-change model, excluding from the measurement of output the increase in productive capacity resulting from the change in technology?

Ruggles would apparently have us take the former course. It seems to us that implicit in this course is a proposed redefinition of output. In the absence of technical change, the increase in productive capacity, by which depreciation is offset, is accomplished through the current output of capital goods. But in the case considered by Ruggles, although productive capacity is increased, it is achieved without output, in any sense in which the latter term is currently used, unless we redefine output to include all increases in productive capacity.<sup>34</sup> This latter possibility is analogous to the question of the inclusion of private capital gains in a measure of output, a topic which is analyzed in more detail in later sections of this paper.

We prefer the second alternative stated above. We base our disagreement with the first alternative on the belief that it is preferable to

<sup>34</sup> Of course, research and development costs will almost always be incurred in introducing an innovation, and, if capitalized rather than being charged to current expense, will be, and should be, included in current output as part of gross private investment. For purposes of simplifying the ensuing discussion, however, it is assumed that development costs associated with an innovation are zero (e.g. that we are considering new productive capacity in excess of that necessary to compensate for expenditure incurred).

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preserve the internal consistency of each of the pre-change and post-change models, and to avoid confusing a change in the structure of the model with the operation of the model. The choice between these two methods is not, of course, one of absolute logic, but rather of consistency, measurability, expediency, and usefulness. These latter qualities are basic to many important conceptual decisions in science, and the superiority of net national product in these respects is in our judgment a powerful and conclusive argument in its favor.

The choice between deduction or no deduction for depreciation affects not only the measure of output but also that of capital formation. Ruggles' proposed procedure involves either including in current output a component which is a new and additional category of final product, or including increases in productive capacity arising from technological advance in capital formation. The latter is presumably implied. The result, however, is hopeless confusion, as we shall now proceed to demonstrate.

We may illustrate the problem by assuming that as each capital good in use reaches the end of its serviceable life, a method is devised for maintaining the level of the output in which it was engaged, without use of any capital, so that no new capital formation whatever is necessary. Let us assume further that each such technique is devised by someone other than the owner of the machine. Ruggles would conclude that no depreciation should be charged throughout the period covered, since no replacement of capital was necessary. We conclude that depreciation should be charged throughout the useful life of the capital, and that while the net value added in production is greater after the new method of supplanting it is introduced, this constitutes no reason either for omitting depreciation for the capital good, or for capitalizing the value of the technique in calculating national product. (If the new technique is discovered unexpectedly before the machine is fully depreciated, a capital loss is experienced. This, however, should not be reflected in national income measurement. See the discussion of capital consumption allowances, below.)

Consider, first, those cases in which the improvement factor might be measured by the increase in the market value of intangible assets. As a simplified example, we might take a case in which tangible assets are replaced by (private) intangibles in the nation's balance sheets, thanks to an advance of technical knowledge subject to monopoly control (e.g. patents). Now let us return to a previous example: suppose a change in production technique permits the same output (previously produced with labor and machines) to be manufactured with the same man-hour input, but with no machinery requirement. If the distribu-

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tion of income between labor and property is unaffected (that is, if the marginal productivity of labor is unchanged), then, given the rate of discount, the market value of the invention will be equal to the value of the machinery that has been scrapped. Here, *both* productive capacity *and* the market value of assets have been maintained intact by technical progress, and there is no need, in Ruggles' view, to deduct depreciation on the now obsolete machines if we choose to exclude the market value of the patent from the measure of output in the year in which the invention is introduced. An alternative method of periodizing the output would be to deduct depreciation on the machinery over the latter's life (on the assumption that the obsolescence is foreseen), and to include the value of the patent in the year of introduction, as a measure of the improvement factor to be included in output.<sup>85</sup>

If, on the other hand, we suppose that the relative degree of monopoly power in the economy (as measured by relative monopoly income) is not affected by technical change, then (and we are still assuming no change in income distribution or interest rates) the market value of intangibles will increase in the same proportion as the value of tangible capital. Productive capacity (as measured by the ratio of tangible capital to output) and the market value of assets (which measures their discounted earning power) will change in the same proportion. For purposes of measuring the *trend* in net output, it makes no difference whether we take net national product, or whether we add to this aggregate the value of the improvement factor, as measured by the increase in the value of intangible assets. If we were to follow the latter approach (in either of the above two examples), we should, of course, have to decide whether or not capital gains are to be included in the measure of output (see the discussion under "depletion").

If, however, there is a change in income distribution resulting from technical progress, productive capacity and the market value of tangibles and intangibles will move at different rates. We should then be left with no way of quantifying the improvement factor. We might modify the extreme example used previously. Suppose the new technique was introduced under competitive conditions. In this case the marginal product of labor would be increased, and the consequent reduction in property incomes would result in a drop in capital values, with the decline in the value of the old machines (from obsolescence)

<sup>85</sup> In an economy with an increasing capital stock, the latter procedure would yield a higher net output. In either case, the "degree of monopoly" would, of course, be increasing over time.

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not being offset by an equivalent rise in the market value of intangibles.<sup>36</sup> As in the case cited previously, the society's productive potential has not been reduced, even though its stock of tangible capital has fallen. The value of the improvement factor cannot now, however, be measured by the change in intangibles. If we impute a value to the maintenance of productive capacity equal to the value of the old machines, we are in effect defining our (social) capital in terms of the previous ratio of capital to output. "Maintaining productive capacity intact" would then mean imputing a value for "capital" sufficient to keep the *average* productivity of capital constant.

But surely, this is an absurd alternative. It implies that we must impute any increase in our "productive capacity" (output per unit of input) to the value of our output and our capital. The concepts of capital and capital formation implicit in this approach would be useless for many—if not most—purposes, where we are concerned with measuring capital in terms of either its discounted earning power to the investor or of its reproduction cost. If the "average productivity" method is not accepted, it is hard to imagine how to devise any other kind of objective measure of this improvement factor that would provide us with a more meaningful measure of either output or capital than we now have. It would seem better to recognize that nonpatented improvements are essentially an addition to our supply of free goods (in the form of available knowledge) and should be treated the way we do other free goods, whose contributions to output are counted when they are utilized, but not when they are merely discovered. It seems worthwhile to preserve the convention of measuring only the things that are *scarce* in relation to demand, whether the scarcity is "natural" in some sense, or is merely a result of man-made institutions (e.g. patents). After we obtain our economic measures based on market values, we may then wish to supplement them by qualitative judgments outside the strict sphere of economic measurement.

We believe, therefore, that the fact of technological change is not in itself an adequate reason for preferring gross national product to net, and that the attempt to impute a value in the national accounts for technical improvements raises more difficulties than it resolves. For the purpose of measuring long-term changes in net output, the

<sup>36</sup> If there were *perfect* competition in the market for this product, the marginal product of labor would be equal to output per man-hour; property income would disappear; and capital values would fall to zero. While such an extreme capital-saving innovation as this would hardly be realistic, it does have the merit of bringing out certain problems in Ruggles' concept. Again, the obsolescence is assumed to be anticipated, so that capital losses will not be involved; the old machines will have been written off over their economic life.

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gross measure can be used as a substitute for the net only if capital consumption remains a constant proportion of the gross. Such a condition requires that the ratio of reproducible capital to output and the average life of capital assets do not change (or that changes in one are offset by changes in the other). The fact that capital consumption *has* remained approximately constant as a proportion of gross national product over the period for which the NID has been measuring output does not mean that this relationship has been characteristic of periods prior to 1929, or that it must hold for the future.<sup>37</sup>

We conclude, then, that for most purposes net national product is conceptually to be preferred to gross as a measure of total output. We would suggest, indeed, that the NID place more emphasis on the net measure in its publications. If, however, the net product is to be substituted for the gross in many uses, and if we are to have a workable measure of net capital formation, it is essential that the NID improve its present measures of capital consumption. This problem is the subject of the following discussion.

### *Capital Consumption Allowances*

Our suggestions for measuring capital consumption may be divided into three sections: periodizing, valuation, and coverage.<sup>38</sup>

1. PERIODIZING. For purposes of measuring net additions to the capital stock in terms either of the discounted earning power or of reproduction costs of assets, the most appropriate method of allocating the initial cost of an existing asset would be one which regularized the rate of return on an asset over its life. Such a method—equivalent to taking the change in the capital value of an asset between the two points of time for which the depreciation is to be measured, provided

<sup>37</sup> In NID estimates, capital consumption allowances fell as a percentage of gross national product from 8.3 per cent in 1929 to 7.0 per cent for the three postwar years 1948-1950. When nonfarm depreciation is recomputed on the basis of replacement costs (according to estimates of replacement cost depreciation made by one of the authors), however, the percentage of capital consumption allowances to gross national product has been remarkably stable at about 8½ per cent. Based on Goldsmith's estimates of replacement cost depreciation, capital consumption was 10.1 per cent of gross national product in 1929 and an average of 10.3 per cent for 1948-1949. The decline in the capital-output ratio since 1929 has been offset almost entirely by the fall in the average life of assets, the latter having been occasioned by the shift in the composition of the capital stock, from buildings to equipment. Kuznets' data, however, show an increase in the ratio of capital consumption to gross national product (when measured in current prices) from 1869 to 1929 (Simon Kuznets, *National Product since 1869*, NBER, 1946, p. 119).

<sup>38</sup> See Ohlsson (*op. cit.*, pp. 14-15) for a similar classification of problems relating to national accounting.

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that certain conditions are met<sup>39</sup>—may be termed the “decline in capital value” approach, or, to use the Lutz’s terminology, the “capitalization method.”<sup>40</sup>

The relation between depreciation computed by such a method and depreciation based on straight-line allocation depends on the internal rate of return on an asset, the time shape of its net receipts or revenue function, and the length of its life. If an asset’s net receipts were constant over its life, then the capitalization method would call for deducting a smaller amount of depreciation in its earlier years than in later years, the difference being greater, the greater the internal rate of return.<sup>41</sup> Working in the opposite direction is the fact that the yield (net of operating and maintenance costs) of many, if not most, assets declines with age, whether this decline is due to purely “physical” or aging factors, or to obsolescence.<sup>42</sup> In such a case, the depreciation deduction should be made larger in the earlier years, the faster the annual decline in the net receipts from the asset, since the capital value of the asset will fall more rapidly in these earlier years. Finally, the longer the life of an asset, the more closely will capitalization approach straight-line depreciation.

Whether or not the straight-line method of periodizing an asset’s

<sup>39</sup> The conditions are as follows: (1) The asset must be valued on the basis of the same set of expectations; otherwise, capital gains or losses will be included in the depreciation allowance. (2) The rate of discount used in computing the change in the capital value of the asset must be equivalent to the internal rate of return or profit (i.e. that rate which equates the present value of the asset’s future receipts to its initial cost), not some external rate of interest. Use of the latter rate (where there is a difference) will mean depreciating the “goodwill” of the asset, and deducting more than its initial cost over its life. For a discussion of these problems, see Friedrich and Vera Lutz, *The Theory of Investment of the Firm*, Princeton University Press, 1951, pp. 219-224, and J. R. Hicks, “Maintaining Capital Intact: A Further Suggestion,” *Economica*, May 1942, pp. 174-179.

<sup>40</sup> Lutz and Lutz, *op. cit.* Terborgh uses the term, “amortization-of-value” approach, to refer to an identical depreciation standard (George Terborgh, *Realistic Depreciation Policy*, Machinery and Allied Products Institute, 1954, pp. 25-27).

<sup>41</sup> Cf. Solomon Fabricant, *Capital Consumption and Adjustment*, NBER, 1938, pp. 15-16. “If output is constant, depreciation charges should rise, the rate of rise depending on the rate of discount implicit in the original capital value.” For a comment on the views of Edward F. Denison, who has criticized the position taken by Fabricant, see below, note 56.

<sup>42</sup> By physical factors we mean those elements which would produce a decline in yields even in a static society. For example, the units of service an asset is capable of rendering, or its physical productivity per unit of service, may decline with age; or maintenance of the asset’s gross productivity may require larger and larger amounts of operating or repair and maintenance inputs with time (on the assumption that repair and maintenance outlays are charged to current expense). Obsolescence, on the other hand, results from changes in the prices of the asset’s output, or changes in the prices of substitute or cooperating inputs (whether these are classified as operating or as maintenance). Technical change is perhaps the most important, although not the only, source of obsolescence.

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cost is a reasonably close approximation to the decline in capital value method, for the average of all assets, is essentially an empirical, rather than a theoretical, question.<sup>43</sup> Terborgh's evidence on resale values of used equipment indicates that the decline of value with age is faster than that shown by straight-line amortization.<sup>44</sup> We believe that the question of periodizing is sufficiently important to the measurement of capital consumption to warrant further investigations along these lines, either by the NID or by other interested workers.

The periodizing method is important for two reasons. First, the capitalization method, insofar as it gives a correct measure of net national product, obviates some of the difficulties related to the rather arbitrary exclusion of all repair and maintenance outlays from gross capital formation, and hence gross national product. Since this method would take into account the timing of repair outlays and the manner in which they are charged, the net measure would not be materially affected by the exclusion of repair and maintenance from gross national product. While the latter may be invariant to the measure of capital consumption allowances, it is unfortunately not invariant to the effects of changes in outlays for maintenance and repairs, as has been pointed out by Shoup.<sup>45</sup> This is one more reason for preferring net national product (provided capital consumption is correctly measured).<sup>46</sup>

Second, the conditions which must be fulfilled if the periodizing formula is not to affect aggregate depreciation allowances are so unrealistic that they are of little interest.<sup>47</sup> When the capital stock and

<sup>43</sup> It is, of course, possible to specify the values of the parameters which will make the results of the two methods identical. If, for example, we assume—as does Terborgh—that the net receipts function is linear, so that the net receipts ( $b$ ) decline by an equal dollar amount per year ( $a$ ), then, denoting the internal rate of return by  $r$  and the length of the asset's life by  $k$ , we find that the two methods will give equivalent results if

$$\frac{a}{b} = \frac{r}{1 + rk}$$

For other types of net receipts functions the solution is less neat. A full discussion of the theoretical aspects of this approach is obviously beyond the scope of this paper.

<sup>44</sup> For eight types of equipment, he finds that resale value declines by an average of two-thirds in the first half of average life (Terborgh, *op. cit.*, pp. 42-45).

<sup>45</sup> Shoup, *op. cit.*, pp. 200-205.

<sup>46</sup> If, on the other hand, emphasis continues to be placed by the NID on gross national product, consideration might well be given to including repair and maintenance outlays in gross private domestic investment and hence gross national product.

<sup>47</sup> The most important are a uniform age distribution of assets and no change in the capital stock. Some type of "equilibrium adjustment" must also be assumed;

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gross investment are subject to growth, a formula which deducts more than the "correct" amount in the early years of an asset's life will lead to an overstatement of depreciation, and hence to an understatement of net capital formation; the opposite applies when net capital formation is negative.<sup>48</sup> This point is recognized by the NID in connection with capital outlays charged to current expense.<sup>49</sup> The effect of the periodizing formula on the size of capital consumption allowances is of immediate practical importance if the NID continues to rely on book values for a substantial part of its depreciation estimates. With the provision in the new tax law for more rapid write-offs of assets, subsequent depreciation figures obtained from tax returns will hardly be comparable with figures presented for earlier years, particularly when temporary "changeover" effects are considered. The rather legalistic attitude that the NID has taken in this matter in the past is not encouraging; for example, it followed whatever changes Congress chose to make concerning the assumed useful life of assets certified as necessary for national defense.<sup>50</sup>

The new tax law may be regarded as a further argument for abandoning book values entirely in the attempt to measure capital consumption for national accounts.<sup>51</sup> We believe that consideration might well be given to building up separate estimates from data on national wealth, annual gross purchases of assets, estimates of useful life, and prices, combined with the selection of a periodizing formula consistent

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a changeover from one depreciation method to another (where old assets are depreciated in accordance with the old plan) will affect the size of the depreciation deduction during the transition period.

<sup>48</sup> The current importance of such considerations can be gauged by the fact that from 1947 to 1953 gross fixed investment in constant dollars was increasing at an average annual rate of 4 per cent.

<sup>49</sup> "In a stationary economy, capital outlays charged to current expense would, for business as a whole, approximate the charges for depreciation which would have been made for these items had they been capitalized instead of expensed. In a situation in which net capital formation occurs, the entry will overstate actual depreciation; when capital formation falls below replacement needs, it will fall short of an adequate capital consumption allowance for the type of equipment involved" (*National Income Supplement, 1954*, p. 42). Since the NID does not depend on book figures for these estimates, one suspects that a more adequate periodizing formula than immediate write-off for these items could be used. Estimates of this component have been materially reduced in the 1954 statistical revision.

<sup>50</sup> Cf. *National Income Supplement, 1954*, pp. 150-151. The net result was to overstate depreciation in war years and to understate it in postwar years.

<sup>51</sup> The effective abandonment of book values does not necessarily require the suppression of accounting depreciation charges as now reported in the accounts. A correction factor, analogous to the inventory valuation adjustment, could be introduced. Our suggestions for such a correction factor are somewhat broader than the term "depreciation valuation adjustment" would imply, since we would correct for errors in periodizing and coverage, as well as in valuation.

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with evidence on the rate of decline of asset values.<sup>52</sup> This procedure is now followed in estimating depreciation on farm property and residential real estate (which account for over one-third of aggregate depreciation charges). Further, as is noted in the section below on valuation, the NID has already made a start in this direction for producers' durable equipment.<sup>53</sup> We recommend that these procedures be extended.

2. VALUATION. Despite the rather thorny problems encountered in the attempt to convert estimates of capital consumption from original to current costs, we believe that the NID should give a high priority to this task. Nonfarm depreciation charges, which constitute over two-thirds of all capital consumption allowances, continue to be based on original rather than on replacement costs. It is now almost universally agreed that all depreciation must be based on the current replacement or reproduction costs of assets, if a total is to be derived that will be comparable to the estimates of gross fixed capital formation, which are given in terms of current prices. While this same point is made by people in the NID itself, they justify their current procedure on the basis of both conceptual and statistical difficulties involved in estimating net capital formation.<sup>54</sup>

Let us consider first the conceptual issues, among which perhaps the most controversial is that posed by technical change. If, as was argued earlier, we abandon the idea that depreciation allowances are designed to measure "replacement requirements" or the loss in the productive capacity of assets in some physical sense, changes in the quality of capital goods or in the techniques of producing them present less serious problems for the adjustment of original to current costs. What we want to measure is the cost of producing yesterday's machine with yesterday's technique at today's factor prices; a measure of changes in factor costs of producing equipment should be sufficient for this purpose.<sup>55</sup>

<sup>52</sup> It might, of course, turn out that straight-line allocation is a sufficiently close approximation to the correct formula. A similar suggestion for discarding book values is made by L. R. Klein ("National Income and Product of the United States, 1929-1950," *American Economic Review*, March 1953, p. 121). Other studies, such as Terborgh's, have made progress in this direction.

<sup>53</sup> Raymond Nassimbene and Donald G. Wooden, "Producers' Durable Equipment—Growth, Replacement, and Stock," *Survey of Current Business*, June 1953, pp. 12-16, 24; and "Growth of Business Capital Equipment, 1929-53," *Survey of Current Business*, December 1954, pp. 18-26.

<sup>54</sup> *National Income Supplement, 1954*, p. 43. This statement is quoted in part in note 81 below.

<sup>55</sup> This statement is based on the assumption that the periodizing formula and the estimate of useful life, on which depreciation charges are based, already take

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The NID appears to take a different view of the problem:

"Over the long run, price indexes tend to overstate effective price increases and understate price decreases because they do not take full account of the improvements in the quality of the product the prices of which they measure. In the instance of producers' durables, quality improvements are, generally speaking, taken into account to the extent that they are reflected in increased costs of producing the equipment; generally speaking, no account is taken of quality improvements which are not reflected in increased costs.

"Quality improvements are of particular importance in the case of producers' durables, where technological progress is especially prominent. Depreciation charges converted to a current dollar basis tend therefore to be overstated; the indicated amount of producers' durable equipment that is required for replacement purposes is too high; and the amount representing net investment is too low."<sup>56</sup>

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into account anticipated obsolescence. We are abstracting at this point from unanticipated obsolescence, a matter which is considered further in the section dealing with coverage.

<sup>56</sup> Nassimbene and Wooden, "Producers' Durable Equipment—Growth, Replacement, and Stock," p. 13. A similar passage appears in their "Growth of Business Capital Equipment, 1929-53," p. 20. On the other hand, the treatment of quality change implied in the above quotation is rejected by Edward F. Denison in a highly important paper, "Theoretical Aspects of Quality Change, Capital Consumption, and Net Capital Formation" (*Problems in Capital Formation: Concepts, Measurements, and Controlling Factors*, Studies in Income and Wealth, Volume Nineteen, Princeton University Press for NBER, 1957). This paper, which contains a penetrating analysis of many of the issues raised in our paper, unfortunately came to our attention only after our paper was completed. While the views expressed in Denison's paper cannot be interpreted as necessarily reflecting the position of the Office of Business Economics, it is encouraging indeed to note the similarity between many of his conclusions and ours on the topic of capital consumption and capital formation. Thus, we agree that the measurement of capital by cost of production is useful and important in its own right, that the impossibility of reflecting quality change in price indexes used for deflation of capital formation and capital consumption is irrelevant to the cost method of valuing capital, and that the productive capacity method of measuring capital, in terms of a given capital-output ratio, produces uninteresting and even absurd results. Denison's discussion of his third method of measuring the capital stock, in terms of "the contribution of capital to production," is illuminating in its exposure of the difficulties involved in any definition of maintaining the capital stock which runs in terms of the ability "to maintain the future production of the economy at a constant level." While we would be more emphatic than is Denison in rejecting this method, there seems to be agreement on the futility of any effort to incorporate changes in productivity into the measurement of capital itself, whether or not these changes can be attributed, in some sense or other, to capital.

With respect to the periodizing of capital consumption, Denison rejects discount-

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This statement would seem to be subject to two possible interpretations: either it implies that obsolescence resulting from technical change is in general not foreseen, so that the purpose of deflation is to remove allowance for capital losses from depreciation allowances, or it invokes the productive capacity or "replacement requirements" concept of capital consumption which was criticized in an earlier section. If obsolescence is generally foreseen, we believe that the measure of capital consumption which is appropriate for the national accounts is not overstated if quality improvements fail to be reflected in the price indexes which are used to convert original to current costs; if it is not foreseen, then indexes that fail to take account of quality improvements will, in the absence of any other adjustment of depreciation charges, overstate depreciation by the amount of capital losses.

These propositions can be clarified by considering a simplified example involving discontinuous obsolescence. Suppose a firm purchasing a \$1,000 machine which will last ten years anticipates correctly at the time of its purchase that five years hence an invention will reduce to \$500 the cost (at given factor prices) of producing an identical machine. Under competitive conditions, the firm will have to anticipate writing off the purchase price with sufficient rapidity over the first half of the machine's life that its book value will be equal to its (approximate) capital value of \$250 at the end of five years.<sup>57</sup> In the remaining five years, the firm's annual depreciation charge would be \$50, as contrasted with \$150 for the first five years. If it is now proposed to deflate the \$50 charge by the 50 per cent decline in the price of the machine, the obsolescence will have been allowed for twice: once in the depreciation formula and again in the deflation procedure. Only if the obsolescence were unanticipated and the firm were depreciating the asset at an annual rate of \$100 for the entire ten-year period would

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ing as relevant to the time allocation of depreciation, largely because of his belief that the proper allocation method requires that the ratio of the annual net yield of an asset (i.e. its net receipts minus depreciation, or what Denison calls "capital output") to its annual depreciation charge be a constant throughout the asset's life. Our periodizing method, on the other hand, would keep the rate of profit (the ratio of net yield to net capital value) a constant over the life of the asset. The choice between these two methods cannot be explored here; in part, it would depend on whether annual capital input is more appropriately measured by capital consumption or by an index of the capital stock.

Relatively minor differences are apparent in our respective treatments of anticipated obsolescence and will not be commented on here. A brief reference to Denison's position on unanticipated obsolescence is contained in note 63.

<sup>57</sup> We say "approximate," because the use of straight-line allocation does not necessarily give the correct capital value of the machine at any point of time. This assumption has been made merely for purposes of simplicity.

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it be correct to deflate the depreciation allowance for the price reduction during the second half of the asset's life.

Precisely the same argument applies if the technical change manifests itself in an improvement in the quality of a piece of equipment rather than in a reduction of its price. Suppose, in the above example, that the improvement results in doubling the productive capacity of an equivalent machine at the end of five years, with no change in its price. Again, under competitive conditions, the capital value of the old machine at the end of five years will be (approximately) \$250. If the improvement is foreseen, the firm's depreciation charge will be \$150 in the first five years and \$50 in the second; no modification of these charges is therefore necessary to account for the quality improvement. If it is not correctly anticipated, then the doubling of productive capacity could be treated as equivalent to a 50 per cent decline in the price of machines, and the annual depreciation charge would be correctly shown during the second five years as \$50.<sup>58</sup>

It is true that if obsolescence is to be considered as in any sense foreseen, it is more properly viewed as a gradual or continuous process than as a discontinuous event, as we assumed in our example. But the argument is not materially altered if the improvements in quality or reductions in cost are treated as occurring continuously over time.<sup>59</sup>

<sup>58</sup> By Ruggles' argument discussed above in the section on gross versus net national product, a depreciation charge of only \$50 per year would be recorded during the first five years as well, since at the end of five years, after the quality improvement, the capital value of the machine will be only \$250 less than that of a new machine.

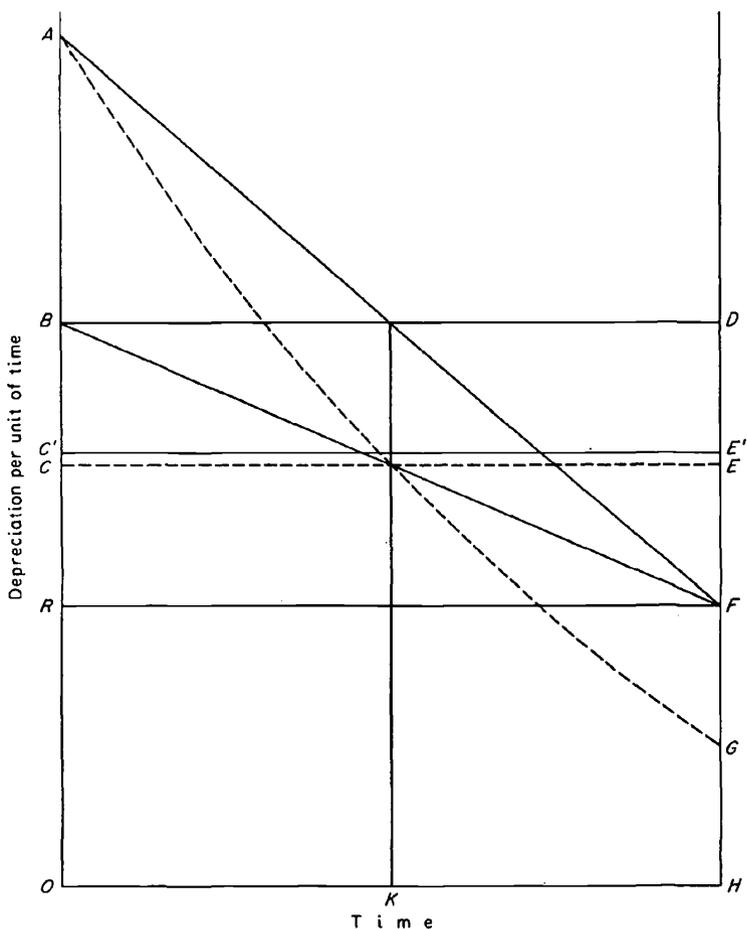
<sup>59</sup> A formal example of the case in which obsolescence occurs continuously over time is illustrated in the following diagram. It represents an asset with a life of  $H$  "years" (time being measured continuously) and with an original cost (assumed to be equal to its initial capital value) of  $OBDH$  ( $= OAFH$ ). In the absence of obsolescence its capital value is assumed to decline by equal amounts per unit of time. Both the capitalization and straight-line methods of depreciation in the absence of obsolescence are therefore given by function  $BD$ .

Suppose now the asset is subject to continuous obsolescence over its life from the competition of newly produced, but physically identical, assets whose cost falls through time because of technical change in producing assets, factor prices being constant. (The obsolescence could also be thought of as raising the productive capacity of new assets over time, but with no change in their cost of production.) The cost of equivalent new assets is assumed to fall by a constant amount per unit of time; by time  $K$  ( $= \frac{1}{2}H$ ), replacement cost has fallen by 25 per cent, and by time  $H$ , by 50 per cent. The curve  $AF$  then shows the resulting change in the capital value of the asset per unit of time, given the assumed rate of obsolescence.

For the case in which the firm foresees correctly the course of obsolescence and uses the capitalization method of depreciation, the correct depreciation charge through time (for both the firm and the national income estimator) is given by the function  $AF$ . If this charge is deflated by the continuous fall in the price of new assets, the "annual" depreciation charge would be shown by curve  $AG$ . Over the asset's life, total depreciation charges would be equal to  $OC'E'H$  (defined to be

## THE PRODUCT SIDE

We conclude, then, that if obsolescence can be viewed by and large as foreseen, technical progress and quality improvements do not present as serious obstacles to the introduction of a "depreciation valua-



equal to  $OAGH$ ), and  $BC'DE'$  ( $= AFG$ ) would be treated incorrectly as a capital loss.

For the case in which the obsolescence is not anticipated, the firm would depreciate the asset according to the function  $BD$ . Deflation of the "annual" charge  $OB$  by the price decline will give  $BF$  as the depreciation function. The total depreciation charge would then be shown correctly as  $OCEH$  ( $= OBFH$ ); that part of the purchase price of the asset represented by  $BCDE$  would be treated as a capital loss due to unanticipated obsolescence. The preferable way to periodize  $OCEH$  (ignoring the area  $CEC'E'$ , which is small) would, however, be by function  $AG$  rather than by  $BF$ .

Suppose next that the firm anticipates the course of the obsolescence, but arbitrarily chooses to allocate depreciation by the function  $BD$ . If the NID were to

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tion adjustment" as the NID seems to believe.<sup>60</sup> Such an interpretation of obsolescence is, we think, a fairly close approximation to the facts.

Instead of revaluing depreciation allowances in terms of indexes of the reproduction costs of capital assets, which we consider the proper procedure, it is often suggested that an index of changes in the general price level should be employed. While this might be legitimate for some purposes, it would be inappropriate for national income estimates where we are concerned with a measure of current production. It would in effect include in net output the real value of realized gains and losses on assets, if asset prices did not change in the same proportion as other prices. If, for example, asset prices were to rise relative to the general price level, the real value of assets would be increased. To value depreciation on the basis of the general price change would be to include in net capital formation that fraction of the real gain which has been realized by the turnover of assets in the period in question.

As Klein has suggested, the statistical problems involved in converting original cost depreciation to current cost, although difficult, are not insuperable; even rough estimates of the current magnitude may be preferable to precise estimates of an incorrect or irrelevant one. For residential real estate, where depreciation is not derived from account-

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abandon book values and estimate depreciation directly, it should select function *AF*. If it continues to rely on book values for depreciation, it should use *BD* rather than *BF*; for the entire period *OH*, the latter method incorrectly treats *BCDE* as a capital loss. With a constant capital stock and a proper age distribution of assets, *BD* will give the proper aggregate depreciation deduction for all assets; with a growing capital stock, *BD* will involve less understatement of depreciation than *BF*.

Finally, the "replacement requirements" criterion would mean, as we interpret it, that a total of only *ORFH* ( $= \frac{1}{2}OBDF$ ) over time *OH* should be deducted, since at time *H* the same productive capacity can be obtained for half the cost (or double the productive capacity for the same cost). It can be seen that this "constant productive capacity" criterion is not achieved by deflation of annual depreciation charges by the fall in asset prices (i.e. functions *AG* or *BF*). It is also evident that this method fails to maintain the earning power of even that part of the asset's value which is not treated as a capital loss (from unanticipated obsolescence). We do not attempt to show how the "replacement requirements" sum should be periodized. Further, there may be other possible meanings which can be attached to the term "replacement requirements." If full replacement of earning power is meant, then the *AF* function is indicated.

<sup>60</sup> That such problems as these have delayed the introduction of an adjustment of this sort is suggested in the following remarks: "The depreciation valuation adjustment would in principle be a desirable addition to national income accounting. Lack of comprehensive data for a sufficiently long period as well as a desire to explore further the problem of quality change and the other problems in estimating depreciation that have been noted, have prevented its introduction so far." (Nassimbene and Wooden, "Producers' Durable Equipment—Growth, Replacement, and Stock," p. 14.)

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ing records, the estimates could be prepared equally well in terms of replacement costs.<sup>61</sup> The NID has already made an excellent start in preparing estimates of replacement cost depreciation of producers' durable equipment, although these estimates have yet to be extended and incorporated into the accounts.<sup>62</sup> The major area still to be explored is nonfarm, nonresidential construction.

3. **COVERAGE.** The principal issue in the coverage of capital consumption allowances concerns the treatment of capital gains and losses on reproducible assets resulting from changes in expectations. Such gains and losses should, we believe, be excluded from the national accounts wherever possible.

As we have already indicated, we hold that losses associated with unanticipated obsolescence are irrelevant to the determination of net output and should not be included in depreciation charges.<sup>63</sup> Such losses may arise either because the economic life of an asset has been overestimated and it must be scrapped prematurely, or because the net receipts from the asset during its economic life have been overestimated.<sup>64</sup> The real problem is to eliminate these losses from the data, since they will undoubtedly be included in book values. It was argued previously that the use of price indexes, reflecting the effect of quality

<sup>61</sup> Klein, *op. cit.*, p. 121.

<sup>62</sup> See the previously cited articles by Nassimbene and Wooden.

<sup>63</sup> We recognize, of course, that a reasonable case can be made for their inclusion. It is, after all, impossible to eliminate the results of *all* errors from the accounts, which remain essentially *ex post* measures regardless of how we try to modify them on the basis of *ex ante* considerations. The actual treatment of single-use goods in the accounts stands in marked contrast to our proposed treatment of gains and losses on durable-use goods. Suppose, for example, that a retailer purchases certain fashion goods which go out of style before they can be sold, and is forced to sell these for less than he anticipated on their purchase. In effect, the retailer has taken a capital loss, and, if the treatment is to be consistent with that of durable-use goods, business profits should be adjusted upward in the national accounts by the amount by which the value of the inventory has to be written down. If our period for measuring output were sufficiently long, we might have fewer qualms in including unanticipated obsolescence of durable-use goods.

Our suggested treatment corresponds with that of Fabricant, who distinguishes between capital consumption and capital adjustment and includes unanticipated obsolescence in the latter (Fabricant, *op. cit.*, pp. 14, 99, and 110). Denison, on the other hand, in the paper cited in note 63, argues for the identity of gross capital formation and capital consumption over the full life of a group of capital goods, on the grounds we have sketched out in the preceding paragraph. Since it is difficult to believe that business men do not allow for the risk of even unusual obsolescence, the practical difference in treatment is likely to be small, although the conceptual difference between Denison and us remains.

<sup>64</sup> As was pointed out above, the use by an enterprise of an incorrect depreciation formula is not necessarily evidence that obsolescence has not been foreseen (cf. p. 256, and note 59).

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improvements, to convert from original to current cost would not solve the problem, since such a procedure would take out all obsolescence, whether anticipated or not. If book values are abandoned and reliance is placed on independent ex post data on asset life, the latter may well include the effect of premature scrapping. Independent investigations on the extent to which firms fail to allow adequately for obsolescence are certainly warranted. While this is a matter of empirical judgment, we are of the opinion that capital losses from unanticipated obsolescence probably constitute but a small part of all depreciation charges.

The problem of treating gains and losses on capital assets is even more acute with respect to fluctuations in output. Indeed one of the major justifications for the use (for short periods) of gross in preference to net national product is the cyclical inflexibility of depreciation allowances, which leads to an understatement of the net product in periods of lowered output. If fluctuations in output are anticipated, then the capitalization method of depreciation referred to above would allocate a smaller amount, or even nothing, to years in which output (and hence gross property income) was low. If the change in output is *not* anticipated, then capital losses have occurred which are irrelevant to the determination of current net output. Even if one took the position—and we do not—that the results of these past errors in purchasing assets should be included in depreciation, they are properly allocable over the assets' ex post lives and should not fall primarily on years of depressed output when the errors are realized. There is an element of absurdity in the cyclical behavior of capital consumption allowances, which rose from somewhat over 8 per cent of gross national product in 1929 to an average of 13 per cent for 1932 and 1933, according to NID data.<sup>65</sup>

We would suggest, therefore, that the periodizing formula be modified to take account of variations in output. If such fluctuations are not foreseen, then depreciation allowances might be determined on the basis of some "normal" level of output, with reductions in these allowances being made in accordance with reductions in output.<sup>66</sup> Full recovery of the acquisition costs of assets would not necessarily be implied.<sup>67</sup>

<sup>65</sup> Part, but certainly not all, of this increase is due to the measurement of depreciation at original rather than replacement cost.

<sup>66</sup> This is by no means a new proposal. It is quite similar, for example, to the service unit method of periodizing depreciation used by Fabricant (*op. cit.*).

<sup>67</sup> If capital losses resulting from unanticipated obsolescence and unanticipated fluctuations in output are excluded from depreciation charges in the derivation of net national product, it would be desirable to show the decline in asset values from these sources in a separate table. The information provided by such a "capital ad-

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### *Depletion*

In its 1947 revision, the NID discontinued its former practice of including depletion allowances in capital consumption allowances, "since the value of new discoveries of natural resources is not counted as part of gross capital formation, or of profits in the year of discovery, and consequently deduction of a capital consumption charge for impairment of the stock of natural resources would be inappropriate."<sup>68</sup> We may ask at this point whether such a view of depletion should not be reconsidered. This question may be divided into two parts: (1) should depletion be included in capital consumption even if discovery value is omitted from gross investment, and (2) should both discovery value and depletion be included in the national accounts?

With respect to the first question, if we are to take net national product as a measure of net output or production, there is no need to deduct depletion from gross national product in order to avoid the double counting of items included in the output of previous years and currently being used up to produce this year's output (the usual rationale for deduction of depreciation), since discovery value has not been included in former years. If any one exhaustible resource is considered by itself, the problem becomes merely one of periodizing the net income from the resource. Over its life (i.e. from just before its discovery until its exhaustion) we may either count the discovery value of the resource in the initial year and deduct depletion equal to discovery value over its lifetime, or we may exclude discovery value from the output of the first year and count the entire value added to current production in succeeding years, without deducting depletion. For if we insist on deducting depletion over the life of the resources without counting discovery value, we will have understated net output, in either a productivity or a welfare sense.

The preceding argument is concerned with the measurement of net output over the life of any particular exhaustible resource discovered in some past period. It may be contended, however, that failure to measure past output correctly (by omitting discovery value when made) should not be permitted to distort the current measure of output, which should be "net" of the amount required to compensate for the decline in the value of the particular resource. This is true, but it does not lead to deduction of an allowance for depletion without at the same

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justment account" would make it possible for the user to obtain figures on net investment adjusted for such losses. Such data would be useful in estimating changes in the capital stock resulting from sources other than current production.

<sup>68</sup> *National Income Supplement, 1947*, p. 12.

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time recording discovery value in excess of the costs of exploration and discovery, for this procedure would continuously understate the amount of output available for current use without reduction in the stock of exhaustible resources.<sup>69</sup> If new resources whose values exceed their discovery costs are currently being found, it does not make much difference whether both discovery value and current depletion are recorded, or only the difference between them. If current discoveries are equal in value to current depletion, the present procedure of counting neither will give a correct measure of net output.

Depletion of exhaustible resources should be included in capital consumption, then, only if discovery value is included in gross investment. The proper treatment of discovery value itself depends largely on the handling of capital gains and losses in the national accounts. Discovery value is more nearly analogous to the revaluation of an existing asset to accord with a change in our knowledge, than to production (i.e. the use of human and physical resources to create new goods and services). It is similar to the revaluation, say, of urban land sites after an influx of population or the development there of new industries, or the revaluation of farm land associated with the introduction of some new type of crop. While it may be legitimate to argue that the latter examples represent revisions of our information as to the present and future productivity of already known resources, and do not reflect the discovery of new resources, the distinction would seem to be of little use as a basis of selecting particular kinds of capital gains for inclusion in the national accounts.

The objection may be raised that factor activity has been associated with "creating" the discovery value, which is analagous to value created by production. This argument has rather far-reaching implications: it would require the inclusion of all gains associated with factor activity—increases in land value which exceed the cost of installation of a new irrigation system, increases in intangibles (patents) in excess of research and development costs, and the like. It may be argued that gains of this sort (as distinguished from those revaluations which occur even in the absence of productive activity) should be singled out for special treatment. But this argument cuts across the narrower question of a

<sup>69</sup> If it is maintained that by and large discovery value has not been in excess of investment and development costs in the past, no problem exists. Capital consumption allowances as currently calculated are quite sufficient to cover the "depletion" of these development costs. Insofar as development costs are charged to current expense rather than capitalized, gross national product will be understated in any case, and net will be understated if our stock of resources (valued at cost) is growing. The NID avoids the former understatement for oil- and gas-well drilling by including these costs in new construction, but not the latter understatement, since these outlays are included in capital consumption allowances (see note 49, above).

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separate treatment of the discovery value of exhaustible resources. We believe the objectives of national income measurement are best served if capital gains and losses, whether construed widely or narrowly, continue to be excluded from net national product.<sup>70</sup> And we hold further that in order to attain consistent results it will be necessary to treat depletion as a capital loss if discovery value (in excess of development cost) is treated as a capital gain. This is the present position of the Department, with which we concur.

### CONSUMPTION

We have only a few comments to make concerning certain aspects of the NID treatment of consumption.

The dividing line between consumption and investment, which places residential housing in the latter category and other durables purchased by consumers in the former, is generally accepted as the least unreasonable, although difficult borderline problems are involved when one considers equipment installed in homes (heating equipment, automatic dishwashers, garbage disposals, and so on).

While the classification of consumer expenditures into durable and nondurable goods is based on a three-year criterion, the standard is not, and perhaps cannot be, applied consistently. Clothing, for example, is considered as nondurable, despite the significant differences in durability as between, say, fur coats and nylon stockings. It is difficult to see, on common sense grounds, why shoes and clothing should be treated as nondurables, whereas tires and tubes and automobile parts and accessories are classified as durables.

When we turn to the distinction between commodities on the one hand and services on the other, we are at a loss to determine what conceptual standard is being invoked. A potted plant is a commodity; a pet is not. Transportation tips are a service; restaurant tips are not. Newspapers are a commodity; amusement programs are not. The facetious suggestion of one economist that "if it's neither solid nor liquid, it's a service" breaks down in the case of water (as a household utility). The "packaged or portable" rule for a commodity leaves purchased meals outside the pale. The old tangibility criterion is simply not applicable.

This criticism is more than a quibble over borderline cases, or over cases in which the separation (e.g. veterinarian services and purchases

<sup>70</sup> While we believe that capital gains should continue to be excluded from the NID aggregative measures, such as net national product, national income, and disposable income, the inclusion of supplementary information on such gains in an additional table would undoubtedly prove valuable to many users in adapting the NID income and product concepts to their particular requirements.

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of pets) is statistically impractical. It is worth asking: What purpose is such a distinction supposed to serve? Thus electricity, gas, fuel oil, and coal are more nearly alike in terms of the uses to which they are put by consumers than any "tangibility" criterion would imply. We believe that the commodity-services distinction is sufficiently arbitrary and of sufficiently little use that it might well be abandoned.<sup>71</sup>

On the other hand, the durability distinction, although somewhat arbitrary in application, is clearly a useful one, particularly for an understanding of cyclical variations in consumer spending. Since postponability of purchase is an important analytic consideration, the durability classification might well be further subdivided, e.g. less than one year, one to four years, five years or more.

Perhaps the most useful classification of consumption expenditures is that by type of product (the NID Table 30). Unless the data were considered too unreliable for the detailed product classes presented in the *National Income Supplement, 1951*, we believe that consolidation of these classes in the *National Income Supplement, 1954*, was unwise.

Interest payments on personal debt are still included in consumption, even though government interest payments were eliminated from the measures of output in the 1947 revision. It is difficult to understand what definition of production is implied by the inclusion of the former.<sup>72</sup> Output is created by the use of real resources—human or physical; interest, on the other hand, is merely a transfer or redistribution item among households, or between households and firms, and no productive services are furnished by the lender to the borrower for which interest is a payment.<sup>73</sup>

If the lender is presumed to be doing the borrower some special kind of favor by abstaining from spending, why do we not count *all* interest in output? The answer is obvious: it is *already* included in the

<sup>71</sup> Jaszi has suggested that the commodity-service distinction can be based on whether the item can be inventoried. If this basis is selected, it must first be decided whether the reference is to the consumer or to the seller (e.g. ice can be inventoried by one, but not the other). If, as seems most reasonable, the consumer is selected, the degree to which "pantry stocks" can be accumulated depends on their perishability. Restaurant meals and a substantial part of food purchases, for example, should presumably be classified as "services" on this count. Perhaps the use of the term "service" should be avoided, in view of its other connotations, if this criterion is to be applied.

<sup>72</sup> In its decision to exclude government interest, the NID quoted the belief of most writers in the field, "that interest on (government) debt does not represent currently produced goods and services or the current use of economic resources" (*National Income Supplement, 1947*, p. 11).

<sup>73</sup> This is certainly not a new position. It has been ably presented by Rolph (*op. cit.*, pp. 332-340), by Shoup (*op. cit.*, pp. 105-106), and by Ohlsson (*op. cit.*, pp. 161-162).

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earnings of some real resource. Mortgage interest is excluded because it represents a part of the value of rental services created by a dwelling. Similarly, the value of interest on loans used by a worker to raise his productive ability (e.g. for education) is already included in his additional earnings. And there is something absurd about including interest on brokers' loans, when the borrower is in fact merely paying over a part of his dividends received from the purchase of stocks that the loan enabled him to make.

It may be thought that interest payments on loans used to purchase consumer durables stand in a different class. In fact, however, this difference arises merely because we do not choose to count in consumer expenditure the value of the services rendered by the existing stock of consumer durable goods. If this is the purpose of the consumer interest item, it would be more appropriate to attempt a measure of the value of such services by direct imputation. As matters now stand, net national product is subject to arbitrary changes arising from variations in the proportions of durables purchased which are financed by consumer credit.<sup>74</sup> We believe consideration should be given to eliminating interest payments from consumer expenditure.

One confusing treatment in the NID Table 30 ought to be mentioned. "Expenditures in the United States by foreigners" are deducted from foreign travel and remittances to yield a figure for "foreign travel and remittances—net." The first-mentioned item is designed to correct for a statistical overstatement of *all* categories of domestic consumption, since sales to visiting foreigners cannot be readily eliminated from each of the product categories. It should therefore be deducted at the end of the table from the total of consumption expenditures, and not from any one category.

## GOVERNMENT SERVICES

The treatment of government services in the NID accounts is less satisfactory, in our judgment, than that of any other component of gross national product. Services intermediate to private production are included along with final services; government production is valued at labor cost alone, without provision for the services contributed by gov-

<sup>74</sup> Our purpose here is not to recommend the inclusion of imputed income from consumer durables, but merely to point up the inconsistent treatment of interest payments between the business and household sectors. Interest payments by businesses are in effect treated as transfers by the NID; interest payments by households, however, are added to total output. In our opinion, there is little to be gained at this point by the inclusion of imputed interest on household stocks, in view of the difficult statistical problems that would be encountered. Government assets are a different matter.

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ernment-owned assets; no segregation is made between capital formation and consumption; and expenditures are not classified by use or type of product, except for the distinction between "national security" and "other." Problems involved in the treatment of the government sector have been exhaustively—one might almost say exhaustingly—discussed in the literature;<sup>75</sup> our purpose here is merely to suggest several changes which would, we believe, make the treatment of the government component more meaningful and useful.

When government services are valued in terms of factor costs, these costs must include the services of government-owned capital as well as labor services, even if the value of capital services must be imputed. Government interest payments cannot be used for this purpose, in view of the absence of any relation between the amount of government capital and the amount of debt.<sup>76</sup> What is required is a separate and direct estimate of the value of government-owned assets, to which can be applied a rate of return which would give us the imputed value of such services. Assets would, of course, have to be classified on the basis of whether their services are intermediate or final; only the latter should be included in gross national product.<sup>77</sup>

The possibility of such an imputation is viewed pessimistically by the NID:

"An imputation for government-owned property is not made in the national income accounts for the United States because the conceptual and statistical bases for making a realistic and useful imputation are absent. . . . In the case of the government, no . . . market-based information to establish the rental value of the vast bulk of government structures and equipment is, or can be, available. . . . In the absence of a realistic market evaluation of the rental value of government property, its net return would have to

<sup>75</sup> In addition to discussions in the earlier volumes of *Studies in Income and Wealth*, the papers by Kuznets and Ohlsson, in *Income and Wealth* (International Association for Research in Income and Wealth), Series I and III, respectively, and Gerhard Colm's paper in *Problems in the International Comparison of Economic Accounts* (Studies in Income and Wealth, Volume Twenty, Princeton University Press for NBER, 1957) can be cited also.

<sup>76</sup> It is suggested by some writers that state and local debts have been contracted largely to finance public improvements and can therefore be used as a measure of capital at these levels. This expedient was put forward originally by Gerhard Colm (in "Public Revenue and Public Expenditure," *Studies in Income and Wealth, Volume One*), who has since modified his position (in his paper referred to in the previous note). In the absence of independent estimates of the value of such improvements, there is no way of knowing how close the approximation would be.

<sup>77</sup> This statement assumes a market-price valuation of privately produced output. If the latter were to be valued at factor cost, the imputed value of the services of all government assets should be included in total output.

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be derived by estimating the total value of government real capital assets, segregating the part which is deemed to be in productive use, and then applying to the latter a rate of return to reflect the value added by the property. Clearly, each of these steps would be highly speculative, and a measure of imputed return useful in realistic analysis would not be likely to result.<sup>78</sup>

While we agree that substantial statistical difficulties would be involved in such an effort, we believe that a beginning could be made at those levels and in those areas in which the estimating problems would be easiest, e.g. assets owned by state and local governments (schools, roads, hospitals, office buildings, fire stations), and that such items as military equipment and installations could be put aside, at least temporarily.

We recognize that the assignment of an interest rate for the imputation of the value of the services of government property is conceptually difficult. There is no reason to assume that either the average or the long-term rate on government debt is the appropriate one. In some degree, the selection of a rate or rates would be arbitrary. However, neither this problem nor the related one of absence of a market valuation of capital value seems to us an adequate reason for excluding the services of government capital from the accounts. We do not believe that the most reasonable value that can be assigned to this uncertain magnitude is zero;<sup>79</sup> in this case, "some adjustment is better than no adjustment."<sup>80</sup> In particular, a zero value for the services of government capital will lead to an understatement in the growth of output when government production is increasing in relative importance.

Our suggestions for a more adequate valuation of government production clearly require the setting up of a government capital account. In order to be able to estimate capital services over time, we need to know the annual net additions to the stock of government-owned assets; this in turn necessitates information on annual gross purchases of assets by government and on depreciation of the existing stock. A dis-

<sup>78</sup> *National Income Supplement, 1954*, p. 54.

<sup>79</sup> The present NID procedure of excluding the net value of the services of government-owned assets from the accounts implies a zero value for such services only for gross national product. Since depreciation of government capital is not deducted in obtaining the current measure of net national product, the NID method implies in effect that the net value of such services is equal to government depreciation, if we interpret net national product as net of *all* capital consumption, public and private.

<sup>80</sup> Ohlsson, *op. cit.*, p. 196. In commenting on the passage we have quoted above, Ohlsson states, "such arguments . . . may be valid for questioning the results but not for making them better through exclusion."

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tion, in the government component, between gross capital formation and consumption would not only facilitate the estimation of the services of government capital but would be interesting and useful in itself. Estimates of new public construction are now presented in the NID Table 31; estimates of durables and equipment purchased by government, together with data on changes in government commodity stocks, would complete the job. The derivation of figures on net government capital formation would have to await the preparation of estimates of government depreciation. In this respect, however, we should be no worse off than we are now with respect to private net capital formation.<sup>81</sup>

In contrast to the breakdown used for the consumption and investment components, which is based largely on type of product, the government component is classified by type of user (i.e. level of government), with a further distinction at the federal level between "national security" and "other." Other classifications are needed. As the accounts now stand, for example, it is impossible to determine the proportion of output which is devoted to many types of end uses or products, e.g. education or health (both public and private). We have already recommended above that capital formation be separated from consumption. With respect to the latter, we suggest that a further distinction be made between those final services of government which are furnished free to consumers (e.g. education, health, recreation, and so forth) and government services which are collectively consumed. The latter would include those activities which do not directly benefit any individual or group, but rather are necessary to maintain the social framework; they might be called "regrettable necessities." Government services to consumers might well be classified along the lines now used for personal consumption expenditures in the NID Table 30. We would then have such classes as health and medical care, transportation (services of roads and highways), recreation (e.g. libraries, museums, parks), education, welfare activities, perhaps even a "personal business" category for such things as state employment services. Collective consumption or "regrettable necessities" might be separated into civilian (certain legislative, administrative, and judicial functions, police protection) and military (army, navy, and air force). The type of system we have

<sup>81</sup> "While from the standpoint of accounting consistency these allowances [for capital consumption on private capital] are appropriate for inclusion on the debit side of the business account—business profits are calculated as a residual consistent with them—they do not measure capital consumption on the current price basis which underlies the values shown for fixed capital formation on the credit side, and hence cannot be used to obtain a measure of net capital formation in current prices" (*National Income Supplement, 1954*, p. 43).

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in mind can be summarized conveniently in the following government production account:<sup>82</sup>

GOVERNMENT PRODUCTION ACCOUNT	
<i>Debits</i>	<i>Credits</i>
1. Net purchases of goods and services from business and abroad <span style="float: right;">xxx</span>	1. Intermediate services to business (production-promoting services) <span style="float: right;">xxx</span>
2. Compensation of government employees <span style="float: right;">xxx</span>	2. Final services to consumers (consumption-promoting services) <span style="float: right;">xxx</span>
3. Imputed value of services of government owned assets <span style="float: right;">xxx</span>	Health and medical care <span style="float: right;">xx</span> Transportation <span style="float: right;">xx</span> Recreation <span style="float: right;">xx</span> Education <span style="float: right;">xx</span> Welfare activities <span style="float: right;">xx</span> Other <span style="float: right;">xx</span>
4. Depreciation of government assets <span style="float: right;">xxx</span>	3. Collective services <span style="float: right;">xxx</span>
	Civilian <span style="float: right;">xx</span> Military <span style="float: right;">xx</span>
	4. Gross capital formation <span style="float: right;">xxx</span>
	New construction <span style="float: right;">xx</span> Durables and equipment <span style="float: right;">xx</span> Change in inventories <span style="float: right;">xx</span>
<hr style="width: 100%;"/> Charges against government product <span style="float: right;">xxx</span>	<hr style="width: 100%;"/> Government gross product <span style="float: right;">xxx</span>

In this system, the government component of gross national product (on the expenditure side) would be composed of items 2, 3, and 4 on the credit side. To obtain net from gross national product, item 4 on the debit side would be deducted. Such a scheme as this might reduce the tendency of textbook writers to classify the expenditure side for government in terms which are relevant only to the income side (for example, purchases from business plus compensation of employees).

We recognize that our proposed treatment of the government component is many years away. Nevertheless, it seems desirable to be clear about our goals, so that progress toward them can be made in time to come.

### NET FOREIGN INVESTMENT

We begin our discussion of this topic with a terminological suggestion. The term "net foreign investment" fails to indicate whether the reference is to net investment abroad by United States residents, or net

<sup>82</sup> In a sense, it is both a production and a consumption account. Since it does not include government enterprises, no sales to other sectors (business, household, foreign) are shown. The terms "consumption-promoting services" and "production-promoting services" are taken from Ohlsson (*op. cit.*, pp. 21-22).

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investment in the United States by the rest of the world. If the concept is to be retained, we suggest that it be retitled "net investment abroad."

We would, however, suggest that the concept be eliminated from the NID basic tables, and that a reconciliation with balance-of-payments tables be shown in a subsidiary table. This netness is appropriate in some balance-of-payments analyses, but it is not appropriate in the general analysis of national income. In the production process, imports are not usually related to exports. Netting the one against the other tends to obscure the relative importance of the "rest of the world" component or, in other words, to conceal some important facts concerning the sources and destination of United States final product—information which is of importance to many users.

The data on "net foreign investment" as given in the basic tables do not include a distinction between exports and imports of goods and services on the one hand, and international factor payments on the other.<sup>83</sup> As a consequence, gross geographic or domestic product, a concept that we believe to be just as important as gross national product, is not shown. In view of the increasing international importance of this aggregate, we regard its presentation as essential. We therefore suggest abandonment of the net foreign investment component and substitution of the components as presented in the summary table which follows. This table contains a new total to which we have given the name "gross available product"; it is equal to the total of domestically produced final products before deducting imports. Such an aggregate would be useful for comparisons with the value of exports and imports.

We would suggest also two related changes. Remittances abroad by individuals should be shown, not as a component of consumption, but as a transfer payment. Further, government unilateral transfers should be excluded from government expenditures for goods and services. The two are not necessarily associated, and we believe the present treatment is both conceptually and empirically undesirable. The result of the change would be to increase "exports of goods and services" insofar as government unilateral transfers abroad are associated with exports, and to decrease "imports of goods and services" insofar as they are not.<sup>84</sup>

### SUMMARY OF CHANGES PROPOSED

The major changes which we propose in the structure of the ex-

<sup>83</sup> In this connection, it should be noted that the magnitude of factor incomes paid to, or those paid from, the United States economy is not shown in any of the NID tables. Only the difference between the two flows is given. These data should be presented in the NID Table 11, which already shows purchases and sales on a gross basis.

<sup>84</sup> Concerning the desirability of these changes, see Klein, *op. cit.*, p. 124.

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penditures side of the gross product account are indicated in the dummy tabulation below:

### *Measures and Components of Gross Product*

Personal consumption expenditures		xxx
Durable goods	xx	
Nondurable goods and services	xx	
Gross private domestic investment		xxx
New construction	xx	
Producers durable equipment	xx	
Change in business inventories	xx	
Government expenditures and investment		xxx
Consumption-promoting services	xx	
Collective services	xx	
Gross government investment	xx	
Exports of goods and services		xxx
		<hr/>
Gross available product		xxxx
Less, imports of goods and services		xxx
		<hr/>
Gross geographic or domestic product		xxxx
Factor incomes earned abroad	xxx	
Less, factor incomes originating in this economy accruing to abroad	xxx	
		<hr/>
Net factor earnings from abroad		xxx
		<hr/>
Gross national product		xxxx

### *Conclusion*

We do not present these suggestions for change as criticisms of the present performance of the NID. We appreciate that in many cases there would be difficulties, both statistical and other, in making some of the changes we have proposed, and we do not doubt that in respect to some of our suggestions there would be obstacles of which we are not aware. But we hold that in the evolution of the use of national income data the time has come for certain innovations which will involve no difficulty, that other changes should be made now even though they will be difficult to carry out, and that successive steps should be taken toward making still other improvements in the future. We hope that the changes we propose—if they stand the test of critical discussion—will have been made when this Conference again considers critiques of national income concepts and data, ten years from now.