

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Substituting a Value Added Tax for the Corporate Income Tax: First-Round Analysis

Volume Author/Editor: Stephen P. Dresch, An-loh Lin, and D. K. Stout

Volume Publisher: NBER

Volume ISBN: 0-884-10474-5

Volume URL: <http://www.nber.org/books/dres77-1>

Publication Date: 1977

Chapter Title: Appendix A Methods Used to Compute the Value-Added Tax

Chapter Author: Stephen P. Dresch, An-loh Lin, D. K. Stout

Chapter URL: <http://www.nber.org/chapters/c3835>

Chapter pages in book: (p. 187 - 194)



*Appendix A **

Methods Used to Compute the Value-Added Tax

A.1 GENERAL DESCRIPTION

The analysis of the possible effects of a single-level value-added tax (VAT) and of a two-level VAT have been computed by the Econoscope Group of Cybermatics, Inc., and are based on the methods used in the quarterly economic analysis service of Econoscope.

Although based on input/output tables previously published by the Department of Commerce, the Econoscope table used to analyze the VAT has been revised to represent the year 1969 with sufficient accuracy for the purposes of the study. For each quarter-year of its normal operation, Econoscope routinely updates the I/O table with newly available data. For the VAT study, four quarterly tables have been consolidated into a single table for 1969. Some further specifications of this table are as follows:

1. The number of sectors is 106.
2. The Standard Industrial Classification (SIC) coverage of 95 of these sectors is shown in Appendix B.
3. The I/O table is in 1969 prices.
4. Domestic final demand data are drawn from a variety of sources.
 - a. Personal consumption expenditure (PCE) from the Bureau of Economic Analysis (BEA), formerly the Office of Business Economics.
 - b. Constructure from the Bureau of the Census.

*Appendices A and B were prepared by Milton L. Godfrey, Cybermatics, Inc.

- c. Producers durable equipment (PDE) from the BEA-Securities and Exchange Commission survey of capital investment expenditures. Estimating procedures are used to remove the construction portion of capital investment, leaving the PDE investment of corporations. Other government data sources are used to enable Econoscope to estimate noncorporate and agricultural investment in PDE. The consolidated figures from these processes reconcile with the national income accounts as published in the *Survey of Current Business*.
 - d. Since foreign trade is critically important in considering a VAT, processing of the export and import data is covered in detail in section A.2.
 - e. Federal government expenditures are based on published Budget figures modified by later reports on actual expenditures.
 - f. State and local government expenditures are based on the most recent Census of Governments and other summaries by federal agencies, by the Conference Board, and others.
5. The value added for each sector in 1969 has been reestimated for this VAT study. The major procedures followed are described in section A.3.

A.2 FOREIGN TRADE

Exports of domestic merchandise as reported by the Census in Schedule B classifications are grouped by Econoscope into seven major end-use categories according to the Census definitions. Each group is then classified by SIC and assigned to the appropriate I/O sector.

The category, "other exports," excluding reexports, is then augmented by adding nonmerchandise exports classified to match the I/O sector definitions.

Military grant shipments and monetary transactions of government are excluded. Hence, Econoscope estimates of exports differ from the balance-of-payments reports to the extent of these government transactions.

Export values at port of embarkation are converted to producers' prices for each I/O sector by subtracting transportation, trade, and insurance costs. The sums of the deductions are entered as purchases from the transportation, trade, and insurance sectors for each of the seven end-use groups.

The basic reference for classification is U.S. Foreign Trade Statistics Classifications and Cross-Classifications with revisions to January 1, 1970. The end-use categories are: food, feeds, and beverages; industrial supplies and materials; capital goods, except automobiles;

automobiles, vehicles, parts, and engines; consumer goods, nonfood, except passenger cars; special category; and exports, n.e.c.

For the conversion from Schedule B classifications to SIC classifications we follow the correlation table in U.S. Foreign Trade Statistics Classifications. However, we deviate from this table to conform to the standard BEA practice in I/O tables. The basis for this deviation is the I/O requirement that each product be assigned primarily to only one industry. For example, the Census classifies petroleum coke as primary to the petroleum industry and classifies coke from coal as primary to either the chemical or steel industry, depending on where it was made. Since coke from any industry is chemically the same, for I/O purposes we define coke as primary to the chemical industry only, and classify it as secondary to or by-product of the other industries.

The nonmerchandise export trade included in the category exports, n.e.c., is as follows: gold exports, electric energy exports, freight valuation adjustment, transportation of foreigners on U.S. carriers, other travel expenses of foreigners in the United States, fees and royalties paid to American industry, other services sold in export by private industry and government, and income on U.S. investments abroad. In general, these items conform to the definitions used in the quarterly reports on the U.S. balance of payments issued by the Department of Commerce.

Imports of merchandise for consumption are taken from Census reports and converted to SIC classifications to match the input/output definitions. They are further classified as competitive or noncompetitive imports. By estimation, Econoscope adds insurance and freight costs to the published foreign port values to get a c.i.f. value of imports.

Nonmerchandise import data is collected from several sources. However, information from the balance-of-payments report in the *Survey of Current Business* is used as a control on the process so that our estimates can be successfully reconciled with the national income accounts.

Noncompetitive imports are all shown in the body of the I/O table as a purchase by the actual buying industry from the import sector.

Competitive imports are all shown in the body of the I/O table as a purchase by the industry that makes the competitive product. We assume that further distribution of these imports follows normal trade channels. This is identical to one of the methods used by the BEA in the official I/O tables for 1958 and 1963. However, since this is a "dummy" transaction, the value added of the competitive domestic industry is not affected by the imports and reflects only the actual sales of the domestic industry.

A.3 ESTIMATION OF VALUE ADDED

For the base year of an I/O table, the value added is an accurate report of what happened. However, when an I/O table is applied to other years with changed prices, making the assumption that value added is a fixed portion of sector expense can lead to major errors in estimating profitability or other details.

The value-added sector covers three major items, labor, depreciation, and profit as well as some minor items.¹ Although more than half of gross income of some industries goes to value added, the I/O tables show no breakdown into labor, depreciation, etc. Instead, value added is treated as a lump sum, in contrast to the fine detail shown for purchases of goods and services. However, as indicated earlier, it is desirable to break value added into components of labor, depreciation, etc. Information on these components is available from a variety of government files but none of these is an exact match to the I/O tables. The major differences are of three general types: (a) a different definition of value added (in the Census files), (b) different definitions of industry than those used in I/O tables (gross product originating files), and (c) data on enterprises which contain establishments in two or more industries (SEC and Internal Revenue Service data). Only the data file for gross product in current and constant dollars, by industry is establishment-based and is constructed using the same definition of value added as the I/O table. A summary is published annually in the July issue of the *Survey of Current Business* (Tables 1.21 and 1.22) and the file in full detail is available on magnetic tape. This file will be referred to as gross product originating or GPO. Sixteen industries in the GPO file can be matched almost exactly to the I/O sectors.

For Econoscope, we developed a method for estimating the details of value added to match our updated I/O table for each quarterly period, and we used the same procedure for this study. The base for estimating 1969 is BEA data on the reconciliation between gross product originating and the I/O table for 1963. This shows the changes in allocations of value added due to the different sector definition in GPO.

For 1969 we have assumed a continuity of the patterns of 1963 and have reallocated accordingly. While almost all sectors are affected to some extent, the major impact of shifted value added falls on: new construction, repair and maintenance construction, crude petroleum and natural gas, petroleum refining and related industries, wholesale and retail trade, business services, and auto repair.

1. The minor items include interest payments, net rental income, transfer payments, inventory valuation adjustment, subsidies from government. For government enterprises it includes a net surplus item.

The causes of reallocation can be separated into seven major classes, described in the following paragraphs:

a. *Force account.* This covers new and maintenance construction work performed by the employees of other industries; for example, the construction and maintenance of distribution systems by electric power companies.

b. *Industry reclassification.* This covers situations where the GPO industries and the I/O sectors are differently defined: for example SIC 138 (oil and gas field services) is considered part of the crude petroleum and natural gas industry in the GPO file, while in the I/O table it is considered part of the new and maintenance construction sectors.

c. *Installation work.* This covers the installation labor supplied by manufacturers of elevators, escalators, heating and air-conditioning equipment, and other items where the installation labor should be applied to the construction sectors.

d. *Manufacturer's sales offices.* Where these offices are separate from the plants or mines and perform only a marketing function apart from retailing, the associated costs are transferred to the trade sector of the I/O table.

e. *Trade activity.* This covers direct wholesale and retail sales of nontrade sectors, for example, the sale of drugs by hospital dispensaries, which is reallocated to the trade sector of the I/O table.

f. *Manufacturing activity.* This covers manufacturing processes performed in stores or warehouses. It is reallocated to the appropriate manufacturing sector. Examples are food processing in retail stores, or custom-made clothing fabricated in retail stores.

g. *Service activity.* Some wholesale and related establishments sell services that are normally provided by sectors such as transportation, warehousing, equipment rental, auto repair, and others. In each case the associated costs are reallocated to the proper service sector.

The impact of these reallocations of value added is small in many sectors. The accompanying table shows the net effects of shifting on selected sectors where the change is substantial.

A.4 DEPRECIATION AND CAPITAL INVESTMENT

In this study, gross capital investment is not subject to the VAT. Since a large part of the funds for investment are generated by depreciation charges (normally part of value added), we estimated the straight-line depreciation flows using IRS Bulletin F [U.S. Treasury

Table A-1. GPO-I/O Value Added Reconciliation

	GPO File	Value Added, 1969 (millions of dollars)	
		I/O Table	Increase
All construction	43,685	60,403	+38.3%
Crude petroleum and natural gas	10,861	7,218	-33.5
Petroleum refining and related industries	7,235	7,868	+8.7
Wholesale and retail	155,421	142,474	-8.3
Business services	20,470	24,172	+18.1
Auto repairs	4,704	10,320	+119.4

Department] modified to conform to the actual service lives of fixed capital assets (see *Survey of Current Business*, December 1966).

The composition of capital investment purchases of each industry was estimated on the basis of 1969 data on total purchases by type, 1969 data on total expenditures by each industry, and earlier data on purchase patterns of each industry.

Since dependable data on capital stocks by industry are not available at the necessary level of detail, the rate of growth of real product of each industry was used to determine the portion of capital investment for expansion and the portion for replacement of retired capital stocks. Hence, the replacement and expansion investments of each industry were estimated. The replacement part was deducted from value added and from final demand, and added to the proper cell in the body of the I/O table. To determine the reasonableness of this procedure, total estimated depreciation was compared with total depreciation in the GPO files with the following results:

Estimated 1969 depreciation: \$59,594 millions
GPO 1969 depreciation: \$76,715 millions

The IRS data used for the gross product originating file reflects the accelerated depreciation schedules of recent years. Hence, the difference above is in the expected direction.

A.5 CORPORATE PROFIT TAXES

Corporate profit taxes are reported only on an enterprise base. The GPO file shows profits, but not taxes, on an establishment base. Hence, while our tax estimates for each I/O sector are reasonable approximations, there is no benchmark that can be used for validation. The Census report titled *Enterprise Statistics 1963* provides

Methods Used to Compute the Value-Added Tax 193

the most recent data on the structure and industrial coverage of enterprises, bridging the enterprise-establishment gap to some extent. It was necessary to assume that tax liability ratios (tax to profit) based on enterprise data could be applied to establishments. However, it was necessary to deviate from this practice for the petroleum industry (sectors 8 and 45, and for medical, educational services, and nonprofit organizations (sector 95).

A very large part of oil field operations of the petroleum industry are run by integrated corporations. The GPO files show on an establishment base that oil field operations are profitable while refinery operations show a net loss. The GPO operations figures for 1969 (in millions of dollars) are:

	<i>Oil and Gas Fields</i>	<i>Refineries</i>
Corporate profits	4,102	-265
Noncorporate profits	<u>285</u>	<u>5</u>
Total	4,387	-260

After adjustment to I/O definitions by reallocation of value added, the 1969 corporate profit and tax figures (in millions of dollars) are:

	<i>Oil and Gas Fields</i>	<i>Refineries</i>
Corporate profits	3,321	-228
Corporate tax liability	698	-54

The negative income tax liability of the petroleum refining industry must be viewed as a tax credit for the crude petroleum and natural gas industry. In a similar fashion the net loss indicated by the medical, educational services, and nonprofit organization sector must be viewed as a tax credit primarily for the wholesale and retail trade sector.

