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# The Nonfarm Business Inventory Component

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MEASUREMENT OF THE BUSINESS INVENTORY component of national wealth raises many problems, among which those relating to the 'book' value of inventories can be distinguished from those concerned with the deflation of book values.<sup>1</sup> Attention is directed in this paper to the former: the definition of inventories; the scope of the cost elements in the inventory valuation; and the significance of, and ambiguities arising from, the various costing procedures in general use. Estimates of both the book value and the deflated value of nonfarm business inventories are presented for 1929, 1939, and 1946. The source materials used in preparing the inventory estimates are described with special emphasis on the reasons for estimating the corporate and noncorporate sectors separately. The problems involved in deflating the book value of inventories for changes in the unit cost of goods in stock between inventory dates are merely touched upon.<sup>2</sup>

The inventory aggregates presented in Table 1 are part of the series used in estimating the change in nonfarm business inventories and the inventory adjustment in the national income and product totals of the Department of Commerce.<sup>3</sup>

<sup>1</sup> In a national balance sheet the year-end 'book' value of business inventories is a fairly close approximation, as wealth estimates go, to 'current value' because most inventory components, unlike the majority of tangible assets measured in a wealth estimate, are replaced many times a year and the inventory costing procedures in general use, as explained in Section B2, are such as to yield a fairly current price-level valuation.

<sup>2</sup> The basic problem of inventory deflation is discussed fully by Simon Kuznets in his *Commodity Flow and Capital Formation* (NBER, 1938) and by Solomon Fabricant in *Studies in Income and Wealth, Volume One* (NBER, 1937).

<sup>3</sup> The relation between the inventory aggregates and the inventory increments in the national income and product estimates may be explained briefly. Total business inventories were compiled at successive points in time as a first step in computing the current value of the net change in business inventories, a component of gross private domestic investment in gross national product.

The necessity of deriving the net physical change in business inventories from aggregate book values for successive periods, however, gives rise to the cumbersome task of disentangling the portion of the change in the book value due to the physical increase or decrease in the quantity of goods stored from the portion due to the change in unit prices. To accomplish this end, the book values of the beginning and ending inventories of each period were deflated, industry by industry, to constant (1939) prices. The year-to-year net change in

Table 1  
 Book Value of Year-end Nonfarm Business Inventories,  
 1929, 1939, 1946  
 (millions of dollars)

	Mfg.	Trade	Mfg. & trade	Mining & quarrying	Public util. <sup>a</sup>	Finance, in- surance, & real estate <sup>a</sup>	Other <sup>b</sup>	Total
<b>CURRENT PRICES</b>								
<i>1929</i>								
Corporate	12,720	5,991	18,711	702	1,175	699	714	22,001
Noncorp.	531	5,410	5,941	89	...	...	396	6,426
Total	13,251	11,401	24,652	791	1,175	699	1,110	28,427
<i>1939</i>								
Corporate	11,129	5,260	16,389	323	723	45	519	17,999
Noncorp.	387	3,522	3,909	33	...	...	203	4,145
Total	11,516	8,782	20,298	356	723	45	722	22,144
<i>1946, prelim.</i>								
Corporate	23,630	10,860	34,490	344	1,439	70	1,204	37,547
Noncorp.	781	6,722	7,503	47	...	...	562	8,112
Total	24,411	17,582	41,993	391	1,439	70	1,766	45,659
<b>1939 AVERAGE PRICES</b>								
<i>1929</i>								
Corporate	10,944	5,073	16,017	596	1,177	608	602	19,000
Noncorp.	435	4,661	5,096	76	...	...	370	5,542
Total	11,379	9,734	21,113	672	1,177	608	972	24,542
<i>1939</i>								
Corporate	10,832	5,085	15,917	313	714	44	510	17,498
Noncorp.	367	3,416	3,783	32	...	...	200	4,015
Total	11,199	8,501	19,700	345	714	44	710	21,513
<i>1946, prelim.</i>								
Corporate	15,919	6,469	22,388	242	998	43	700	24,371
Noncorp.	457	4,095	4,552	33	...	...	352	4,937
Total	16,376	10,564	26,940	275	998	43	1,052	29,308

<sup>a</sup> No data available for noncorporate holdings, which are believed to be small.

<sup>b</sup> Chiefly construction and service industries.

## A SCOPE OF THE ESTIMATES

Business inventories cannot be precisely defined. Instead such common-knowledge terms as 'merchandise', 'finished goods', 'goods in process', 'raw materials', and 'supplies' must serve inventories in constant prices was then revalued in terms of the average current prices for the period under consideration, yielding the measure desired for inclusion in gross national product. ('Change in business inventories' as it appears in the published gross national product tables includes farm inventories, which are not covered in this paper.) The difference between the change in the book value of the terminal inventories of each period and the current value of the physical change in inventories, as derived above, appears as an adjusting entry, 'inventory valuation adjustment', in national income.

to suggest their content.<sup>4</sup> In general, the goods and materials represented by these terms are characterized by the fact that they are destined for sale in the normal course of business or for use in the productive process, and by their relatively high rates of turnover. The former characteristic distinguishes business inventories from personal inventories; the latter distinguishes many types of supplies conventionally classified as 'inventory' from capital assets, which, of course, are also 'used in the productive process'.

Whatever the formal definition of inventory, the basic sources upon which we are dependent for estimates of business inventories measure the aggregate of commodities classified as 'inventories' by the business community itself. While the main body of the inventory account is relatively unambiguous, the scope of the assets included at the periphery varies with the accounting practice. The variety of accounting treatment is notable in the case of many miscellaneous small assets such as replacement parts, dies, patterns, small tools, containers, and office supplies.

Miscellaneous assets of this type pose two major difficulties for the estimator of national wealth. The one is largely a matter of classification, the other of omission. These assets may be classified on the balance sheet as part of plant and equipment, inventories, or deferred charges. To the extent that they are classified as inventories or as capital equipment they will be included in an over-all wealth estimate based on balance sheet data, though their distribution between these two accounts may be unknown. To the extent that they are classified as deferred charges it will be necessary, in using the substantive

<sup>4</sup> *Accountants' Handbook*, W. A. Paton, ed. (Ronald Press, 1943, 3d ed.), p. 517, for example, cites the following definition from Montgomery, *Auditing Theory and Practice*: "In general, merchandise bought for resale, finished and partly finished goods manufactured for sale . . . and materials and supplies purchased for use in production constitute a concern's inventory."

Strictly speaking, materials and supplies used in production need not be purchased. Many vertically integrated companies produce much of their own raw material. See also 'Accounting Research Bulletin 29: Inventory Pricing', Committee on Accounting Procedure, American Institute of Accountants, *Journal of Accountancy*, Sept. 1947.

approach to the measurement of national wealth, to include a portion of this account (i.e., the real assets as distinguished from paper claims) to ensure full coverage.

The second problem is that miscellaneous small assets are not only variously classified on the balance sheet but also in many cases are omitted altogether. For example, when supplies are issued they are commonly treated as expended items, that is, transferred from the asset account (on the balance sheet) to the expense account (on the profit and loss statement). At any given time, however, a considerable volume of issued supplies may be on hand. These items are in the anomalous position of being fully written off in financial terms but not fully consumed or used up. Moreover, many firms do not maintain supply accounts but charge their expenditures for such items to current operating expense; in this case the unissued as well as the issued supplies are 'omitted' from the balance sheet. Therefore to cover this category of 'omitted' supplies in a national wealth estimate it will be necessary to go beyond the scope of ordinary commercial balance sheets.

The content of the inventory account varies also with the type of industry, occasionally embracing assets not ordinarily associated with 'inventories'. In the film industry, for example, inventories consist mainly of the production costs incurred to date on films in process and on films completed but not yet released; the residual costs of films released, i.e., the difference between the total cost of each film and the amortization accrued from the date it is generally released; and the costs of screen rights to books, plays, and scenarios. Since films are rented, not sold, the cost of film production is amortized against the rental income in accordance with a weekly table, established for tax purposes with the approval of the Bureau of Internal Revenue. The book value of these inventories in recent years has been roughly a quarter of a billion dollars. Dealers in securities afford another unusual example. Until 1936 the Bureau of Internal Revenue classified the securities held by stock and bond brokers as inventories. These inventories, which amounted in 1929 to approximately \$300 mil-

lion, have been omitted from our estimates on the ground that they represent claims to assets, not real assets.

Two additional points relating to the scope of the inventory estimates should be noted. (a) The fact that certain production may be 'in process' does not necessarily mean that it will appear in the inventory account. For example, in the case of large scale projects such as buildings, roads, and battleships, which involve large sums of money and are produced under specific contracts rather than for the open market, it is fairly common practice to set up separate asset accounts for the unbilled charges incurred and to treat them, in effect, as accounts receivable.<sup>5</sup> A similar procedure was followed during the war in the case of work done under 'cost plus fixed percentage' contracts. Since partly completed assets of this nature are not covered in inventories, they may be missed in the substantive approach to the national wealth estimate unless special provision is made to include them.

(b) Goods in transit present an especially difficult problem. Bureau of Internal Revenue regulations indicate that they should be included in the inventory of the concern that holds title to them.<sup>6</sup> The problem of precisely when title passes, however, has many obscure ramifications which lead ultimately into the law of contracts. Many accountants, therefore, do not recognize goods in transit until they have been received. Hence, as of any given date a considerable volume of goods is in a statistical limbo: they have been eliminated from the inventories of the seller but not yet added to the inventories of the buyer. Apparently, the precise manner in which the buyer handles goods in transit is not of great concern to the Bureau of Internal Revenue. For if goods in transit are added to the

<sup>5</sup> On small construction jobs, however, the practice is quite varied and whether a partly finished structure is classified as inventory or as a receivable may depend upon whether the contractor is paid in stages as the work progresses or is paid upon completion of the job; see *Accountants' Handbook*, p. 398.

<sup>6</sup> Bureau of Internal Revenue regulations or practices are referred to frequently because data reported to it by business concerns on income tax returns are the main source underlying our estimates; see Section C for a discussion of source materials.

acquisitions of the current year, they must be subtracted from the year-end inventory, so that the cost of goods sold will be the same with or without goods in transit and therefore will not affect the taxable income.

According to balance sheet information in *Moody's Industrials* many large corporations do show a separate 'goods in transit' category for inventories; but there is no way of ascertaining how complete the coverage is. Furthermore, there is some presumption that a substantial, if not the major, portion of the reported in-transit inventories reflects the movement of commodities between subsidiary plants of parent corporations rather than between independent buyers and sellers. Corporations with subsidiaries can more readily account for goods in transit and are inclined to do so in order to have more comprehensive financial reports and better management controls. In the absence of further data, we can merely note the probability of considerable omission on this score.

A rough computation suggests that the average value of goods in transit via rail alone amounted to approximately three-quarters of a billion dollars in 1939. This computation is based upon (a) an Interstate Commerce Commission estimate which places the value of commodities transported on Class I steam railways in the United States during 1939 at \$40,042,370,000; <sup>7</sup> (b) the assumption that the average freight haul, including loading and unloading time, lasts about seven days (suggested by data from the Interstate Commerce Commission, Cost Section). While the basis for corresponding approximations to the value of goods in transit via other modes of transport is not readily available, the estimate for railroads clearly indicates the substantial magnitude of the combined total.

## B THE GENERAL PROBLEM OF VALUATION

Accountants make two basic pricing determinations that affect the book valuation of inventories. The first relates to the scope

<sup>7</sup> *Freight Revenue and Value of Commodities Transported*, Statement 4045, File 18-C-23, Oct. 1940 (mimeographed release).

of the cost elements to be included in the inventory account. To what extent should inventory values reflect indirect or overhead costs as well as direct costs? The second relates to the costing procedures used to charge goods to cost of sales and to inventories respectively, and fixes the period to which the prices reflected by the inventory book values pertain.

### 1 *Scope of the Cost Elements Included in the Inventory Account*

In general, accountants tend to distinguish between direct costs, notably material and labor costs, which may readily be related to the flow of goods through the concern and are therefore reflected in the inventory account; and indirect costs or 'burden', which cannot be readily related to the product flow. Obviously, the policies concerning the cost elements to be included in the inventory account represent a primary allocation that will affect the book valuation of inventories at any given time.

Theoretically, it would seem that for purposes of a wealth estimate the valuation of business inventories should take into account all the expenses of bringing the goods in inventory to their present stage of production. Thus the value of the ending inventory should reflect a pro rata share of all costs incurred during the accounting period except those uniquely related to the selling function, i.e., that are for services rendered after the goods leave inventory.

In most industries, however, it is almost impossible to trace adequately the complete cost history of each commodity. The complexity of industrial processes together with the enormous diversification of final products introduce cost allocation problems for which there are no definitive solutions. This is not to say, of course, that cost allocations are not made, but rather that they are made in accordance with widely divergent principles and accounting practices.

The diversity of prevailing accounting procedures is clearly recognized in the Bureau of Internal Revenue regulations concerning inventories for income tax purposes. The regulations

are so broadly drawn that they must be looked upon more as a statement of recommended procedures than as a precise body of definitions that must be adhered to. This point of view is clearly noted in *Regulations 111*, Sec. 29. 22 (c)-2; "Section 22 (c) provides two tests to which each inventory must conform: (1) It must conform as nearly as may be to the best accounting practice in the trade or business, and, (2) It must clearly reflect the income. It follows, therefore, that inventory rules cannot be uniform but must give effect to trade customs which come within the scope of the best accounting practice in the particular trade or business. In order clearly to reflect income, the inventory practice of a taxpayer should be consistent from year to year, and a greater weight is to be given to consistency than to any particular method of inventorying or basis of valuation so long as the method or basis used is substantially in accord with these regulations."

This introductory section to the regulations on the valuation of inventories seems to suggest that each type of business generally follows a standard practice, whereas, in fact, numerous accounting procedures and rule of thumb methods are employed. The *Accountants' Handbook* (p. 221) reports recent surveys as showing "a wide variation in cost accounting methods, with a lack of any method worth mentioning in many of the smaller companies. As might be expected, the greatest variation in methods occurs in connection with the computation of overhead. Rates varying from 50 percent to 500 percent of direct labor have been reported for individual concerns in the same industry, with a large part of the range obviously due to variation in methods of computation rather than to differences in conditions."

In view of these considerations, the costs represented in the book value of inventories tend to be extremely heterogeneous and may involve a significant understatement of the true costs of production. It is impossible to determine the extent to which each major type of cost is included in the book value of inventories in the summary compilations. The range, however, appears to be from virtually complete exclusion in the

case of interest, profits, and many types of general administrative expense (the limits of which are very ambiguous) to almost complete inclusion in the case of such costs as raw materials and direct labor. Between these two extremes ranges the broad array of costs subsumed under 'burden'.

Since the scope of the cost elements in the book valuation of inventories may vary from concern to concern, the aggregate value for the business sector of the economy can be defined only obliquely as the sum of all costs that do not happen to be deducted from current revenues (or set up as deferred charges). The understatement of 'true' inventory costs has long been debated. The essence of the present argument has been well stated in an article in the *Journal of Accountancy* for October 1941 by William A. Paton, editor of the *Accountants' Handbook*:

" . . . what are the limits of the area of charges which may reasonably be funneled through the inventory? . . . At one extreme is the view that only the net invoice cost of merchandise or materials, plus the direct costs of production in the case of conversion or manufacturing, are inventoriable. At the other extreme is the broad interpretation of operating charges, which considers virtually all costs necessarily incurred in the activity of the enterprise as attaching . . . to the stream of tangible goods flowing through the business, from the raw-material stage to that of finished product ready for consignment to customers. From this point of view all classes of burden or overhead costs, including so-called 'general' and 'administrative' charges, are factors in the measurement of the cost of inventories at any time that activity is viewed as momentarily arrested; the president's salary, for example, is no less inventoriable, than the wages of a workman operating a lathe in the plant . . .

. . . the amount of the periodic inventory may be greatly affected by the general policy adopted with regard to the kinds or classes of costs considered to be inventoriable; the committee on accounting procedures and accountants generally will do well to keep this fact in mind in dealing with those phases of the inventory problem which have been most actively discussed in recent years. To spar endlessly over pricing alternatives which involve, say, a 10 percent

variation in total, and entirely ignore an area of policy which may easily mean a variation of 50 percent in the final determination smacks of the lack of sense of proportion of which auditors have often been accused."

While the precise proportion of the costs not included in the book value of inventories is unknown, some inferences concerning its size may be drawn from the data on total deductions from current revenue in *Statistics of Income for 1939*, Part 2 (see Table 2). Since the book value of inventories tends by and large to include only the elements of costs that are classified as 'cost of goods sold' (and, in the Bureau of Internal Revenue tabulations, 'cost of operations'), the remaining array of costs will give some indication of the nature and relative size of the excluded costs. The following statement from *Statistics of Income* (Part 2, p. 17) is pertinent to the interpretation of Table 2 (and indirectly emphasizes the diversity of accounting practices).

"'Cost of goods sold' and 'Cost of operations' include taxes, depreciation, and salaries and wages, only to the extent that these

Table 2  
Summary of Deductions from Total Compiled Receipts of  
Corporations, 1939  
(billions of dollars)

	All in- dustries	Mfg.	Trade
Total compiled deductions	125.7	54.7	41.9
Cost of goods sold	77.3	41.2	32.9
Cost of operations	11.1	0.6	0.5
Compensation of officers	2.7	1.0	0.8
Rent paid on business property	1.6	0.3	0.7
Repairs	1.1	0.7	0.1
Bad debts	0.7	0.2	0.2
Interest paid	2.8	0.3	0.1
Taxes paid	4.0	1.6	0.4
Contributions or gifts	*	*	*
Depreciation	3.4	1.4	0.3
Depletion	0.4	0.2	*
Net capital loss	0.1	*	*
Net loss, sales of property other than capital assets	0.2	*	*
Other deductions	20.2	7.0	5.9
Cost of goods sold & of operations	88.4	41.8	33.4
All other deductions	37.3	12.9	8.5

*Statistics of Income for 1939*, Part 2, Table 3.

\* Less than \$0.05.

deductions are reported as part of such costs. Amounts of these items which may be allocable to 'Cost of goods sold' or to 'Cost of operations' but which are reported elsewhere on the returns are tabulated in the appropriate deduction items in the cases of 'Taxes paid', 'Depreciation', and 'Depletion', and in 'Other deductions' in the case of salaries and wages. If other deduction items, such as 'Rents paid', 'Interest paid' and 'Compensation of officers' are definitely shown in 'Cost of goods sold' and 'Cost of operations', adjustment is made, and such items are transferred to their appropriate classifications."

According to the Bureau of Internal Revenue, the reallocation of 'rents paid', 'interest paid', and 'compensation of officers' from the cost of goods sold and the cost of operations to the appropriate deduction classification is made in relatively few cases and is very minor quantitatively. An important point the Bureau stresses in this connection is that it is concerned less with the formal content of the statistical tabulations (though it is constantly taking steps to improve the character of the data) than with ascertaining that each individual report is reasonable and consistent. In other words, the Bureau of Internal Revenue is less interested in whether a particular expense is counted as a part of the cost of goods sold or included with some other deduction than in the fact that it is counted only once.

From Table 2 it will be noted that in 1939 aggregate costs of the type that tends to be excluded from the inventory account were \$37.3 billion for all corporate industries combined, \$12.9 billion for manufacturing, and \$8.5 billion for trade. What proportion of these aggregates should be reallocated to the inventory account to reflect the true cost of production cannot be stated at this time; however, the figures suggest that the amounts involved may be substantial.<sup>8</sup> The understatement of

<sup>8</sup> Logically, an adjustment to the value of the ending inventory might be indicated also for net profits (which in 1939 amounted to \$7.2 billion for corporations) on the ground that profits are not a unique reward for selling a commodity to the exclusion of any return for financing, organizing, and directing its physical production. Hence to exclude profits from the value of the ending inventory is—in a free enterprise system—to exclude an important element of

ending inventories on this account is probably largest in manufacturing industries; considerably smaller in trade, where selling represents the primary aspect of production; and probably negligible in the service industries, where inventories consist of supplies and the significant unit of production is a service rather than a commodity.

Adjustments along these lines would obviously entail considerable difficulty. Until the problems are explored more fully we can do little more than indicate that the undervaluation of inventories implicit in accounting procedures is a significant factor conditioning the use of our estimates for certain purposes. The comparability of inventories with other assets in the national balance sheet, for example, might be seriously impaired. Since most assets are finished commodities or structures, they tend to be valued at some kind of market price, such as original cost, reproduction cost, or current market price. Therefore, the value of such assets necessarily embraces, at least in theory, all the cost elements, including profits, incurred in their production. The book value of inventories, on the contrary, embraces only the cost elements that accountants 'recognize' on the basis of numerous and diverse accounting standards.

Over time inventories are probably more comparable, since book values are understated for all years. But an interesting point for speculation may be raised even here. In an economy with a constant price level and a constant physical quantity of inventories, the book value of inventories could still rise appreciably over a long period merely because of the gradual adoption of broader cost accounting systems tending to allocate a higher proportion of pertinent costs to the inventory account.

The problem presented by the omission of certain cost elements from the inventory account is fundamentally different in the case of a wealth and of an income (or product) estimate.

cost. In terms of national income, to count the entire profit earned on the sale of the beginning inventory as part of the income of the period in which the sale is made is, in effect, to count as part of the national income of the current year a factor return that was partly earned in the preceding year.

In the latter it is essentially one of timing. Since the entire cost of the inventory at the end of one period is charged to the revenue of the succeeding period, whether more or fewer costs are charged to the inventory account will determine merely whether more or fewer costs will be charged to the current or to the succeeding period. As in the course of the two periods, all the relevant costs will be deducted from the stream of revenue, the net income of the two periods combined will not be affected by the allocations.<sup>9</sup> The problem of timing is, of course, highly significant and warrants consideration on its own merits. However, in the case of a wealth estimate the current accounting practices mean that a significant area of costs is never included in the value of the inventory asset.

For any given period, the 'error' resulting from the cost undervaluation of inventories is far larger, absolutely, for a wealth than for an income or product estimate. The wealth estimate is too low by the amount by which the entire stock is undervalued, whereas the income or product estimate is in error (plus or minus) only by the amount by which the increment to the stock is affected.

## 2 *Costing Procedures*

Whereas the physical units of goods and materials of each type that flow through the inventory account of a business concern during an accounting period are essentially homogeneous, the unit costs at which they are acquired (purchased or produced) are continuously changing. It is usually impracticable, if not impossible, to link specific goods to specific costs. Accountants must decide therefore what unit costs are to be attached to goods sold and what to the goods remaining in the inventory as of any given date. To make this determination several basic costing procedures have been developed on the manner in which inventory costs are to be allocated. These procedures are of special interest here. For to the extent that

<sup>9</sup> This appears to be at the root of Bureau of Internal Revenue emphasis upon consistency as a cardinal principle in its regulations on inventory practices: *III*, Sec. 29:22 (c)—2.

concerns value their inventories at cost (whether on a straight cost basis or the lower of cost or market)<sup>10</sup> the value of the inventory at the end of any given accounting period represents, in effect, the residual costs that have not been charged out as cost of goods sold.

The Internal Revenue Code takes cognizance of three general methods of charging out inventories: the first-in, first-out (FIFO) method which, as the name suggests, assumes that costs are charged out in the order in which they are incurred; the specific identification method, which can be used only when specific costs can be linked to specific goods—these costs are charged out only when the particular items are sold; and the 'elective method', under which, for the most part, the costs most recently incurred are charged out first.<sup>11</sup> A fourth method, not specifically mentioned in the Bureau of Internal Revenue regulations but fairly common, is the weighted average cost method. It reduces all the unit costs incurred during an accounting period to one level so that the order in which they are charged to sales is no longer significant. There are several variants of the average cost method.

According to Treasury officials questioned on this point, the FIFO method is used most extensively for tax reporting purposes. It tends to value the year-end inventory at the cost prices at which it was physically accumulated. The period to which these costs pertain may be approximated from the average age of inventories as indicated in stock turnover ratios, that is, the ratio of the year-end inventories to the cost of goods sold. The period of accumulation indicated by these ratios tends to vary between three and six months in most industries. In trade, however, it is approximately two months.

The specific identification method is not feasible for most industries because of the difficulty, if not impossibility, of trac-

<sup>10</sup> These are the two main bases of valuation distinguished by the Bureau of Internal Revenue for income tax purposes. The method chosen must be followed consistently from year to year in order to "clearly reflect" periodic income or loss.

<sup>11</sup> Special methods are permitted for certain industries, such as farming, mining, and retail trade; these, for the most part, are variants of the general methods.

ing the costs to individual items in the inventory unless the units are relatively few and the unit value is relatively large. However, as far as this method is used, the cost value of the ending inventory tends to approximate the level of costs obtained by the FIFO method, because goods in inventory tend to be used up in the order in which they are acquired, especially if they are subject to style changes, obsolescence, or any kind of physical wastage or spoilage.

Since the period to which the average cost pertains is ambiguous, the method is frowned upon by the Bureau of Internal Revenue.<sup>12</sup> The precise definition of average cost will obviously depend upon whether costs are averaged for a month, a quarter, or a fiscal year. However, when continuous inventories are maintained (as is customary in most industries) the effective average tends to become a moving average which is modified by the current cost of each new increment to the inventory or by the sum of the increments added during a specified interval. Hence, given the usual rate of turnover in most industries, the average costs reflected in the year-end inventory will be heavily weighted by the prices prevailing in the closing months of the year and hence will approximate the cost levels obtained by the FIFO and the specific identification methods. However, the valuations of the ending inventories computed by these three methods are merely crude approximations, and in extreme cases may differ substantially. In the absence of the requisite statistics on the precise methods followed in each industry and the extent to which each method is used by type of inventory, the assumption of approximate similarity is the most feasible working hypothesis. The above considerations

<sup>12</sup> The Bureau of Internal Revenue position with respect to the use of average costs is difficult to pin down. The method is not mentioned in the Regulations as an allowable procedure; on the other hand, it is not specifically disallowed. In general, the position is that if firms have been using this method consistently for a long period they may continue, subject always to review by the Treasury examining officers in the field. The point is also made that some firms use the average cost method for purposes other than tax reporting so that a survey showing the number of firms using this costing method in general practice will not necessarily indicate the number using it for tax purposes.

suggest that this hypothesis does not conflict unduly with the underlying data.

The 'elective method' was introduced for general use in the 1939 Revenue Act. It permits the taxpayer to establish what is tantamount to a base stock and to maintain this stock at the fixed average cost of the opening inventory of the taxable year in which the method is adopted. For each successive year the costs flowing through the inventory account are arranged in chronological order and the charge to sales may be made on a first-in, first-out basis, a last-in, first-out basis, an average cost basis, or "pursuant to any other proper method which in the opinion of the Commissioner clearly reflects income".<sup>13</sup> The residual value of the units not charged to sales on the basis of these alternative methods is added to the value of the beginning inventory to yield the value of the ending inventory. (The last-in, first-out variant is so generally used by firms adopting the elective method that it is almost universally referred to as the 'last-in, first-out' method—LIFO.) Thus to the base stock valued in base-year prices may be added successive annual increments valued in terms of the prices of the years in which each increment is made. If the units sold in any given year exceed the number acquired, this process is reversed. The most recent increment is subtracted first from the value of the beginning inventory, then the increment of the next earlier year, and so on back to the base stock.

Since the LIFO valuation of inventories thus involves several strata of price levels, it is extremely difficult to determine the period to which the value pertains. Indeed, if this method were employed universally, or even extensively, it would not be possible to use the book value of inventories as an approximation to the current value of goods in stock without making major adjustments.

A sample survey by the National Income Division based on *Moody's Industrials* reports covering 1940-45 indicates that less than 5 percent of the total value of business inventories were valued on a LIFO basis. It is difficult to evaluate the sam-

<sup>13</sup> *Regulations 111*, Sec. 29.22 (d)—1.

ple data, however, because many firms use the LIFO method for only part of their total inventories and usually do not indicate the proportion. The sample shows that for manufacturing the LIFO method is concentrated in the meatpacking, non-ferrous metals, leather, petroleum, lumber, and paper industries. Less than 10 percent of all manufacturing inventories are valued on a LIFO basis.<sup>14</sup>

The interpretation of the book value of ending inventories is complicated not only by the somewhat ambiguous nature of the cost basis of valuation but also by the fact that concerns following the lower of cost or market rule may set aside the former in a period of declining prices in favor of the latter.<sup>15</sup> What is meant by 'market' in the familiar lower of cost or market formula, the Bureau of Internal Revenue regulations point out, is the replacement cost at the date of the inventory: "(a) of goods purchased and on hand, and (b) of basic elements of cost (material, labor, and burden) in goods in process of manufacture and in finished goods on hand . . ." <sup>16</sup> Moreover, the regulations require that the cost-market comparison be made separately for "each article on hand at the inventory date".

<sup>14</sup> In estimating the change in business inventories in gross national product, a rough adjustment is made for LIFO inventories for each of these six manufacturing industries. As a result of this adjustment, LIFO inventories are, in principle, properly valued in the constant dollar estimates in Table 1.

<sup>15</sup> Attention is called to the additional complication, probably not important quantitatively, that under both the cost and lower of cost or market bases write-downs of goods are permitted because of such factors as physical deterioration, obsolescence, and imperfections; see *Regulations 111*, Sec. 29.22 (c)—2.

<sup>16</sup> *Regulations 111*, Sec. 29.22 (c)—3: "Where no open market exists or where quotations are nominal, due to stagnant market conditions, the taxpayer must use such evidence of a fair market price at the date or dates nearest the inventory as may be available, such as specific purchases or sales by the taxpayer or others in reasonable volume and made in good faith, or compensation paid for cancellation of contracts for purchase commitments. Where the taxpayer in the regular course of business has offered for sale such merchandise at prices lower than the current price as above defined, the inventory may be valued at such prices less direct cost of disposition, and the correctness of such prices will be determined by reference to the actual sales of the taxpayer for a reasonable period before and after the date of the inventory. Prices which vary materially from the actual prices so ascertained will not be accepted as reflecting the market."

How far such an item by item comparison can be carried out or, in many cases, appropriate replacement market prices found, remains an area of open conjecture and controversy. The writedowns involved in the use of this method are important only in years of sharply declining prices, such as 1930-32 and 1938. In view of the difficulty of making the relevant comparison for goods in process and finished goods in manufacturing inventories, serious questions may be raised with respect to the extent to which firms using the lower of cost or market method actually do write down the value of inventories. Thus, while replacement market pricing may not be ambiguous with respect to time, there is considerable ambiguity in the extent to which writedowns are made in practice. The lower of cost or market and the LIFO methods may not be used simultaneously for tax-reporting purposes.

The practice of valuing inventories at the lower of cost or market presents an interesting aspect of the general problem of inventory cost allocation. In reducing the value of the ending inventory to the replacement market price the accountant, in effect, reallocates the amount of the writedown to the cost of goods sold during the period and reduces the book profit of the current period. The rationale appears to stem from the notion that the revenue of one period should not be burdened with the excessive costs inherited (via the beginning inventory) from the preceding period. In other words (the argument seems to run), if book cost exceeds replacement cost the excess represents an operational blunder or misfortune, which should be charged to the current period rather than passed on to the succeeding period. The argument is, however, peculiarly one-sided. Elementary consistency would require that the accountant follow through in years when the concern has built up an inventory at low cost on a rising market (that is, when replacement cost exceeds actual cost) and take credit for the operational foresight or bonanza in the year in which it occurs instead of passing it on to the succeeding period. If the high cost of the beginning inventory constitutes an improper drain upon the revenues of the period that inherits it, why should a low-

cost beginning inventory not be viewed as imparting an improper gain? The shortcomings of the lower of cost or market procedure have been widely recognized in theoretical accounting articles,<sup>17</sup> but the criticism seems not to have affected accounting practice much. It continues to be the valuation basis most extensively used.

In our estimates, for the purpose of the deflation procedure used to express book values in constant dollars, it has been assumed that all manufacturing industries,<sup>18</sup> except beverage and tobacco, and all trade groups value their inventories at the lower of cost or market, and that all other inventories are valued on a straight cost basis. Both assumptions are based on what appears to be the predominant practice.

An additional element in this complex picture is that not only do concerns vary in their costing procedures, but an individual concern may evaluate the various segments of its total inventory on different bases. For example, a concern may use the last-in, first-out method for raw materials, the straight cost method for goods in process, and the lower of cost or market for finished goods. Indeed the coils of involvement do not end even here. If a manufacturer chooses, he may use the LIFO method not only for his raw materials inventory but also for the raw material elements of cost in his goods in process and finished goods inventories as well.<sup>19</sup>

This outline of costing procedures is not exhaustive, but serves to indicate the heterogeneous character of inventory costs relative to the periods to which they pertain. For this reason the book value of inventories should be interpreted as a first approximation to 'current value'. The closeness of the approximation depends in part upon the definition of 'current value'. The great majority of all inventory costs are current within the compass of one year. The problem of the "heterotemporality of prices" (to use Professor Kuznets' apt phrase)

<sup>17</sup> See the succinct summary in *Accountants' Handbook*, pp. 560 ff.

<sup>18</sup> An exception is made for LIFO inventories, a relatively minor proportion of the manufacturing inventory total; see note 14.

<sup>19</sup> See *Supplement to Regulations 111*, Sec. 29.22 (d)—1.

diminishes rapidly as the base for current prices is increased from one day to one year.<sup>20</sup>

In general, for reasons briefly indicated above, the book value of inventories tends to approximate the price levels prevailing in the latter half of each year, the particular period varying from industry to industry depending upon the rate of turnover in each. When prices are declining sharply, however, a substantial proportion of the total value of inventories in manufacturing and trade may be valued at 'market' prices prevailing at the year-end. For the three survey years considered, most inventories appear to be valued at cost, the writedowns to market under the lower of cost or market formula being of minor importance. Consequently, differences between cost and market valuations are probably a negligible factor in the comparability of the estimates.

In two noteworthy areas the cost prices reflected in the book value of inventories are not 'current', but may extend beyond a year. The first arises from the use of the LIFO method. As noted, the book value of LIFO inventories may be in terms of the prices of preceding years. While the method is used by business to only a minor degree, to that degree it makes the book value of the 1946 inventories somewhat lower than a strictly 'current' valuation would be, since the inventories of firms using the LIFO method reflect the lower prices of preceding years. There is no similar effect in the 1929 or 1939 data because the LIFO method was used little or not at all.

Products that undergo extensive aging periods as part of their normal production process form a second area in which the cost prices of goods in inventory may be in terms of prices of a preceding year or years. The two outstanding examples are alcoholic beverages and leaf tobacco, though aging periods are common to many other types of commodity of lesser importance in the inventory aggregate, such as seasoned lumber and

<sup>20</sup> In a year such as 1946 the variability of prices may be as great as the maximum range of fluctuations encountered in some periods of a decade or more. However, this problem is common to the valuations of all assets in the national balance sheet.

certain kinds of cheese. Tobacco and alcoholic beverages constitute the bulk of the inventories of two principal industries in the manufacturing group; according to *Statistics of Income for 1939*, the book value of inventories for corporate firms amounted to \$571 million in the tobacco industry and to \$296 million in the beverage industry. However, since the unique pricing problems the aging process entails are largely confined to these two industries, their inventories can be conveniently isolated or treated separately from all other inventories if this should prove necessary or desirable for certain types of wealth comparisons.

### C STATISTICAL SOURCES

Partly because of the requirements of national income and product estimates and partly because of the character of the underlying data, the inventories of the corporate and noncorporate segments of the nonfarm business sector of the economy were estimated separately. The corporate inventory compilation is based upon data published annually in *Statistics of Income* (Part 2), which covers all corporations filing federal income tax returns. In view of the predominance of the corporate form of organization in terms of inventory holdings, *Statistics of Income* may be regarded as the mainstay of the estimates. Approximately four-fifths of total nonfarm business inventories are held by corporations (Table 3).<sup>21</sup>

The chief sources for the noncorporate inventory estimates are the various Censuses of Business and the special tabulations of the 1939 tax returns of sole proprietorships and part-

<sup>21</sup> With respect to the geographic scope of the estimates, it may be pointed out that the corporate estimates include inventories held in (a) Hawaii and Alaska; (b) the United States by resident foreign corporations; and (c) foreign countries by branches of United States corporations. (Foreign branches are distinguished from foreign subsidiaries by the fact that the latter are incorporated abroad and therefore do not file tax returns with the U.S. Treasury Department.) There is no way of indicating the value of the inventories that may be involved in each case. To the extent that United States inventories held abroad are counted also in the estimates of total United States tangible assets abroad, there will be double-counting. These inventories, however, are relatively small. See estimates by Robert L. Sammons, below.

Table 3  
 Book Value of Nonfarm Business Inventories  
 by Legal Form of Organization, 1939  
 (millions of dollars)

	Total	Corp.	Noncorp.	% Corp. are of Total
Total	22,144	17,999	4,145	81
Manufacturing & trade	20,298	16,389	3,909	81
Manufacturing	11,516	11,129	387	97
Trade	8,782	5,260	3,522	60
Wholesale	3,202	2,437	765	76
Retail	5,580	2,823	2,757	51
All other	1,846	1,610	236	87
Public utilities	723	723	...	100
Mining & quarrying	356	323	33	91
Finance, insurance, & real estate	45	45	...	100
Miscellaneous	722	519	203	72

nerships,<sup>22</sup> which provided valuable benchmark inventory-sales ratios for each industry. For some years the noncorporate inventory data are available directly, notably in the case of wholesale trade for 1939 and retail trade for 1929.<sup>23</sup> In most cases, however, the noncorporate estimates had to be constructed from the raw materials in the sources. Noncorporate sales data and noncorporate inventory-sales ratios were cross-multiplied to yield the inventory estimates for each industry. Because of lack of data our estimates omit the fragmentary holdings of three noncorporate industrial groups: finance, insurance, and real estate; transportation; and communications and public utilities. Trade inventories constitute approximately 85 percent of the noncorporate total.

Neither the Census nor *Statistics of Income* covers the entire nonfarm business universe. The latter does not cover noncorporate enterprises, and the former presents inventory data for manufacturing and trade only. In both, however, the areas covered, though differing in scope, represent preponderant proportions of the total. Accordingly, the integration of the inventory data in the two sources presented the familiar statis-

<sup>22</sup> *Statistics of Income for 1939*, Part 1, Table 8; *Supplement*, Part 1, Table 2.

<sup>23</sup> The Census data on noncorporate retail inventory for 1929 were adjusted for comparability with later Census data.

tical problem of adjusting for the omissions and duplications encountered whenever source materials are heterogeneous.

Since Census inventory data for entire industries (both corporate and noncorporate) exist, an explanation may be in order why these totals were not used directly for the industries to which they apply. The basic reason lies in the difference in industrial classification of the Census and of *Statistics of Income* due to the organizational unit on which the classifications are based. Census data are classified by 'establishment', a relatively small organizational unit, usually a single plant, factory, or place of business. *Statistics of Income* classifies corporate concerns on the basis of the one business activity that accounts for the largest percentage of total receipts. Since a corporate concern may have many establishments, the *Statistics of Income* classification makes for overlaps in some major industrial groups. It is therefore impossible to move freely from Census to *Statistics of Income* data for individual industry groups.

Unfortunately, few of the discrepancies due to the differences in classification can be compared in detail because the Census inventory data are not arranged by legal form of organization. Of the three major Census compilations for 1939 in which inventories are reported—manufacturing, wholesale trade, and retail trade—the wholesale trade inventory data alone are divided into corporate and noncorporate.<sup>24</sup> This division, however, gives a clue to a significant area of difference between the two series. The inventories of the corporate wholesale trade group for 1939 are reported in the Census volume as \$3,107 million; the corresponding figure from *Statistics of Income* is \$2,437 million.<sup>25</sup> The discrepancy is due mainly to the fact that large portions of the two wholesale trade subdivi-

<sup>24</sup> However, all three censuses present an allocation of *sales* by legal form of organization that was useful in constructing the noncorporate estimates.

<sup>25</sup> In *Statistics of Income* corporate trade is divided into three major groups: wholesale, retail, and trade not allocable. The wholesale inventory figure is \$2,203 million (after a minor adjustment for returns without balance sheets); the inventory in the trade not allocable group (after a similar minor adjustment) is \$505 million. Even an allocation of the latter that differed considerably from the one used would leave a significant area of difference between the two series.

sions, 'manufacturers' sales branches' and 'petroleum bulk tank stations', are classified with the parent corporations in the manufacturing industry group in *Statistics of Income*.

Comparison of Census and Bureau of Internal Revenue inventory data is further complicated by serious omissions from the former, some of which are noted in the prefaces to the Census volumes. The *1939 Census of Manufactures*, for example, points out: "Inventories owned by manufacturing concerns but held in warehouses separate from the manufacturing plants are not included." In consequence of this omission the Census inventory total for the tobacco industry is approximately \$390 million short of the corporate total in *Statistics of Income*. There is a discrepancy of a similar order of magnitude and in the same direction for the petroleum industry. Again it is impossible to make detailed comparisons because it is not known to what extent divergencies are due to undercoverage or to differences in classification. However, a comparative compilation of the 1939 inventories for all manufacturing and wholesale trade combined, based on Census data, yielded a total that was considerably lower (about \$1 billion, after adjustment for certain incomparabilities) than our estimated aggregate. The latter estimate was based upon *Statistics of Income* for the corporate sectors of manufacturing and wholesale trade, Census data for the noncorporate sector of wholesale trade, and an estimate of the noncorporate sector of manufacturing, constituting less than 5 percent of the total inventories held by all manufacturing concerns.

The integration of the inventory data from these two sources for 1929 was further complicated by two factors. First, the Census of Manufactures did not compile inventory data; second, corporations were at that time permitted to file consolidated returns for affiliated groups of companies. Some idea of the effect of consolidated reporting on the industrial distribution of inventories can be ascertained from *Statistics of Income for 1934*. In that year the privilege of filing consolidated returns was revoked and all corporations except railroads were required to file unconsolidated returns, which were classified

on the basis of the predominant business of each company.<sup>26</sup> Special cross-tabulations, however, make it possible to summarize the 1934 industrial distribution on both the consolidated and unconsolidated bases. The effect of the two methods of filing returns on the industrial distribution of inventories is shown in Table 4. Trade inventories in 1934 were approximately \$400 million less than they would have been had the consolidated basis been continued. In relating this type of shift to 1929, it should be recalled that the level of corporate inventories was about 50 percent higher than in 1934; consequently, the absolute differences in the industrial distribution occasioned by unconsolidated reporting would be correspondingly magnified.

Table 4  
Year-end Corporate Inventories by Major Industry Group  
Consolidated and Unconsolidated Bases, 1934  
(millions of dollars)

	Consolidated <sup>b</sup>	Unconsolidated
Total <sup>a</sup>	14,606	14,595
Manufacturing & trade	12,830	12,950
Manufacturing	8,750	8,454
Trade	4,080	4,496
Mining & quarrying	443	407
Public utilities	736	636
Finance, insurance, & real estate	114	118
All other	483	484

*Statistics of Income for 1934*: 'consolidated basis', computed according to method described on pages 20 and 27-9; 'unconsolidated basis', *ibid.*, Table 3.

<sup>a</sup> The small difference in the grand totals is due to the different weights given to the raising ratios used to adjust for firms not reporting balance sheet data in each industry.

<sup>b</sup> The 1934 tax returns are consolidated on the same basis as for 1933.

The foregoing considerations indicate that an estimate for 1929 obtained by adding *Statistics of Income* data for manufacturing (and for 1929 there is no alternative for this large segment of the total) to Census data for trade would significantly overstate the aggregate. An overstatement of this type is im-

<sup>26</sup> Although this requirement provided for a more selective industrial distribution than was possible for consolidated returns, it was still not a 'pure' industrial classification because of the diversified business activities of many of the unconsolidated corporations, as pointed out above.

plied in Professor Kuznets' estimates of manufacturing and trade inventories for 1929.<sup>27</sup>

It is evident that considerable duplication is introduced by combining Bureau of Internal Revenue and Census data for 1929. The duplication stems from (a) the overlapping between manufacturing and wholesale trade indicated by the comparison of corporate wholesale trade inventories as reported by the Census and the Bureau of Internal Revenue for 1939, when corporate tax returns were classified on an unconsolidated basis; and (b) the additional amount of trade inventories included in manufacturing when returns were classified on a consolidated basis (see Table 4). These two comparisons could readily account for the difference between the two trade inventory estimates.<sup>28</sup>

It was partly for the statistical considerations outlined above that inventories were estimated by legal form of organization. While *Statistics of Income* data have serious defects in the somewhat blurred industrial classification due to the use of companies as the unit of classification, the system is internally consistent and yields a more comprehensive (that is, all inclusive) aggregate. Internal consistency in the industrial classification is of prime importance not only in getting estimates relatively free from omissions and duplications for the manufacturing and trade groups, but also in connection

<sup>27</sup> See *National Income and Its Composition, 1919-1938* (NBER, 1941), pp. 904 and 907.

	Kuznets' estimates	Our estimates
	MILLIONS	
Manufacturing	\$13,920	\$13,251
Trade	12,372	11,401
Total	26,292	24,652

<sup>28</sup> The difference between the two manufacturing inventory estimates is attributable to variations in the noncorporate estimates. Kuznets' series is based on the assumption that the inventory-sales ratios are the same for both corporate and noncorporate manufacturing industries, whereas our estimates are based on the assumption that corporate and noncorporate inventory-sales ratios show the same year-to-year movement but are at considerably different levels, as evidenced by the 1939 tabulations of the tax returns of sole proprietors and partnerships by the Bureau of Internal Revenue. These tabulations were not available when Professor Kuznets made his estimates.

with measuring the inventories of all other industries, for which no direct data are available in the Census compilations.

A second and equally compelling reason for using *Statistics of Income* corporate data in toto is that these, covering, as noted, about four-fifths of the nonfarm business total, are available annually, thereby affording a satisfactory basis for measuring year-to-year movements in the total.

A third reason stems from the unique relation between the inventory valuation adjustment and profits in national income. Clearly the inventories on which the valuation adjustment is calculated and the profits affected by this adjustment should pertain as nearly as possible to the same companies, both in total and by industry. Thus the use of *Statistics of Income* for estimating corporate profits virtually requires the use of the same source for inventories. An auxiliary advantage is that the corporate inventory division makes possible comparisons with other types of assets for the corporate sector. Asset data for the noncorporate sector are relatively few.

A final point: the *Statistics of Income* inventory data have an added merit in that their general basis of valuation conforms to the regulations specified in the Internal Revenue Code. Thus certain statistically troublesome practices not allowed by the Code, such as "deducting from the inventory a reserve for price changes, or an estimated depreciation in the value thereof" or "using a constant price or nominal value for so-called normal quantity of materials or goods in stock",<sup>29</sup> can be ruled out in evaluating the book value of inventories derived from this source.

#### D CONCLUSION

Estimates of the nonfarm business inventory component of national wealth are reasonably satisfactory except for undervaluation due to the exclusion of certain cost elements. We conclude with a brief note on the additional types of informa-

<sup>29</sup> *Regulations 111*, Sec. 29.22 (c)-1.

tion that would contribute to a solution of certain peripheral problems that arise in using and interpreting the book value of inventories.

First, in view of the relatively adequate information available for the predominant corporate sector, the principal problems in obtaining comprehensive estimates of the book value of business inventories relate to the availability of noncorporate data (particularly on noncorporate trade). Two suggestions may be made in this connection. (a) Estimating would be greatly facilitated if future Censuses classified inventories by legal form of organization. (b) Useful data on inventory-sales ratios might be obtained from periodic surveys of the income tax returns of sole proprietors and partnerships similar to the tabulations by the Bureau of Internal Revenue for 1939. (The Bureau plans to prepare such tabulations for the 1945 returns.)

Secondly, more information is needed on the scope of the assets included in the inventory account, especially with respect to goods in transit and the balance sheet classification of miscellaneous small assets such as replacement parts, small tools, dies, and patterns.

Thirdly, it would be very helpful to find out more about the extent to which indirect costs are included in the book valuation of inventories; inventory goods are actually written down to market under the lower of cost or market rule; and the various costing procedures such as FIFO, LIFO, average cost, specific identification, or other methods are used by businesses for tax-reporting purposes. Few of the sample surveys on this subject made during the last several years can be interpreted statistically because many of the costing procedures reported in use are not accepted by the Bureau of Internal Revenue for tax purposes and consequently have no bearing on the interpretation of *Statistics of Income* data; the results are stated in terms of the number of companies using each of several methods with no indication of the dollar value of the inventories so valued; and the results are not stratified by industry

and hence cannot be applied to industrially classified data.<sup>30</sup> It is realized that a sample survey on the 'quantitative importance' of the various inventory valuation methods in use would entail many difficulties, especially since most firms use different methods for the various segments of their inventories. However, even if it were necessary for the respondents to estimate the proportion of the total book value that is based on each method, the information would be far superior to the rather naked guesses of an outside estimator.

<sup>30</sup> See, for example, *Practices in Inventory Valuation*, National Industrial Conference Board, Feb. 1938; Survey by the National Association of Cost Accountants, *Bulletin*, Vol. 18; and the compilation by the research department of the American Institute of Accountants, *Journal of Accountancy*, Vol. 70.