Volume Title: Measurement of Business Inventories

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Volume Publisher: U.S. Census Bureau

Volume ISBN: 3024029227

Volume URL: http://www.nber.org/books/foss81-1

Publication Date: 1981

Chapter Title: Inventories in Agriculture, Public Utilities and Construction

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Chapter URL: http://www.nber.org/chapters/c11090

Chapter pages in book: (p. 132 - 141)

12. INVENTORIES IN AGRICULTURE, PUBLIC UTILITIES AND CONSTRUCTION

Inventories held outside manufacturing and trade are relatively small apart from those held in the agricultural sector (table 12.1). Although problems in sampling inventory data for these sectors cannot be discussed here at length, certain issues merit attention. Farm stocks are included because their changes are often important to shortrun changes in GNP. Inventory statistics in public utilities and construction are used to illustrate some interesting definitional problems.

Estimates of farm inventories and their changes are made by the Department of Agriculture. It is difficult to generalize about data sources for public utilities and construction. Current BEA quarterly inventory estimates for these sectors are based on limited information from sources such as the Bureau of Mines, but judgmental estimates are required for large components of their stock accumulations. BEA benchmarks its annual estimates for these sectors to IRS statistics and prepares quarterly interpolations using SEC inventory data compiled for the SEC series on working capital.

Table 12.1. BUSINESS INVENTORIES, END OF 1974

Industry Division	Billions of 1972 Dollars
Total	301.8
Farm	41.8
Nonfarm	260.1
Manufacturing	128.6
Wholesale	50.6
Retail	56.5
All other nonfarm	24.5
Mining	2.0
Transportation	1.7
Construction	8.6
Public Utilities	3.8
Communication	1.9
Services	3.7
Other industries	2.7

Source: Bureau of Economic Analysis, U.S. Department of Commerce. National Income and Product Accounts.

FARM INVENTORIES

Estimates of changes in farm inventories in the GNP have undergone large revisions in recent years.[1] Successive estimates of annual changes from 1967 to 1976 are shown in table 12.2 and quarterly changes, 1971-76, in table 12.3. The main reason for large revisions in the recent past is that end-of-quarter and end-of-year data ordinarily have not been available from the Department of Agriculture in time for the publication schedule used for current period (quarterly or annual) GNP. Consequently, early estimates of farm inventories have tended to be based on projections by the Department of Agriculture; even when preliminary figures have been used, they have often been quite inadequate.

Definitions

In principle, determining changes in farm business inventories in the national accounts is no different from determining those in nonfarm business inventories. In practice there are some major departures from what is conceptually desirable. Most important is that farm inventory statistics are based on estimates of raw farm commodities held on farms rather than on total inventories owned by farm units. Since nonfarm estimates are based on stocks owned by reporting units, for consistency farm estimates should be similarly based.

For livestock inventory estimates, the Department of Agriculture takes account of different kinds of animals as well as their age and weight. However, these estimates are too inclusive since all livestock is counted as inventory and animals that represent fixed capital–like milk cows, breeding herds, etc.–are not excluded. Inventories of crops include only those that have been harvested; crops growing in the field are not measured. Also omitted from Department of Agriculture estimates are stocks of most purchased materials owned and used

[1] The large revisions in farm inventories of the early 1970's led to formation of a special task force on farm statistics by the Economic Research Service of the Department of Agriculture. The report of the task force contained several recommendations concerning farm inventories. See *Report of Task Force on Farm Estimates* (January 1975). See also memorandum from Norman Frumkin to Daniel Creamer, GNP Data Improvement Project, "Data Needs for Current Quarterly Estimates of Gross Farm Product and Farm Inventory Change–Revision of 9/25/74 Memo," Nov. 11, 1974.

Table 12.2. SUCCESSIVE ESTIMATES OF CHANGE IN FARM INVENTORIES: 1967-1976

(Billions of dollars, seasonally adjusted at annual rates)

Year	First estimate	Second estimate	First July[1]	Second July	Third July	Jan. 1976 benchmark[2]	July 1976	July 1977
1967	0.4	0.4	0.5	0.6	0.7	0.7	(NA)	(NA)
1968	.4	.5	-.1	.1	.1	.1	(NA)	(NA)
1969	.2	.2	.4	.1	.1	.1	(NA)	(NA)
1970	.5	.6	.3	.1	.2	.1	(NA)	(NA)
1971	.6	.5	1.2	1.6	1.4	1.3	(NA)	(NA)
1972	.3	.3	.4	.7	([3])	.6	(NA)	(NA)
1973	.7	.6	4.0	([3])	(NA)	3.5	3.2	(NA)
1974	2.4	2.3	([3])	(NA)	(NA)	-1.9	-1.5	-1.8
1975	1.9	1.9	(NA)	(NA)	(NA)	(NA)	3.0	3.6
1976	-.2	0	(NA)	(NA)	(NA)	(NA)	(NA)	-1.6

NA Not available.

[1]Refers to July of year following given year.
[2]Benchmark estimate published in Survey of Current Business, Vol. 56, Part 1 (January 1976) pp. 50 and 51.
[3]In July 1975 the revisions for 1972, 1973, and 1974 in accordance with the customary schedule were not made.

Source: Bureau of Economic Analysis, Survey of Current Business, successive issues.

in production by farmers, such as manufactured feeds, seeds, fertilizer, pesticides, fuel, etc.

Estimates of crop inventories have been limited to stocks on farms. However, parts of those stocks on loan to the Commodity Credit Corporation are subtracted since USDA treats such loans as sales and BEA treats them as Government purchases in the GNP.[2] Until recently USDA estimates did not reflect off-farm stocks owned by farmers. The implicit assumption was either that farmers owned insignificant amounts or that there were insignificant year-to-year changes in farmer owned off-farm stocks. This now appears to have been an erroneous assumption.

Annual Estimating Procedures

For livestock, information on January 1 inventories is obtained as part of a semiannual survey of cattle and calves, sheep and lambs, and chickens (December 1 for hogs) conducted by the Statistical Research Service (SRS) of the Department of Agriculture. Data are collected on number of head on farms and on feedlots, disaggregated by age, weight and sex as well as value per unit. To value physical change in current prices, the change in physical inventory is multiplied by the average of beginning- and end-of-year prices of the stock. Although the figures become available, at least on a preliminary basis, by late February, the January 1 statistics have been too late to be incorporated into either BEA's January or February estimate of GNP for the year just past. This has meant that the survey data could not be incorporated into the national accounts until July. The December 1977 change in BEA publication policy whereby an additional estimate will be made in March should make it possible to incorporate the survey data.

Crops can be divided into two major categories with respect to end-of-year inventory estimates made prior to 1977.

1. Crops for which SRS collects and reports January 1 stocks.

Data on physical stocks on farms on January 1 are obtained as part of a quarterly survey by SRS of key crops: wheat, corn, rye, hay, barley, oats, sorghum, flaxseed, soybeans. The physical change during the year (adjusted for CCC stocks on farms) is multiplied by a weighted calendar year average price; prices are weighted by physical marketings including net CCC loans.

2. Crops for which January 1 stocks are estimated from production and other data.

For a number of crops only production data are available on a current basis. Output data in combination with estimated monthly marketings provided the basis for estimating inventory change. The physical change is valued at current prices as described above. This estimating technique is used for rice, cotton lint and seed, peanuts, dry beans and peas, potatoes, sweet potatoes, apples, and tobacco.

Until 1975, the Department of Agriculture used as a proxy for the monthly marketing pattern of a given crop year the average of patterns for the three preceding years, including crops placed on loan to the CCC. Actual monthly marketings for the crop year just past were obtained through special surveys conducted in October and available the following spring—nearly a year and a half after the end of the calendar year. For example, 1973 crop year data were first available in the spring of 1975. Under a new system initiated by USDA for 1975 crops, preliminary tabulations of monthly marketings are obtained half way through a following year, nearly 12 months earlier than under the old system. Final tabulations become available roughly six months earlier. The preliminary tabulations turned out to be no better estimates than the three-year averages, but

[2]Tobacco loans are an exception.

the availability of final tabulations six months earlier clearly has been a significant improvement over the former system.

Interim Inventories

Estimates of inventories at the end of a calendar quarter have been extremely difficult to make, as a review of the data in table 12.3 suggests. Although some survey data are available for use in developing estimates of interim inventory changes, because of their incomplete coverage and erratic seasonal behavior, these data represent only a portion of the information needed by USDA in the estimation process.

Current quarterly estimates of inventory change for some crops depend upon projections of annual changes. In making quarterly estimates, USDA places primary emphasis on projected annual changes. To illustrate, suppose that at the end of the first quarter the forecast of annual change for a particular crop is an increase of 100. On this basis the estimate for the first quarter would be an increase of 25. Similarly when a second quarter estimate is made in the summer, assume that the annual forecast remains at 100. The second quarter change would also be 25. However, at the time of the third quarter estimate suppose the annual forecast is raised to 140. The third quarter estimated change would be 45 = 1/2 of (140 − 50).

Table 12.3. **SUCCESSIVE ESTIMATES OF QUARTERLY CHANGE IN FARM INVENTORIES: 1971-1976**

(Billions of dollars, seasonally adjusted at annual rate)

Year and quarter	First estimate	Second estimate	Extra 1st quarter[1]	First July[2]	Second July	Third July	Jan. 1976 bench-mark[3]	July 1976	July 1977
1971:									
1st quarter	0.2	0.2	0.2	0.9	1.2	1.8	1.7	(NA)	(NA)
2nd quarter	.5	.5	(NA)	1.5	1.4	1.3	1.2	(NA)	(NA)
3rd quarter	.8	.8	(NA)	1.6	2.0	1.4	1.3	(NA)	(NA)
4th quarter	.9	.5	(NA)	.9	1.8	1.0	.9	(NA)	(NA)
1972:									
1st quarter	.5	.4	.3	.4	.8	(4)	.7	(NA)	(NA)
2nd quarter	.7	.7	(NA)	.7	1.0	(NA)	.8	(NA)	(NA)
3rd quarter	.4	.1	(NA)	.3	.6	(NA)	.5	(NA)	(NA)
4th quarter	.2	.2	(NA)	.3	.6	(NA)	.5	(NA)	(NA)
1973:									
1st quarter	.3	.3	.2	3.5	(4)	(NA)	2.3	0.2	(NA)
2nd quarter	.1	.1	(NA)	3.0	(NA)	(NA)	3.3	3.5	(NA)
3rd quarter	1.5	1.5	(NA)	4.4	(NA)	(NA)	4.6	4.0	(NA)
4th quarter	1.0	.7	(NA)	4.9	(NA)	(NA)	3.7	5.3	(NA)
1974:									
1st quarter	1.0	.6	3.8	(4)	(NA)	(NA)	3.7	-1.9	-3.3
2nd quarter	3.2	3.1	(NA)	(NA)	(NA)	(NA)	-1.7	-.9	-.1
3rd quarter	2.7	2.1	(NA)	(NA)	(NA)	(NA)	(NA)	3.2	-.1
4th quarter	.7	.3	(NA)	(NA)	(NA)	(NA)	-3.2	-3.2	-3.8
1975:									
1st quarter	-1.3	-1.4	(4)	(NA)	(NA)	(NA)	-1.5	3.4	3.9
2nd quarter	-.3	-.4	(NA)	(NA)	(NA)	(NA)	-.1	1.2	1.4
3rd quarter	1.2	1.8	(NA)	(NA)	(NA)	(NA)	3.6	2.2	3.5
4th quarter	5.5	5.6	(NA)	(NA)	(NA)	(NA)	(NA)	5.2	5.5
1976:									
1st quarter	4.0	4.2	(NA)	(NA)	(NA)	(NA)	(NA)	2.2	-1.4
2nd quarter	-1.4	-1.3	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	-2.2
3rd quarter	-1.0	-.5	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	-.5
4th quarter	-1.0	-.5	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)	-2.3

NA Not available.

[1]Because of timing of July revision there is always an additional estimate for the first quarter.
[2]Refers to July of year following given year.
[3]Benchmark estimate published in Survey of Current Business, Vol. 56, Part 1 (January 1976) pp. 50-53.
[4]In July 1975 the revision for the period 1972 through 1st quarter 1975 in accordance with the customary schedule was not made.

Source: Bureau of Economic Analysis, Survey of Current Business, successive issues.

Clearly such a procedure gives rise to very erratic quarter-to-quarter fluctuations when annual forecasts for crops change by substantial amounts. Fourth quarter inventory data are particularly susceptible to erratic movements because they incorporate the full effects of revisions in the annual forecast.

Off-Farm Stocks

Until recently, the Department of Agriculture did not attempt to estimate amounts of off-farm stocks owned by farmers. Although the Statistical Research Service had conducted many surveys of grains held in elevators, it never inquired about ownership of such stocks. Uneasiness about the validity of the implicit assumption that such stocks were either negligible or did not change much led to two surveys of farmers. The first was conducted to determine farmer-owned off-farm stocks covering January 1, 1975 and January 1, 1976 and the second, a considerably larger survey, for off-farm storage facilities covering January 1, 1977. Data from the new surveys made it clear that off-farm stocks owned by farmers are large in relation to on-farm stocks; results are shown in table 12.4. It is evident that producer-owned stocks held off-farm can be substantial—in this instance ranging from 52 percent of all off-farm stocks for soybeans to 69 percent for corn and 77 percent for wheat. Furthermore, as can be seen in the last column of table 12.4, farmer-owned off-farm stocks as of January 1, 1977 exceeding on-farm stocks of wheat and sorghum and were more than 60 percent of on-farm stocks of soybeans.

At present, the Department of Agriculture believes it is too early to reach definitive conclusions regarding inventory change of all stocks owned by farmers, partly because comparable data are not available for earlier years, and partly because there is some uncertainty about SRS results for January 1, 1977. In Colorado, for example, it was found that farmers owned more wheat off-farms than the entire stock of wheat in the state, regardless of ownership. Also, there are problems relating to the definition of producer-owned grain held in off-farm facilities. The definition used by SRS in its survey of ownership of off-farm grain stocks was:

> Producer owned grain stored in commercial off-farm storage facilities was defined as grain for which the producer had some marketing control. The amount of producer control varied considerably and depended on the particular agreement between the storage operator and producer. Agreements varied from warehouse receipts in bonded facilities to delayed pricing agreements, which allowed warehouse operators to move the grain. Movement could be to a larger facility in or out of state or even into milling or export channels. Producer owned grain as defined here does not necessarily include legal title but does include an obligation on the operator of the storage facility to provide settlement to the producer at some later date within the confines of their agreement. Grain under government loan and stored in an off-farm facility was considered producer owned. Grain sold to a co-op was not considered producer owned unless the individual producer retained some marketing control as indicated above.[3]

Without delving into the intricacies of what constitutes producer-owned off-farm stocks, it seems reasonable to conclude that ignoring off-farm stocks has been a serious omission from all previous estimates of farm stocks made by USDA. The farm inventory estimates made during 1977 partially reflect an attempt to take account of producer owned off-farm stocks. The procedures employed by the Department of Agriculture for the July 1977 revisions are likely to be modified as better data on marketings and producer-owned stocks become available.

[3]Crop Reporting Board, Statistical Reporting Service, U.S. Department of Agriculture, *Grain Stocks* (January 25, 1977), p. 29.

Table 12.4. **GRAIN STOCKS ON AND OFF FARMS: 1976-1977**

(Millions of bushels)

Item	January 1, 1976		January 1, 1977			Farmer Owned Off Farm as Percent of	
	On Farm	Total Off Farm	On Farm	Total Off Farm	Farmer Owned Off Farm	Total Off Farm	On Farm
Corn	3,179	1,269	3,317	1,544	1,060	69	32
Sorghum	165	310	161	329	204	62	127
Oats	406	94	347	73	24	33	7
Barley	163	114	154	118	28	24	18
Wheat	547	838	664	1,113	857	77	129
Rye	6	4	5	4	1	[1]19	[1]15
Soybeans	589	665	467	559	288	52	62
Flaxseed	4	6	3	4	1	[1]23	[1]31

[1] Based on unrounded data.

Source: Basic data, Crop Reporting Board, Statistical Research Service, U.S. Department of Agriculture.

The extent to which off-farm farmer-owned inventory change is omitted from the GNP on a current basis is difficult to determine although it is probable that up to 1977 most of it was omitted. To the extent that farmers (and landlords) operate merchant wholesale businesses that should be covered in the Census Bureau's monthly wholesale survey, the inventories would be counted; the likeliest industry classification is SIC 5153, Grain Wholesalers. This classification includes, among others, combination grain elevators, which store commodities owned by farmers and others and trade on their own account as well. Grain elevators that are used for storage only do not fall into the wholesaler classification. Farmers engaged in assembling farm products would be classified as merchant wholesalers according to the 1972 revision of Census Bureau classifications; previously they were classified as nonmerchant wholesalers. The Census Bureau has shifted its monthly survey to the new classification system and should now be including such activities as wholesale trade.

Recommendations

The Department of Agriculture should change its estimation procedure foı farm inventories to one that is consistent in definition with that used for other sectors of the economy. This means data on inventories should be based on ownership and should be collected for off-farm as well as on-farm holdings, and for purchased materials as well as finished products.

The methods employed should be similar to those used for other industry divisions. A monthly sample of farm businesses should be selected and inventory totals obtained from them, as is done in retail trade, for example. The focus should be on a single national total applicable to all farm business, not on regional and commodity breakdowns. Larger samples could be used for obtaining end-of-year inventories. The small size of a typical farm unit and its lack of recordkeeping probably will require special assistance by field representatives of the Department of Agriculture, working closely with individual farmers. Such a changeover probably will not occur quickly nor without difficulties but new approaches are necessary given present unsatisfactory data collection procedures.

PUBLIC UTILITIES

Consideration of data for public utilities illustrates a general problem concerning the definition of inventories. This industry embraces electric, gas and water utilities but not gas pipeline firms, which are included in transportation.

The book value of yearend inventories for public utility corporations for 1965-75, as compiled by IRS, appears in table 12.5.

Two points about the data should be noted. Most firms in this industry group, and certainly all large ones, maintain their internal accounts in ways prescribed by the Federal Power Commision (FPC)[4] or state utilities commissions. A review of the

Table 12.5. **INVENTORIES OF PUBLIC UTILITY CORPORATIONS: 1965-1975**

Year	Billions of Dollars
1965	1.6
1966	1.7
1967	2.0
1968	2.1
1969	2.5
1970	2.9
1971	2.3
1972	3.6
1973	4.4
1974	6.6
1975	P7.5

PPreliminary.

Source: 1965-75, IRS, *Statistics of Income.*

accounting structure prescribed by FPC raises questions regarding its possible impact on inventory statistics compiled from balance sheets reported to IRS. First, FPC prescribes that advance payments for fuel to be received within the coming two years be treated as inventory-type current assets. Second, many types of fuels ordinarily designated as inventory are listed as "fuel" rather than as "inventory" in balance sheets. In view of these FPC definitions, there are questions on how such items are reported on the balance sheets submitted to IRS and how IRS tabulates them. For national income and product accounting, fuel should be included in published inventory totals, and all advance payments should be excluded from inventory. This was discussed with IRS staff but no conclusions could be reached. Determining if these data are represented properly in IRS tabulations of balance sheets would require a specific study. Since NBER did not have access to IRS returns it was not feasible for us to undertake that project. However, IRS staff should do so.

The Definition of Inventory and Public Utilities

According to IRS income tax regulations, the value of inventories at the beginning and end of each year must be stated whenever production of goods or the purchase and sale of merchandise is an income-producing factor. The regulation specifies that such an inventory should include "finished or partly finished goods" and "materials and supplies . . . which will physically become a part of merchandise intended for sale."[5]

A narrow interpretation of these phrases suggests that one may not count as inventory, merchandise that is not to be sold in the form purchased (trade) or to be converted from one form into another form of merchandise (a manufacturing activity). At issue is whether coal held by an electric utility, gasoline held

[4] Now the Federal Energy Regulatory Commission.

[5] 1.471-1 Income Tax Regulations.

by an airline, soap held by a laundry, etc., can be called inventory or should be treated as something other than inventory.

How much coal, gasoline and soap are to be treated is covered by IRS regulation 1.162-3, which reads:

> Taxpayers carrying materials and supplies on hand should include in expenses the charges for materials and supplies only in the amount that they are actually consumed and used in operation during the taxable year . . . . If a taxpayer carries incidental materials or supplies on hand for which no record of consumption is kept . . . it will be permissible . . . to include in his expenses . . . the total cost of such supplies and materials as were purchased during the taxable year . . . .

Thus, if a business buys and sells coal, strict interpretation of IRS regulations would require that its balance sheet include coal in its inventory and that in the calculation of cost of goods sold by the usual formula (beginning inventory plus purchases minus ending inventory), coal stocks and purchases should be included.

However, if an electric utility has a stock of coal it cannot be called inventory. Presumably it would appear on the balance sheet as a prepaid expense. The cost of coal consumption would be charged as an expense in the income statement but there is no explanation in IRS regulations as to how the cost is to be calculated.

If coal consumption is an "incidental material," presumably by which IRS means that it is not a major expense item, all purchases during the year can be charged off whether the coal is actually consumed in the year or whether some of it is carried over to the next year.

Aside from cases where amounts involved are immaterial, the issue is whether the balance sheet will carry an asset called inventory or an asset called prepaid expenses. For measuring production in the national accounts and for the usual kinds of economic analyses such materials ought to be tabulated as inventory, and might as well be treated similarly in the IRS publication, *Statistics of Income.* The refined accounting distinction in the IRS regulation of merchandise for sale and materials used to produce a service is an artificial distinction which has little economic basis. Since GNP is a measure of production, changes in stocks of such items should be included in inventory change.

This IRS regulation appears to have been ignored by firms in preparation of their balance sheets. Probably most firms in service industries classify their stocks of important materials as inventory rather than as prepaid expenses. As noted earlier, some utility firms simply list "fuels" on balance sheets; the method of tabulating inventories of such firms in *Statistics of Income* should be investigated.

As long as FIFO or average cost methods of inventory valuation are used, it makes no difference what firms in service industries call their stocks of materials. It does, however, make a difference if LIFO is used. Prepaid costs cannot be expensed on a LIFO basis. LIFO is applicable only to what are called inventories. With rising prices firms could reduce tax liabilities by treating materials as inventories and adopting the LIFO method.

Until 1974, IRS took no action to require firms in service industries to discontinue designating their materials holdings as inventories. The LIFO method was rarely used by such firms and tax revenue losses were negligible. With the increasing inflation of 1973 and 1974, especially in relation to energy costs, IRS moved to deprive such firms of the option of using or changing to use of the LIFO method. It could not have been a coincidence that a test case occurred when prices of various types of energy skyrocketed. The potential amount of added taxes in the years after 1970 is probably considerable, since the LIFO method would be especially attractive in view of the quantum jump in the cost of fuel in the past few years.

Madison Gas and Electric v. Commissioner of Internal Revenue

Madison Gas had been using LIFO for a portion of its inventories since the 1930's. On August 1, 1974, IRS presented the firm with a Statutory Notice of Deficiency claiming that it was not entitled to use LIFO because the coal used as fuel by a utility company cannot be treated as inventory. IRS recalculated the Madison Gas tax liability for 1969 and 1970 on the FIFO method and claimed an increased amount due of $178,000 (see figure 7).

The firm filed a petition for relief on October 29, 1974 in the U.S. Tax Court in *Madison Gas and Electric Company, Petitioner* v. *Commissioner of Internal Revenue, Respondent.* The company claimed it used accounting methods that: clearly reflected income, conformed to requirements of the Public Utilities Commission of Wisconsin and the Uniform System of Accounts prescribed by the National Association of Regulatory Utilities Commissions, and had been accepted by the Internal Revenue Service for many years. It is interesting that the LIFO method is not mentioned in the petition although in the IRS notice of deficiency and in annual reports to stockholders their inventory is described as being based partly on the LIFO method. Instead, two arguments are presented in the petition. First, the coal on hand is defined as inventory within the meaning of Section 471 of the Tax Code and the Madison Gas method of accounting for the cost of coal consumption therefore is proper. Second, if Section 471 is not appropriate and Section 162-3 of the IRS regulations is governing, then costs can be charged by any method properly reflecting actual consumption. Under Section 162-3 the firm uses the "specific identification of cost" method to account for the purchase and consumption of coal. As described in the petition, the most recent purchases of coal actually are used first and the oldest purchases remain in stock. In short, the firm claimed that its actual physical flow of coal is a last in, first out, or LIFO, flow.

The issue is that the accounting method to be employed to value uses or consumption of materials is not specified in Section 162-3. It has simply been assumed by IRS that FIFO or average cost would be used, since the LIFO method is a special way of treating inventory, and does not apply to prepaid expenses.

The case was docketed for the session of the Milwaukee Tax Court commencing May 23, 1977. This case could have a sig-

nificant effect on tax liabilities and on statistics used in economic accounting and economic analysis. About 10 percent of inventories held by the utilities industry are valued by the LIFO method and it is used sparingly in the service industries. If the IRS is sustained in this case, it will forestall the spread of LIFO in various service industries and probably force all firms that have employed the method to discontinue such use. Affected firms would have to recalculate their revised tax liability back to the end of 1953. That is, the increase in LIFO reserves since 1953 would become taxable income in the first year in which a nonLIFO calculation is applied (see figure 7). Sustaining the IRS position could be detrimental to inventory statistics for all service industries since it might result in the designation of stocks of materials as prepaid expenses instead of as inventories.

Recommendations

First, the IRS Statistics Division should study balance sheets of utilities and other service industries to ascertain if stocks of materials actually are being tabulated as inventory or as some other asset in *Statistics of Income.* At present, they probably are recorded as inventory, but the question can be resolved by a relatively modest one-time study.

Second, the IRS should adopt regulations or statistical procedures that will provide inventory statistics needed for the national accounts.

Finally, the statistics community should be attentive to disposition of the *Madison Gas and Electric Company* case and to its implications for inventory statistics and endeavor to insure that there is no deterioration of inventory data for various service industries if the IRS position in the case prevails.

BEA is considering using physical data on fuels to measure inventory change. This may yield good estimates of inventory change but does not eliminate the problem of reconciliating inventory change with profits as reported to IRS.

CONSTRUCTION INDUSTRY

In chapter 11 statistical and accounting procedures for dealing with goods and services requiring long production periods were considered in a general context. Many construction projects are long term in nature, but since they are treated uniquely in the national accounts and in related source statistics, separate discussion of construction data is warranted.

In the GNP accounts of the United States, construction activity is measured on a value-put-in-place basis. Essentially this is the method that accountants refer to as percentage completion. Except for shipbuilding this differs from all other industrial sectors, where a delivery basis is used. The following is the familiar list of GNP expenditure components:

1. Personal consumption expenditures
2. Gross private domestic investment
3. Fixed investment
4. Nonresidential
5. Structures
6. Producers' durable equipment
7. Residential
8. Structures
9. Producers' durable equipment
10. Change in business inventories
11. Net exports of goods and services
12. Government purchases of goods and services

The construction of buildings, roads, bridges, etc., is included as work is being done in lines 5, 8, and as a component of line 12,

Figure 7. **EXCERPT FROM PETITION FILED BY MADISON GAS AND ELECTRIC COMPANY TO U.S. TAX COURT**

(b) It is determined that you are not entitled to use a last-in, first-out method of accounting for the cost of coal consumption or any variation of such method. Therefore, it is further determined that your taxable income is recomputed by using a first-in, first-out method for valuation of coal on hand pursuant to Sec. 481 of the Internal Revenue Code. Accordingly, your taxable income is increased for the taxable years 1969 and 1970 in the respective amounts of $92,952.80 and $84,743.53, as computed below.

Item	1953	1968	1969	1970
Coal on hand December 31—FIFO basis	$250,486.79	$361,505.43	$644,679.20	$1,021,844.50
Coal on hand December 31—LIFO basis	215,938.80	294,326.99	517,178.41	809,000.18
Increase in coal on hand December 31	34,547.99	67,178.44	127,500.79	212,244.32
Increase in cost of coal on hand January 1	–	–	(67,178.44)	(127,500.70)
Current year increased	–	–	60,322.35	84,743.53
Adjustment to prevent omission—Sec. 481(a)(2)	–	–	(34,547.99)	–
Increases to taxable income	–	–	92,952.80	84,743.53

Source: Petition filed by the Madison Gas and Electric Company, October 29, 1974 to the U.S. Tax Court in *Madison Gas and Electric Company, Petitioner* v. *Commissioner of Internal Revenue, Respondent.* Excerpted by petitioner from IRS Statutory Notice of Deficiency.

not when construction has been completed and end products become available for use. In contrast, equipment expenditures like those for large machine tools are included in producers' durable equipment (line 6) only when delivered to purchasers. While machines are in process of manufacture, increases in production appear as rises in business inventories. When machine tools are completed and delivered to purchasers, expenditures for producers' durable equipment rise but there are corresponding reductions in inventory in line 10. There are no entries for line 10 that relate to construction in progress.

Sources of data entering lines 5, 8, and 12 are surveys conducted by the Bureau of the Census; the concept of work put in place as measured in these surveys is in close agreement with concepts used in the GNP. However, the change in business inventories in the GNP includes an entry for the construction industry. These data, which come from Internal Revenue Service tabulations of balance sheets published in *Statistics of Income,* are shown in table 12.6.

Table 12.6. **INVENTORY AND INVENTORY CHANGE IN THE CONSTRUCTION INDUSTRY: 1965-1974**

(Billions of dollars)

End of Year	Book Value	Change in Book Value
1965	4.3	–
1966	4.5	0.2
1967	5.3	.8
1968	5.4	.1
1969	5.9	.5
1970	6.1	.2
1971	7.1	1.0
1972	8.9	1.8
1973	11.8	2.9
1974	11.9	.1

Source: Internal Revenue Service, *Statistics of Income,* various years.

While inventories in the construction industry are relatively small compared to those in manufacturing and trade, annual changes of $2 billion in recent years have been large enough to warrant at least a limited review of concepts, data sources and reporting problems. The need to synchronize data on profits and data on construction put in place also merits some discussion. There could be a problem because data on construction put in place come from one source–the Census Bureau–while data on inventories held by the construction industry come from another–IRS. Unless the two sets of statistics are coordinated, the same materials might be reported both as construction and as inventory; it is much less likely that something could be omitted from both.

The question is, for example, is a brick put-in-place (a) when the bricklayer puts it into the structure, (b) when it arrives at the construction site, or (c) at an earlier time? Reporting instructions in Census surveys give no specific guidance on this point. The prevailing view of Census personnel most familiar with tabulations of various construction surveys is that once materials are delivered to a construction site they are considered put in place. Materials still at a firm's warehouse or not located at construction sites are not considered put in place. The opinions of experts are that data for large construction projects reported to the Census Bureau come from central office bookkeepers who know only when materials are delivered to various construction sites and not when they are embodied in structures. This view seems reasonable. A literal interpretation that counted each brick as work put in place only when it had been cemented onto a structure would be totally impractical. Thus, to be practical, construction materials generally can be defined as inventories of construction firms only when they are not at construction sites.

Construction Put In Place and Profits

Use of the put-in-place concept also raises a synchronization problem with respect to profits of the construction industry. Bureau of the Census instructions to respondents in cases of nonresidential construction and Census procedures in cases of residential construction call for profits to be allocated over the period of construction. If a project takes two years to complete, the profit (or loss) is to be spread over the two years in proportion to work done. Profits included in value of construction as work progresses are necessarily estimates since profits cannot be known accurately until projects have been completed. Problems occur when firms use methods for calculating profits that are at variance with data used to measure work put in place. Such differences in methods can give rise to discrepancies between the income and product sides of the national accounts.

Both the accounting profession generally and the Internal Revenue Service permit construction firms to use either the percentage completion or completed contract methods of accounting.[6] The former approximates the value-put-in-place concept in that operating revenues in income statements reflect estimates of percentages of construction completed, including allocations of profits over periods of construction. Under the completed-contract method, operating revenues are not recorded in income statements, nor are profits taken and income tax liabilities computed until projects are completed.

Variants are numerous. For example, study of annual financial statements of some firms using the percentage completion method shows that the method is applied in practical ways. A firm using the method may not apply it until, say, 25 percent of a project is completed, since it is impractical to assemble necessary data or to make estimates at very early stages of construction.

Defining when a project is completed also poses problems. A large office building may be partly occupied and require only minor repairs or adjustments, which may continue for a year or more. The general contractor using the completed-contract method may attempt to postpone reporting revenues, profits, and tax liabilities until final repairs are made and all issues between builder and purchaser are settled.

For purposes of this study, it is sufficient to note that use of the percentage completion method of accounting yields

[6] 1.451-3 Income Tax Regulations.

profits data roughly conforming to the timing concept by which construction put in place is measured by the Census Bureau. However, firms using the completed-contract method show profits (or losses) on a different timing basis. This leads to a statistical discrepancy between the income and product sides of the national accounts.

Methods used by large construction firms were checked by examining a small number of SEC 10K annual reports. For these reports construction firms always specify methods used in annual financial statements and methods they used in reporting to IRS can often be inferred. In the data which follow it is assumed that firms used the same method in reporting to stockholders (10K) and to IRS if there was no substantial evidence to the contrary. Reports from 14 firms, all among the 30 largest construction firms on the *Engineering News Record* list of nonresidential builders, were examined. Two of these had 2 methods so 16 cases are shown.

	Cases
Completed contract to both stockholders and IRS	5
Percentage completion to both stockholders and IRS	6
Percentage completion to stockholders and completed contract to IRS	5

For 10 of these 16 cases corporate profits were reported to IRS on the completed-contract method. This is the wrong timing for the measurement of profits in the national accounts since the put-in-place concept is used in the GNP expenditure components. The percentage-completion method for measuring profits would be preferable; however the problem is not serious because amounts involved are small. From 1965 through 1975, corporate profits of the contract construction industry ranged from $1.4 billion to $2.5 billion. During sharp cyclical expansions or contractions in construction, lack of synchronization between profits allocations and construction put in place may cause a statistical discrepancy of a few tenths of a billion dollars at worst.

With respect to inventories, IRS regulations are helpful for statistical purposes insofar as they specify that construction in progress should not be recorded as inventory but rather as an asset item other than inventory. The review of annual reports of large firms showed that this regulation is followed. Large builders typically show asset items such as "construction in progress" or "construction in progress less billings" which are omitted from inventories on balance sheets.

Furthermore extensive discussions were held with staff members of the Statistics Division of IRS concerning their treatment of inventory statistics in the construction industry. Editing instructions used in preparing individual reports for tabulation call for review of large inventory values for construction firms and their removal from inventories whenever there is evidence that these really are construction in progress.

What then is included in the $12 billion in inventories held by the construction industry at the end of 1974? Reporting to IRS is done on a company basis and in many cases reflects consolidated reports that include subsidiaries. Hence, the inventory aggregate reported for the construction industry may include inventories associated with nonconstruction activities. This also implies that construction inventories may be included in tax returns that IRS classifies in other industries. For example, heading the list of the largest construction firms compiled by *Engineering News Record* (April 10, 1975) was United Engineers and Constructors, a subsidiary of the Raytheon Company, which generally is classified as a manufacturing firm.

The annual reports to stockholders of some large construction firms were examined in an attempt to learn what might be included in the IRS inventory aggregates for the construction industry. The cases reported below may suggest the kinds of information being reported.

Firm A reported $90 million of inventory for 1975, which could be identified as not being construction in progress. The firm stated that it held $11 million as "merchandise for resale" (possibly a wholesale or retail operation) and $79 million in materials and supplies. The firm was contacted to obtain further information about the value reported in inventory. It described the $11 million as a variety of purchased items for sale to the shipbuilding and construction industries but did not say if they were held at retail or wholesale establishments. The $79 million was described as steel plates, steel shapes and other heavy materials held at fabricating yards around the world. Changes in the portion of the $79 million held in the United States is properly treated as inventory investment for purposes of measuring GNP. However, the $11 million may duplicate data collected by the Census Bureau in wholesale or retail trade surveys.

Firm B reported $33 million in inventory. The balance sheet had no further description except a note that the firm had changed to LIFO, a method generally not used by construction firms. Construction in progress was clearly segregated in the balance sheet and not included as part of inventory. The firm was contacted concerning the $33 million. It described the inventory as standard steel plates, structural shapes, bars and sheets and strips, and specialized items such as galvanized material, stainless steel, aluminum, etc. The locations of these goods were described as at "our various plants . . . or in some cases at construction warehouses." Since this is a firm which has manufacturing plants, probably at least part of the $33 million duplicates inventory values reported to the Census Bureau.

Firm C reported $40 million in inventory, which included $18 million in work in process and $8 million in unamortized cost or contracts, according to balance sheet notes. The firm used the percentage completion method in reporting to stockholders and the completed contract method, to IRS. Firm C responded to requests for further information with a detailed accounting of its inventory, which is too long to reproduce here. Although it is reasonable to assume that some of the inventory is properly classified as off-site construction materials, a large part is construction in progress. It is not known how this was reported to or tabulated in IRS statistics, but it may have been improperly included in inventory.

Firm D reported $24 million in inventory. In reply to correspondence this was described as "goods purchased for resale through our supply subsidiaries." These inventories probably are

included in Census Bureau wholesale or retail inventories and consequently may involve duplication.

Recommendations

1. With respect to profits data no special steps need be taken at this time. A timing problem exists, but amounts involved appear to be small.

2. Remedial action cutting across agencies is required for improving inventory data in the construction industry. A solution is feasible once the Census Bureau and IRS grant permission to examine each other's data.

The objective is to adjust IRS inventory statistics for the construction industry so that they conform to needs for calculating the national income and product accounts. Reports for only a limited number of large firms need to be examined and only a very modest effort by one or two employees in each agency is involved. Chapter 9 contains a recommendation that large manufacturing, retail and wholesale enterprises submit reports to the Census Bureau showing their total domestic inventories with a breakdown by operating divisions. Inventories applicable to construction activities of such firms would be identified separately. In those cases where IRS obtains a single consolidated report that it classifies in manufacturing, the proper inventory amount for construction would be added to inventories of the construction industry as defined by IRS. There may be a few firms that are classified primarily in the construction sector but who are also large enough in manufacturing or trade to be included in the divisional reporting system proposed for the Census Bureau. For these the process would be reversed. The Census report would indicate the amount of inventory that is properly included in manufacturing sector statistics and should be removed from the IRS tabulation of inventories for the construction industry.

3. Reports from large construction firms should be more carefully reviewed by IRS to ascertain that construction in progress is not being recorded as inventory.