

**A REVIEW OF THE ACCURACY OF
TREASURY REVENUE FORECASTS,
1963-1978**

Staff Working Paper

February 1981



**CONGRESSIONAL BUDGET OFFICE
U.S. CONGRESS
WASHINGTON, D.C.**

A REVIEW OF THE ACCURACY
OF TREASURY REVENUE FORECASTS,
1963 - 1978

The Congress of the United States
Congressional Budget Office

PREFACE

In the preparation of the Administration's budget each year, the Treasury Department forecasts federal receipts in the coming fiscal year. This report, prepared at the request of the Joint Economic Committee of the Congress, reviews the accuracy of the Treasury's estimates of aggregate receipts and of its estimates of the effect of significant changes in the tax law over the period 1964 to 1978. As an initial step in an ongoing effort by CBO to analyze the revenue feedback resulting from various tax changes, this study also examines the ability of econometric models to estimate retrospectively the sizes of feedback from enacted legislation. The major part of the work with the econometric models was done in mid-1979 and therefore reflects the models as they existed at that time. In accordance with CBO's mandate to provide objective and nonpartisan analysis, this study contains no recommendations.

Hyman Sanders of the Tax Analysis Division prepared the report under the direction of James M. Verdier with the assistance of Donna G. Richard, Huda Fadel, and John Morrill. The author wishes to acknowledge important contributions made by Joshua Greene, Peter Karpoff, and Fred Ribe of the Tax Analysis Division, and helpful suggestions of the CBO internal reviewers, Nariman Behravesh and James R. Capra. Many persons outside of CBO also provided valuable assistance, including John G. Wilkins, Thomas E. Vasquez, and Howard W. Nester of the Treasury Department; Michael House and David T. Dobbs of the Commerce Department; Kenneth G. Sander of the Social Security Administration; Patricia Riggle of the General Accounting Office; Leonard J. Santow of J. Henry Schroder Bank and Trust Company; Louis A. Talley of the Congressional Research Service; James Fralick of the Federal Reserve Board, and Donald W. Kiefer of the Congressional Research Service who commented on an earlier draft. Francis Pierce edited the manuscript, and Linda Brockman and Shirley Hornbuckle typed it for publication.

Alice M. Rivlin
Director

February 1981

CONTENTS

	<u>Page</u>
PREFACE	iii
SUMMARY	ix
CHAPTER I. INTRODUCTION	1
CHAPTER II. THE ACCURACY OF TREASURY ESTIMATES OF AGGREGATE COLLECTIONS	3
Two Measures of the Accuracy of Treasury Estimates	3
Selection a Criterion to Evaluate Treasury's Performance	6
The Effect on Forecasting Errors in Specific Revenue Soruces on Estimates of Total Revenue	9
Potential Sources of Difference Between Estimated and Actual Revenues	10
CHAPTER III. TREASURY ESTIMATES FOR SPECIFIC TAX MEASURES	19
Computing the Revenue Effects of a Tax Change Using Econometric Models	19
Treasury Policy Regarding Feedback	20
The Effect of Different Accounting Methods.	21
Limits to the Precision of Forecast Estimates of Federal Budget Receipts	22
Estimating Direct Effects Using Econometric Models	22
Measurement of Feedback Effects	25
Conclusion	29
APPENDIX	33
Personal Tax Collections	33
Corporate Tax Accruals	38
Conversion of Accruals into Receipts	38
Direct Effects and Feedback	41

TABLES

	<u>Page</u>
TABLE 1. ESTIMATED AND ACTUAL BUDGET RECEIPTS	4
TABLE 2. ESTIMATED AND ACTUAL CHANGES IN BUDGET RECEIPTS. . .	5
TABLE 3. PRIVATE FORECASTERS' ESTIMATES OF BUDGET RECEIPTS	8
TABLE 4. ESTIMATED AND ACTUAL REVENUES FROM INDIVIDUAL INCOME TAXES	12
TABLE 5. ESTIMATED AND ACTUAL REVENUES FROM CORPORATION INCOME TAXES	13
TABLE 6. ESTIMATED AND ACTUAL REVENUES FROM SOCIAL INSURANCE CONTRIBUTIONS	14
TABLE 7. PERCENT DIFFERENCES BETWEEN THE ADMINISTRATION'S ECONOMIC ASSUMPTIONS AND ACTUAL ECONOMIC CONDITIONS	15
TABLE 8. PERCENT DIFFERENCES BETWEEN TREASURY ESTIMATES AND ACTUAL COLLECTIONS--SUMMARY	17
TABLE 9. COMPARISON OF ESTIMATES OF THE DIRECT EFFECTS ON TAX COLLECTIONS OF SELECTED CHANGES IN THE FEDERAL INCOME TAX LAW	24
TABLE 10. COMPARISON OF ESTIMATES OF FEEDBACK EFFECTS RESULTING FROM CHANGES IN THE FEDERAL INCOME TAX LAW	26

APPENDIX TABLES

TABLE A-1. PERSONAL AND CORPORATE TAX EQUATIONS AS SPECIFIED IN THE DRI, WHARTON, AND BEA MODELS . . .	34
TABLE A-2. ESTIMATED EFFECTS OF SELECTED TAX CHANGES	39
TABLE A-3. DIFFERENCES BETWEEN UNIFIED BUDGET AND NIA ACCOUNTING METHODS	40

SUMMARY

Each year, in the President's Budget, the Treasury Department provides an estimate of the federal government's receipts for the coming fiscal year. It does this by estimating tax collections under the existing tax structure and adjusting them for changes in the tax laws recommended in the budget. The accuracy of these estimates has become of greater concern in recent years, particularly since the advent of the Congressional budget process in 1974. There has also been some concern in recent years that Treasury estimates of the gain or loss in revenue from specific tax law changes may not adequately take into account "feedback" or "supply-side" responses brought about by those changes. This paper reviews the accuracy of Treasury estimates using a retrospective comparison of Treasury estimates and actual collections for the period from 1963 to 1978.

Treasury Estimates of Receipts

During the years 1963-1978, the Treasury forecasted aggregate receipts between six and nine months before the start of the fiscal year. Over this 16-year period, these estimates deviated from total collections by an average of about 4 percent. Private forecasts, by comparison, have erred in recent years by about 3 percent.

A forecast of aggregate receipts, however, may be less inaccurate than the forecasts of components of the total. In a particular year, some of the components may be overestimated and others underestimated; their offsetting differences may reduce the average deviations between the estimated and the actual aggregates. Indeed, a separate analysis of the three most important components of aggregate collections--the individual income tax, the corporation income tax, and social insurance taxes--reveals that over the period 1963-1978 their estimated amounts differed from actual collections by 6 percent, 11 percent, and 3 percent, respectively.

Estimates for each revenue source assume a particular set of economic conditions. They also assume that recommended changes in

the tax law will be enacted by the Congress. When the foregoing estimates were adjusted for unanticipated economic events and for enacted, rather than recommended, legislation, the average difference between estimated and actual revenues for the three components mentioned dropped to 1 percent each for personal tax collections and corporation tax receipts and became insignificant for social insurance contributions over the 16-year period.

Treasury Estimates of Specific Tax Law Changes

Ideally, the Treasury's estimates of the effect of specific tax law changes on revenues could be evaluated by comparing them to the differences in revenues with and without the tax legislation. The revenue impact resulting from a tax law change cannot be directly measured, however, because the Treasury does not record the revenues that would have been received in the absence of a change. Such an estimate might be obtained with the use of an econometric model. Unfortunately, the employment of three separate models--those of Data Resources, Inc., Wharton Econometric Forecasting Associates, and the Bureau of Economic Analysis of the Department of Commerce--to estimate the revenue effects of each significant tax law change between 1964 and 1976 produced figures that differed widely without any particular pattern. These results suggest that the models must be viewed very cautiously when used for this purpose.

The Exclusion of Feedback from Treasury Estimates

Treasury estimates for proposed changes in the tax law have been criticized because they do not include "feedback"--the effect on federal revenue produced by the changes in economic activity and incomes brought about by a change in the tax law. The Treasury has argued that because aggregate revenue estimates include feedback, its further inclusion in estimates for particular proposals would result in double counting. In addition, the amount of feedback associated with particular proposals cannot be readily computed. Because of these difficulties, the Treasury has held that direct revenue estimates without allowance for feedback provide the most appropriate basis for evaluating competing tax proposals.

To test this belief, the same three econometric models were used to estimate the feedback effect for each significant tax law change in the 1964-1976 period. The models produced estimates

even more inconsistent than those of direct revenue impacts. In some cases, contrary to what one would expect, the indicated direction of the feedback was the same as that for the direct revenue impact of the tax law change. These differing and at times inconsistent results do not yield a standard by which the accuracy of the Treasury's estimates can be tested. They also suggest that the feedback effect of any specific tax law change, particularly a change in corporate tax liabilities, is still uncertain and that better methods of estimating such effects must be developed.

Since the enactment of the Congressional Budget Act in 1974, the Congress has become increasingly concerned with the accuracy of federal outlay and revenue forecasts. The second budget resolution each year specifies a ceiling above which projected federal spending may not climb and a floor below which expected revenues may not be reduced. Because forecasts of expenditures and receipts weigh heavily in the establishment of these legislated limits, their accuracy is essential to the effectiveness of the budget process. Miscalculations can cause difficulties, since many federal programs and the tax liabilities of many taxpayers may be dependent on the availability of federal funds. Imprecise estimates may have still other repercussions: Budget projections that underestimate the size of the federal deficit may cause the Congress to stimulate the economy unintentionally, and overestimates may inadvertently result in decisions that tend to contract the economy. Recurring forecasting errors may, for these reasons, lead policymakers to give less weight to budget resolution guidelines than they do at present.

This report examines Treasury Department forecasts of aggregate tax collections and of revenue changes caused by specific tax law changes. Although Treasury revenue projections are crucial to the development of budgetary and fiscal strategies, little is known about how they are produced. A full description of the Treasury's estimating methodology is not available, and for this reason the report attempts only to evaluate the accuracy of the forecasts rather than to appraise the methodology underlying them.

Chapter II presents the aggregate revenue forecasts made in the years 1963-1978 and measures their accuracy against two standards: actual collections, and the projections of other revenue forecasters.

Treasury's critics have argued that, on the basis of certain statistical measures, Treasury's forecasts can be shown to differ considerably from actual receipts. The report discusses the adequacy of these measures and suggests alternative criteria for evaluating the Treasury's performance. It is true that comparing

Treasury estimates with actual revenues serves to highlight a number of the shortcomings of the Treasury's estimation techniques; but since the estimates of private forecasters have many of the same shortcomings, it may be more useful to measure Treasury's forecasts against the relative standard of those other forecasts.

The remainder of Chapter II is devoted to analyzing the potential sources of error in the Treasury's revenue forecasts. It focuses on two key elements--legislative and economic assumptions--and shows that they account for sizable portions of the estimation error.

Chapter III reviews the accuracy of Treasury estimates of revenue changes induced by specific changes in the tax law. Unlike the aggregate revenue data, though, Treasury estimates of the effects of legislation cannot be measured against an absolute standard since actual revenue changes resulting from tax law changes are never recorded. Therefore, the report compares Treasury estimates to other forecasters' revenue projections.

A final section of Chapter III reviews the usefulness of estimating "feedback" for specific tax law changes. Econometric models used by private forecasters produce estimates that can be broken down into a direct revenue impact and a feedback effect. The paper analyzes these estimates in detail and concludes that, given the present state of the art, provision of such estimates for corporate tax changes, in particular, can easily be misleading.

CHAPTER II. THE ACCURACY OF TREASURY ESTIMATES OF AGGREGATE COLLECTIONS

TWO MEASURES OF THE ACCURACY OF TREASURY ESTIMATES

In January of each year, the Treasury Department estimates tax receipts for the coming fiscal year.¹ Table 1 presents the annual estimates of total federal revenues between 1963 and 1978, comparing them with actual collections during this period. It shows that total revenue estimates contained in the annual budget have differed from receipts, on the average, by about 4 percent.

Critics of the Treasury's forecasting record have argued that this does not provide a stringent enough measure of Treasury's performance. The relevant measure, they say, is not how close Treasury came to predicting total revenues, but how close it came to predicting the change in revenues from one year to the next. Since revenues in recent times have rarely declined from year to year, and since the trend upward has been relatively steady, it should not be difficult, they say, to come close to predicting the annual total. The Treasury's accuracy in predicting the annual change, they argue, would be more to the point.

Table 2 shows that, when looked at in this way, the Treasury's performance is less impressive. Columns 4 and 5 show the differences between the forecasted changes and actual changes in dollar terms and in percentage terms, respectively. Between 1964 and 1978, the average percentage error--the statistic critics most frequently cite--was about 70 percent.

Although this average percentage error exceeds the mean error calculated in Table 1 by a factor of 17, both numbers, of course, are derived from the same information. Since 1963, federal revenues have ranged between \$106 billion and \$402 billion annually,

1. These figures appear in The Budget of the United States Government, published annually by the Office of Management and Budget.

TABLE 1. ESTIMATED AND ACTUAL BUDGET RECEIPTS, 1963-1978: IN BILLIONS OF DOLLARS

Fiscal Year (1)	Budget Estimate <u>a/</u> (2)	Actual (3)	Difference	
			(in dollars) (4)	(in percent) (5)
1963	113.5	106.6	6.9	+6
1964	109.3	112.7	- 3.4	-3
1965	115.9	116.8	- 0.9	-1
1966	119.8	130.9	-11.1	-8
1967	141.4	149.6	- 8.2	-5
1968	163.3	153.7	9.6	+6
1969	178.1	187.8	- 9.7	-5
1970	198.7	193.7	5.0	+3
1971	202.1	188.4	13.7	+7
1972	217.6	208.6	9.0	+4
1973	220.8	232.2	-11.4	-5
1974	256.0	264.9	- 8.9	-3
1975	295.0	281.0	14.0	+5
1976	297.5	300.0	- 2.5	-1
1977	351.3	357.8	- 6.5	-2
1978	393.0	402.0	- 9.0	-2
Average Absolute Difference			8.1	4

Source: Office of Management and Budget, Budget of the United States Government, various years.

a/ Until 1977, the federal fiscal year began in July, 6 months after the initial estimates were published in the Budget, and ended 18 months later. The fiscal year now runs from October 1 to September 30, thus beginning 9 months after the revenue estimates are published in the Budget.

TABLE 2. ESTIMATED AND ACTUAL CHANGES IN BUDGET RECEIPTS, 1964-1978: IN BILLIONS OF DOLLARS

Fiscal Year (1)	Estimated Change <u>a/</u> (2)	Actual Change <u>b/</u> (3)	Difference	
			(in dollars) (4)	(in percent) (5)
1964	2.7	6.1	-3.4	-56
1965	3.2	4.1	-0.9	-22
1966	3.0	14.1	-11.1	-79
1967	10.5	18.7	-8.2	-44
1968	13.7	4.1	+9.6	+234
1969	24.4	34.1	-9.7	-28
1970	10.9	5.9	+5.0	+85
1971	8.4	-5.3	+13.7	+258
1972	29.2	20.2	+9.0	+45
1973	12.2	23.6	-11.4	-48
1974	23.8	32.7	-8.9	-27
1975	30.1	16.1	+14.0	+87
1976	16.5	19.0	-2.5	-13
1977	51.3	57.8	-6.5	-11
1978	35.2	44.2	-9.0	-20
Average Absolute Difference			8.2	70

SOURCE: Office of Management and Budget, Budget of the United States Government, various years.

a/ The difference between the current year's estimated receipts and the previous year's actual receipts.

b/ The difference between the current year's and the previous year's actual receipts.

and have changed by an average of \$20 billion each year. Treasury aggregate projections during this period have deviated from actuals by an average of \$8 billion. This \$8 billion figure is large compared to the \$20 billion average change in receipts, but relatively small compared to total revenues.

Selecting a Criterion to Evaluate Treasury's Performance

Both measures of error accurately reflect the Treasury's forecasting record; the choice between them depends on the purpose to be served. If the purpose is simply to determine how close Treasury has come to predicting actual total revenues, the first measure should be adequate. If, however, the purpose is to show that Treasury has difficulty predicting precise year-to-year changes, the second measure is a good illustration of that.

Few legislative or budgetary decisions are likely to turn on the exact size of year-to-year increases in revenues. For most budgetary purposes the need is to determine what total revenues are likely to be, since this indicates the resources that will be available to the federal government as well as the likely impact of the federal budget on the economy. Thus, the first measure of the accuracy of Treasury revenue estimates is the more useful one for most budgetary and legislative purposes.

One difficulty with the second measure is that in some circumstances it can be overly sensitive to year-to-year fluctuations in revenues. It may show very large percentage errors, for example, when the Treasury has in fact missed the correct total by only a relatively small amount in actual dollars. To illustrate, suppose the Treasury forecasts revenues to increase by \$1 billion. If actual revenues increase by \$2 billion, the Treasury will be charged with a 50 percent forecasting error. If, on the other hand, actual revenues rise by a fairly small amount, \$0.1 billion, the Treasury error will be recorded as 1,000 percent, while if revenues decline by \$1 billion, the error will be 200

percent.² These percentage errors can easily be misinterpreted, especially since federal outlay projections are not generally evaluated in this manner.³

The first measure remains less than ideal, however. While a 4 percent estimation error represents only a small fraction of total revenues, it nevertheless translates into \$16 billion. Recurring errors of this magnitude could entail considerable political and economic costs.

It would thus be useful to have other forecasts of federal receipts with which to compare the Treasury forecasts. Such forecasts are made several times during each fiscal year by financial institutions whose investment portfolios contain government securities. Relatively few of them, however, publish their forecasts. Table 3 presents figures obtained from three New York investment houses. Their estimates were all made between December and March prior to the fiscal year concerned, and did not necessarily assume either that the administration's legislative proposals would be adopted or that its economic forecast would be realized.

2. The following table summarizes these results.

Case	Treasury Estimate (\$ billions)	Actual Change in Collections (\$ billions)	Forecasting Error
A	+1.0	+2.0	50%
B	+1.0	+0.1	1,000%
C	+1.0	-1.0	200%

3. This measure's extreme sensitivity to fluctuations in revenues can be moderated by employing a three-year moving average. In place of an annual estimate of the revenue change during a particular year, one can use the average of that annual estimate and those of the two adjacent years. This provides a better indication of underlying patterns in the series of estimated and actual changes. One drawback, though, is the inability to analyze Treasury's accuracy in specific years, particularly years when collections grow rapidly, or when they remain relatively stable.

TABLE 3. PRIVATE FORECASTERS' ESTIMATES OF BUDGET RECEIPTS, 1971-1978: IN BILLIONS OF DOLLARS

Fiscal Year	Mean Estimate	Actual	Percent Differences	
			Private Forecasts	Treasury Forecasts <u>a/</u>
1971	198.7	188.4	+5	+7
1972	214.5	208.6	+3	+4
1973	221.0	232.2	-5	-5
1974	257.5	264.9	-3	-3
1975	289.0	281.0	+3	+5
1976	290.2	300.0	-3	-1
1977	363.2	357.8	+2	-2
1978	394.0	402.0	-2	-2
Average Absolute Difference			3	4

SOURCES: Aubrey G. Lanston and Company, Inc., Lehman Brothers, Inc., and J. Henry Schroder Bank and Trust Company.

NOTE: For 1971-1973, figures were available only from Lanston; for 1974, from Lehman only. The 1975 figure represents the average of the Lanston and Lehman estimates. For 1976-1978, the numbers reported are the average of the Lanston and Schroder estimates.

a/ From Table 1, col. 5.

It is evident from these data that, since 1971, private forecasters have performed about as well as the Treasury. On average, their predictions of total federal revenues have erred by about 3 percent while Treasury's estimates between 1971 and 1978 have missed the mark by about 4 percent. Given the limited number of estimates in Table 3, it is not possible to say that the differences in these error rates are statistically significant. Nevertheless, the gradual accumulation of revenue forecasting expertise outside the federal sector should eventually permit the establishment of better standards by which to evaluate Treasury forecasts.

THE EFFECT OF FORECASTING ERRORS IN SPECIFIC REVENUE SOURCES ON ESTIMATES OF TOTAL REVENUE

What factors account for the 3-4 percent error rate in private and Treasury revenue forecasts? A thorough attempt to uncover these elements requires that the receipts figures presented in Tables 1 and 3 be broken down into specific revenue sources. Evaluating the projections solely on the basis of total receipts may be misleading because overestimates of collections from some revenue sources will offset underestimates from other categories. Thus the overall difference between total estimated and actual collections in a particular year may be smaller than the sum of the differences attributable to particular revenue sources. In fiscal year 1976, for example, Table 1 shows that total revenues exceeded Treasury's projection by 1 percent. Income tax collections in that year reached \$131.6 billion, however, exceeding earlier forecasts by 19 percent. Offsetting this gain was a sizable 15 percent shortfall in corporation taxes.⁴ While errors in the two revenue sources were greater than for the sum of all receipts categories, they offset one another so that the overall error was much smaller.

Private forecasters' past revenue estimates for particular revenue sources are generally unavailable. Treasury estimates for most sources, however, appear annually in the President's Budget. From the published data, three categories--the individual income tax, the corporation income tax, and social insurance contributions--were chosen for study because they made up about 85 percent

4. Corporation tax receipts were initially estimated at \$47.7 billion (see Table 5, column 1) but were later reported at \$41.4 billion (Table 5, column 2).

of total federal receipts between 1963 and 1978.⁵ Columns 1 and 2 of Tables 4, 5, and 6 compare the Treasury's estimates for each of these revenue sources with actual collections.

POTENTIAL SOURCES OF DIFFERENCES BETWEEN ESTIMATED AND ACTUAL REVENUES

Differences between the estimates and the actuals arise primarily because Treasury projections are based on assumptions as to economic conditions in the coming fiscal year and on assumptions as to changes in the tax law—assumptions that may not be borne out by events.⁶ If Treasury estimates are adjusted for the differences between these assumed conditions and those that ultimately prevailed, the remaining differences between Treasury's estimates and actual collections can serve as a more precise measure of the predictive accuracy of the Treasury's estimating techniques.

Differences Caused by Legislative Assumptions. The aggregate estimates appearing in the budget are based upon existing tax laws and the Administration's proposed changes in these laws. The ultimate tax legislation enacted by the Congress often differs substantially from the President's initial proposals. Table 4 includes a number of instances in which income tax collections were different from those estimated because Congressional action modified the legislative requests made by the Administration. For example, the President recommended income tax changes for fiscal year 1976 that would have reduced collections by over \$32 billion. The enacted legislation, however, cut income taxes by only \$13 billion, or \$19 billion less than initially proposed.

-
5. The size of this share has varied from year to year. For a given year, this fraction can be computed by adding the historical figures for that year appearing in Tables 4, 5, and 6 and dividing the total by the overall collections figure shown in Table 1.
 6. See former Secretary of the Treasury Simon's testimony in Hearings on the Second Budget Resolution, Fiscal Year 1976, House Budget Committee, September 29, 1975, especially pp. 5-9.

Column 4 in Tables 4, 5, and 6 shows adjusted revenue estimates that take into account the differences between proposed and enacted tax measures. These figures are calculated by adding to initially forecasted revenues the revenue losses (or gains) resulting from the Administration's proposed tax changes, and then subtracting the estimated revenue effects of newly enacted tax provisions.⁷ When these adjustments are made, the difference between estimated and actual receipts for the individual income tax drops from 6 percent to 4 percent; the difference for corporation income taxes falls from 11 percent to 8 percent; and that for social insurance contributions declines from 3 percent to 2 percent. These changes reduce the average difference for the three revenue sources combined by about 2 percentage points.

Differences Caused by Economic Assumptions. Besides errors resulting from legislative assumptions, Treasury revenue estimates may differ from actual receipts because the Administration's forecast of future economic conditions is not realized. Since most federal revenue sources are highly sensitive to the state of the economy, this can lead to substantial differences between estimates and actuals. For example, the 1974-1975 recession, largely unanticipated in the Administration's forecast, contributed to slower growth in individual income tax receipts. Because the revenue estimation techniques used by the Treasury are not available, little is known about the sensitivity of the Treasury's revenue estimates to underlying economic conditions. Isolating the precise effects of changes in economic activity on federal revenues is thus extremely difficult.

Table 7 shows the differences (in percentage terms) between the Administration's assumptions about GNP, personal income, and

7. These adjustments can only approximate the legislative assumptions' true revenue impact because Congressional actions changing the Administration's proposed fiscal policy stance will have their own economic effects. These effects, though, are likely to be fairly small. Reestimating totals based on a revised economic forecast taking into consideration newly enacted legislation would provide marginally greater accuracy. Unfortunately, because of difficulties in quantifying the effects of legislative actions, the revised figures may not necessarily be better than the unadjusted totals presented in the text.

TABLE 4. ESTIMATED AND ACTUAL REVENUES FROM INDIVIDUAL INCOME TAXES, 1963-1978: IN BILLIONS OF DOLLARS

Fiscal Year	Budget Estimate <u>a/</u>	Actual	Percent Difference	Estimate Adjusted for Legislative Differences <u>b/</u>	Percent Difference Between Adjusted Estimate and Actual
1963	49.3	47.6	+4	49.6	+4
1964	45.8	48.7	-6	47.9	-2
1965	48.5	48.8	-1	47.0	-4
1966	48.2	55.4	-13	48.2	-13
1967	56.2	61.5	-9	55.8	-9
1968	73.2	68.7	+7	69.8	+2
1969	80.9	87.2	-7	82.4	-6
1970	90.4	90.4	0	90.4	0
1971	91.0	86.2	+6	91.0	+6
1972	93.7	94.7	-1	91.8	-3
1973	93.9	103.2	-9	94.8	-8
1974	111.6	119.0	-6	112.2	-6
1975	129.0	122.4	+5	121.3	-1
1976	106.3	131.6	-19	125.9	-4
1977	153.6	157.6	-3	160.5	+2
1978	171.2	181.0	-5	181.8	0
Average Absolute Difference			6		4

SOURCE: Office of Management and Budget, Budget of the United States Government, various years.

a/ Between 1963 and 1976, estimate appears in the President's budget six months prior to the start of the fiscal year. Since 1976, estimate appears 9 months before the fiscal year.

b/ Column shows what the budget estimate would have been if it had been based on the legislation actually enacted.

TABLE 5. ESTIMATED AND ACTUAL REVENUES FROM CORPORATION INCOME TAXES, 1963-1978: IN BILLIONS OF DOLLARS

Fiscal Year	Budget Estimate <u>a/</u>	Actual	Percent Difference	Estimate Adjusted for Legislative Differences <u>b/</u>	Percent Difference Between Adjusted Estimate and Actual
1963	26.6	21.6	+23	22.7	+ 5
1964	23.8	23.5	+ 1	25.0	+ 6
1965	25.8	25.5	+ 1	25.2	+ 1
1966	27.6	30.1	- 8	28.6	+ 5
1967	34.4	34.0	+ 1	34.4	+ 1
1968	33.9	28.7	+18	31.8	+11
1969	34.3	36.7	- 7	35.8	- 2
1970	37.9	32.8	+16	37.9	+16
1971	35.0	26.8	+31	35.0	+31
1972	36.7	32.2	+14	36.7	+14
1973	35.7	36.2	- 1	35.7	- 1
1974	37.0	38.6	- 4	37.0	- 4
1975	48.0	40.6	+18	44.2	+ 9
1976	47.7	41.4	+15	37.7	- 9
1977	49.5	54.9	-10	52.5	- 4
1978	58.9	60.0	- 2	62.2	+ 4
Average Absolute Difference			11		8

SOURCE: Office of Management and Budget, Budget of the United States Government, various years.

a/ Between 1963 and 1976, estimate appears in the President's budget six months prior to the start of the fiscal year. Since 1976, estimate appears 9 months before the fiscal year.

b/ Column shows what the budget estimate would have been if it had been based on the legislation actually enacted.

TABLE 6. ESTIMATED AND ACTUAL REVENUES FROM SOCIAL INSURANCE CONTRIBUTIONS, 1963-1978: IN BILLIONS OF DOLLARS

Fiscal Year	Budget Estimate <u>a/</u>	Actual	Percent Difference	Estimate Adjusted for Legislative Differences <u>b/</u>	Percent Difference Between Adjusted Estimate and Actual
1963	19.6	19.8	- 1	19.4	- 2
1964	21.5	22.0	- 2	21.3	- 3
1965	21.9	22.3	- 2	21.9	- 2
1966	23.9	25.6	- 7	25.8	- 1
1967	30.5	33.3	- 8	30.4	- 9
1968	35.0	34.6	+ 1	35.1	+ 1
1969	40.0	39.9	0	40.0	0
1970	45.9	45.3	+ 1	43.9	- 3
1971	49.1	48.6	+ 1	48.8	0
1972	57.6	53.9	+ 7	54.9	+ 2
1973	63.7	64.5	- 1	68.4	+ 6
1974	78.2	76.8	+ 2	78.0	+ 2
1975	85.6	86.4	- 1	85.4	- 1
1976	91.6	92.7	- 1	91.5	- 1
1977	113.1	108.7	+ 4	108.0	0
1978	126.1	123.4	+ 2	124.8	+ 1
Average Absolute Difference			3		2

SOURCE: Office of Management and Budget, Budget of the United States Government, various years.

a/ Between 1963 and 1976, estimate appears in the President's budget six months prior to the start of the fiscal year. Since 1976, estimate appears 9 months before the fiscal year.

b/ Column shows what the budget estimate would have been if it had been based on the legislation actually enacted.

TABLE 7. PERCENT DIFFERENCES BETWEEN THE ADMINISTRATION'S ECONOMIC ASSUMPTIONS AND ACTUAL ECONOMIC CONDITIONS, 1963-1978

Calendar Year	GNP <u>a/</u>	Personal Income <u>a/</u>	Pre-tax Corporate Profits <u>a/</u>
1963	-1	-1	+ 3
1964	-1	-1	-14
1965	-3	-3	-19
1966	-3	-3	- 5
1967	0	-1	+ 2
1968	-2	-2	- 5
1969	-1	-2	+ 5
1970	+1	0	+18
1971	+1	+1	+18
1972	-1	-2	+ 1
1973	-2	-4	-12
1974	-1	-2	- 6
1975	-1	-1	+ 1
1976	-1	0	- 1
1977	0	-1	- 1
1978	-1	-1	- 7
Average Absolute Difference:			
	1	2	7

NOTE: Figures appearing in the budget documents represent mid-points of intervals extending several billion dollars on each side. It is assumed, however, that the Treasury uses the published figures as a basis for its own estimates.

a/ Source: Office of Management and Budget, Budget of the United States Government, various years.

pre-tax corporate profits from 1963 to 1978 and the levels actually achieved in those years. Since the Administration's economic forecasts underly the Treasury estimates of tax collections, they would seem to be responsible for some of the observed differences between Treasury projections and historical receipts.⁸ While in practice it may be difficult to measure the precise relationship, it is possible to approximate the general magnitude of the differences contributed by economic assumptions.⁹ Since projections of personal income between 1963 and 1978 deviated from reported totals by an average of 2 percent, economic factors may account for 2 points of the average 3 percent difference between estimated and actual social insurance contributions, and about 3 points of the average 5 percent difference in individual income tax receipts.¹⁰ Similarly, 8 points of the average 10 percent

-
8. Lacking access to the Treasury models, CBO has assumed that differences between receipts and estimates are proportional to the size of the differences between the economic assumptions and the economic performance. For example, if the Administration underestimates GNP, personal income, and corporate profits by 10 percent, then, in theory, estimated collections from most federal revenue sources (see footnote 10) should be about 10 percent lower than actual receipts. If estimated collections turn out to be 12 percent lower, the extra 2 percent would be attributed to imprecision in Treasury's estimation methodology.
 9. It is not obvious that more sophisticated statistical techniques would yield more definitive results. Most econometric models, for example, use economic factors in predicting future tax collections that do not directly correspond to those used by the Administration. Incorporating the Administration's assumptions into these models would require numerous adjustments that would only indirectly affect the models' estimates of revenues. It is unlikely that the results of these makeshift changes would describe reliably the relationship between economic activity and tax collections.
 10. For the individual income tax, there is likely to be a more than proportional response of receipts to errors in estimating personal income, since the progressivity of the tax

difference in corporation tax receipts can be related to errors in the Administration's forecasts of corporate profits.

Other Differences Between Estimated and Actual Revenues.

After removing the impact on revenues of differences between proposed and enacted legislation and differences between assumed economic conditions and those achieved, the remaining differences between Treasury estimates and actual receipts are fairly small. Table 8 shows that the component of the total difference that can be labeled the methodological error amounted to about 1 percent each for personal tax collections and corporation tax revenues and was insignificant for social insurance contributions. On the average, therefore, Treasury receipts estimates after adjustments were accurate to within 1 percent of actual collections.

TABLE 8. PERCENT DIFFERENCES BETWEEN TREASURY ESTIMATES AND ACTUAL COLLECTIONS, 1963-1978--SUMMARY

Revenue Source	Total Difference	Difference Due to Legislative Assumptions	Difference Due to Economic Assumptions	Remaining Difference
Individual income tax	6	2	3	1
Corporation income tax	11	3	7	1
Social insurance contributions	3	1	2	0

structure serves to exaggerate the impact of changes in personal income. Assuming that the elasticity of receipts to changes in income is about 1.5, the average two percent error in estimating personal income will result in about a three percent difference in projected income tax liabilities.



CHAPTER III. TREASURY ESTIMATES FOR SPECIFIC TAX MEASURES

In proposing new tax legislation, the Treasury Department estimates the gain or loss that will result from each change in the tax law. Unlike its estimates of aggregate receipts, these projections cannot be verified in terms of later collections because the changes in tax collections cannot be separated into those specifically resulting from changes in the tax law and those resulting from other factors such as economic growth, inflation, and changes in labor market conditions.

COMPUTING THE REVENUE EFFECTS OF A TAX CHANGE USING ECONOMETRIC MODELS

In principle, the problem could be resolved by the use of econometric models that simulate the behavior of the economy under assumed conditions. In this study, the revenue impact of certain tax changes was analyzed with the aid of three large-scale forecasting models--those developed by Data Resources, Inc. (DRI), Wharton Econometric Forecast Associates (Wharton), and the Bureau of Economic Analysis of the Department of Commerce (BEA). These models are used both to forecast future levels of economic activity and to reproduce the historical performance of the economy.¹ It was possible to estimate the gain or loss in revenues from specific tax legislation by running the models to show total revenues both with and without the tax change.² The difference

-
1. An excellent illustration of the latter application is contained in Joint Economic Committee, Economic Stabilization Policies: The Historical Record, 1962-1976, November 1978.
 2. In order to produce figures rigorously comparable to the Treasury's revenue estimates, the models should also be run under the same economic conditions assumed by the Treasury in making its projections. Incorporating all of these economic assumptions was not considered practicable, however, and was in any event unlikely to alter the results substantially. See the discussion in Chapter II.

between the two totals provides an estimate of the change in tax revenues caused by the particular legislation.³ The results obtained by this method also provide an indirect measure of the revenue impact of a tax-induced income change--referred to as "revenue feedback."

TREASURY POLICY REGARDING FEEDBACK

The estimates provided by the models of the net revenue impacts of tax changes can be separated into the direct revenue impact of the legislation and the "revenue feedback" effect. When taxes are cut, for example, the direct effect is a reduction in revenues. But the tax cut itself may stimulate increased economic activity and higher incomes, leading to partially offsetting revenue gains. The Treasury takes account of revenue feedback resulting from specific legislation in its estimates of aggregate revenue collections.⁴ Because feedback is embedded in the economic forecasts containing these aggregate estimates, feedback estimates for specific tax proposals or tax law changes are not reported by the Treasury.⁵

The Treasury has been criticized for not reporting revenue feedback for specific proposals. In its own defense, it has argued that providing feedback information both for aggregate

3. The revenue effects of a tax change are sometimes studied by examining only a handful of macroeconomic relationships. This approach simplifies the analysis but excludes many of the complex interactions between variables that are normally captured by more general macroeconomic models. For an example of this "partial equilibrium" approach see Joseph Pechman, "Responsiveness of the Federal Individual Income Tax to Changes in Income," in Brookings Papers on Economic Activity, 1973:2, pp. 385-421.
4. Generally, the Treasury's long-run revenue projections include the induced economic effects of tax law changes upon prices and supply behavior, in addition to their immediate impacts on individual incomes and consumption. Explicit estimates of these effects appeared for the first time in the Carter Administration's FY 1982 Budget (p. 82).
5. See statement of Treasury Secretary W. Michael Blumenthal on The Revenue Act of 1978 (H.R. 13511) delivered before the Senate Finance Committee, August 17, 1978.

revenue collections and for estimates of specific legislation would result in double counting. Estimates of aggregate revenues for a coming fiscal year include feedback because they are based on the Administration's economic forecast. This forecast, in turn, reflects the assumed fiscal impact of enactment of all of the Administration's specific tax proposals. To show this feedback again as a part of the revenue estimates for particular proposals would be to count it twice.

The Effect of Different Accounting Methods

The use of econometric models to assess the Treasury's performance is handicapped because the models do not report revenue data in the same way as does the Treasury. Treasury revenue estimates are based on the unified budget concept, while the econometric models record their information on a national income accounts (NIA) basis.⁶

Unified budget and NIA estimates of federal tax revenues differ in two major ways. First, federal revenues on the unified budget basis are counted only when received, while the NIA method records personal taxes at the time of withholding and corporate taxes as they are accrued. The difference in accounting conventions is especially significant in the case of corporate income taxes, because the payment of the amounts accrued may extend over several years.

The second difference between the two accounting methods is that they do not define personal and corporate tax revenues in the same way. Unified budget figures, for example, distinguish among individual income, gift, and estate tax collections, while the NIA estimates list all three items under the heading of "personal tax collections." Because the econometric models do not distinguish between the elements that comprise the NIA receipts categories, it was not possible to correct for these accounting differences. The differences are not of major importance, however, since the income tax has typically provided 95 percent of all the revenues under the NIA heading of personal tax collections, and the corporate tax has, on the average, accounted for over 90 percent of NIA corporate accruals figures.

6. Table A-3 in the Appendix summarizes the differences between these accounting methods.

Limits to the Precision of Forecast Estimates of Federal Budget Receipts

In addition to the accounting problems described above, accuracy may suffer from the estimation techniques used in forecasting federal revenues. In order to accommodate technical constraints unique to their models, forecasters will often make straight-line projections of complex economic and behavioral relationships. One consequence of this procedure is the loss of some precision in the forecast results. The general rule of thumb adopted by the forecasting profession is that reported estimates should be accurate to within one-half billion dollars. Differences between revenue projections of less than one-half billion dollars are considered insignificant.

ESTIMATING DIRECT EFFECTS USING ECONOMETRIC MODELS

Six changes in the federal tax code were examined retrospectively with the three econometric models, and compared with the Treasury's figures. Four were changes in the individual income tax: the Revenue Act of 1964 (P.L. 88-272), The Revenue and Expenditure Control Act of 1968 (P.L. 90-364)⁷, the Revenue Act of 1971 (P.L. 92-178), and the combined effects of the Tax Reduction Act of 1975 (P.L. 94-12) and the Revenue Adjustment Act of 1975 (P.L. 94-164). Two were changes affecting corporate income tax liabilities: the 1964 act and the 1968 surcharge. The effects of four of the six legislative changes on collections were examined for only a two-year period⁸ because most econometric models cannot isolate the impacts of specific tax measures after a long period of time, nor separate out the effects of subsequent tax measures that alter collections patterns.⁹ Consequently there are 14 sets of estimates: three each for the individual and corporation income taxes under the 1964 act; two each for corporations and

-
7. This act is referred to below as the 1968 surcharge.
 8. Treasury estimates of the 1964 act's impact were reviewed for a three-year period because a number of the tax changes resulting from its enactment were first effective in 1965.
 9. This is so in part because not all tax law changes are incorporated into the econometric models.

individuals under the 1968 surcharge; two for individuals under the 1971 act; and two for individuals under the 1975 acts. There are six entries for totals.

In general, subject to the minor qualifications discussed earlier, the models' estimates of direct revenue effects are comparable to those of the Treasury. Certain adjustments to the models' projections of corporate tax revenues must be performed, however, to make them comparable with Treasury figures. In this analysis, a technique developed by the Treasury was used to convert the models' estimates of the effects of specific legislation on corporate tax accruals to a receipts basis. Table 9 describes the results of the simulations with the econometric models.¹⁰

The first three columns of Table 9 contain the models' retrospective estimates of the direct revenue effects of specific tax changes.¹¹ The Treasury estimates appear in the last column. Below the estimates of revenue gains or losses resulting from particular tax law changes are totals representing the cumulative estimates of the direct effects over the period immediately following the legislation's enactment. Some differences in estimates arising from differences in the timing of the receipts are eliminated by this technique, and a comparison of the totals may be more instructive than year-to-year comparisons.

The table shows that the models' estimates both of annual revenue changes and of cumulative effects varied considerably.

10. The Appendix contains each model's estimate of the change in receipts produced by the five tax law changes. In addition, it describes the statistical techniques applied to the econometric models and lists the variables used to estimate receipts in each model.

11. These results assume that the Federal Reserve would have held nonborrowed reserves constant in the absence of major alterations of the tax code. This type of monetary policy is often referred to as "neutral." To the extent that the Federal Reserve might have adopted either more restrictive or more expansive policies, the predicted collections levels presented in this report may require some adjustment.

TABLE 9. COMPARISON OF ESTIMATES OF THE DIRECT EFFECTS ON TAX COLLECTIONS OF SELECTED CHANGES IN THE FEDERAL INCOME TAX LAW BY FISCAL YEAR: IN BILLIONS OF DOLLARS

Tax Act	DRI ^a	Wharton ^a	BEA ^b	Treasury
1964 Tax Reduction Act				
<u>Personal</u>				
1964	-2.8	-4.0	-3.0	-2.7
1965	-8.9	-9.2	-9.4	-8.9
1966	-9.9	-13.0	-12.8	-12.6
Total	-21.6	-26.2	-25.2	-24.2
<u>Corporate^c</u>				
1964	-0.1	0.0	-0.1	+0.3
1965	-0.6	-0.3	-0.8	-0.6
1966	-2.3	-0.7	-2.4	-1.0
Total	-3.0	-1.0	-3.3	-1.3
1968 Tax Surcharge				
<u>Personal</u>				
1969	+10.1	+10.7	+8.7	+8.4
1970	+5.4	+5.4	+6.3	+4.6
Total	+15.5	+16.1	+15.0	+13.0
<u>Corporate^c</u>				
1969	+1.2	+0.2	+1.1	+4.8
1970	+3.3	+0.5	+2.8	+3.5
Total	+4.5	+0.7	+3.9	+8.3
Revenue Act of 1971				
<u>Personal</u>				
1972	+3.2	+0.7	+1.8	+0.9
1973	+1.9	-3.3	+4.4	-3.3
Total	+5.1	-2.6	+6.2	-2.4
The 1975 Tax Acts				
<u>Personal</u>				
1975	-9.6	-9.5	-10.2	-9.4
1976	-15.8	-12.0	-12.4	-13.2
Total	-25.4	-21.5	-22.6	-22.6

NOTE: Estimates were made using forecasting models of Data Resources, Inc. (DRI), Wharton Econometric Forecast Associates (Wharton), and the Bureau of Economic Analysis of the Department of Commerce (BEA). These estimates were compared with those of the Treasury Department.

- DRI and Wharton estimates calculated by estimating the tax equations separately from the model.
- BEA estimates based on Treasury unified budget estimates.
- Accruals estimates converted to a receipts basis to conform with Treasury accounting methods.

For example, the estimates of the revenue loss in 1964 resulting from the 1964 act's individual income tax provisions fell between \$2.8 billion and \$4.0 billion, a range of \$1.2 billion. For the 1964 act as a whole, the variation in the estimates approached \$5 billion. Of the 14 estimates generated on each of the three models, the Treasury's projections fell within the range produced by the models half the time. On five of the remaining occasions when the Treasury's estimate was outside this range, the difference between the Treasury and at least one of the models was less than one-half billion dollars, an amount considered insignificant by the estimating profession. In the other two cases, the Treasury's distance from the range of the models would appear significant, but there is no way of telling whether the Treasury or the models were more accurate.

When each of these models was similarly measured against the range formed by Treasury and the other two models, the DRI estimates were outside the range on three occasions, each apparently significant; the Wharton estimates fell outside the range on nine occasions, three of which appear significant; and the BEA model six times produced estimates outside the range of the others, three of which appear significant.

A comparison of the estimated cumulative effects of the five tax changes revealed that in only one instance--the 1968 surcharge--did the Treasury estimates differ substantially from the models' totals. Similar comparisons with each of the models showed that two DRI cumulative estimates fell outside the range of totals formed by the Treasury's and the other two models' projections, all six Wharton totals were outside of their respective ranges, and one BEA estimate was significantly different from the related figures produced by the Treasury and the other models.

These findings suggest that with the exception of the 1968 surcharge on corporate income tax payments, the Treasury's estimates are generally within the range produced by these models' measurement of what occurred. Indeed, the Treasury's estimates of what would occur agree with the models' assessments of what did occur about as well as the models agree with each other on this latter point.

MEASUREMENT OF FEEDBACK EFFECTS

Table 10 shows the models' estimates of the feedback associated with the five tax bills under consideration. These feedback

TABLE 10. COMPARISON OF ESTIMATES OF FEEDBACK EFFECTS RESULTING FROM CHANGES IN THE FEDERAL INCOME TAX LAW BY FISCAL YEAR: IN BILLIONS OF DOLLARS

Tax Act	DRI	Wharton	BEA
1964 Tax Reduction Act			
<u>Personal</u>			
1964	+0.1	+0.1	+0.3
1965	+1.2	+1.0	+0.5
1966	+2.0	+2.1	+0.8
Total feedback	+3.3	+3.2	+1.6
Total feedback as a percentage of total direct effect	(15)	(12)	(6)
<u>Corporate a/</u>			
1964	0	+0.1	+0.1
1965	0	+0.5	+0.5
1966	+0.1	+1.4	+2.4
Total feedback	+0.1	+2.0	+3.0
Total feedback as a percentage of total direct effect	(3)	(200)	(91)
1968 Tax Surcharge			
<u>Personal</u>			
1969	-2.5	-1.0	-0.4
1970	-1.3	-2.9	-0.9
Total feedback	-3.8	-3.9	-1.3
Total feedback as a percentage of total direct effect	(25)	(24)	(9)
<u>Corporate a/</u>			
1969	-0.3	-0.3	-0.1
1970	-0.7	-0.2	-0.2
Total feedback	-1.0	-0.5	-0.3
Total feedback as a percentage of total direct effect	(22)	(71)	(8)

continued

TABLE 10. continued

Tax Act	DRI	Wharton	BEA
Revenue Act of 1971			
<u>Personal</u>			
1972	-0.1	+0.4 <u>b/</u>	0
1973	-0.8	-0.6 <u>b/</u>	-0.4
Total feedback	-0.9	-0.2	-0.4
Total feedback as a percentage of total direct effect	(18)	(8)	(6)
The 1975 Tax Acts			
<u>Personal</u>			
1975	+0.7	+0.8	-0.5 <u>b/</u>
1976	+2.4	+2.7	-0.4 <u>b/</u>
Total feedback	+3.1	+3.5	-0.9
Total feedback as a percentage of total direct effect	(12)	(16)	(4)

NOTE: Estimates were made using forecasting models of Data Resources, Inc. (DRI), Wharton Econometric Forecast Associates (Wharton), and the Bureau of Economic Analysis of the Department of Commerce (BEA). The feedback effects were calculated by subtracting the direct effects of the tax law changes from the retrospective estimates of the total tax changes.

a/ Accruals estimates converted to a receipts basis to conform with Treasury accounting methods.

b/ Feedback estimate is in the same direction as the corresponding direct estimate.

figures are useful in determining the total change in tax revenues attributable to a particular tax-induced income change. For the most part, the feedback revenue in the initial years following legislation is likely to be quite small relative to the direct revenue effect. For example, the offsetting feedback revenue gain in 1964 resulting from the reduction in the individual income tax was estimated by the models to be between \$100 million and \$300 million.

These estimates should be used with caution, because it is doubtful whether most econometric models can accurately measure changes amounting to less than \$500 million. In four instances in Table 9, for example, the indicated impact of the feedback was in the same direction as the tax change, which is directly contrary to what one would expect. Since the magnitudes in these cases were small, these inconsistencies have been ignored.

In addition, the estimates provided here are limited by the models themselves. For example, the models are not capable of taking into account long-term changes in behavior that alter the relative prices of goods and services. They may therefore be unable to predict the ultimate induced consequences of tax law changes.

The estimates of feedback differed widely both in dollars and in percentages of the direct effects shown in Table 9, particularly with regard to corporate tax changes. Most of this variation probably results from differences in the models' specifications of the U.S. economy. Part of it may stem from differences in timing; feedback estimates of the same general magnitude and direction may fall into different years, giving a very diverse pattern. The timing differences can be at least partially eliminated by adding the separate years' figures for each law change together and comparing the totals for direct revenue effects and for feedback. After making this computation, the feedback effect for the 1964 reduction in personal income taxes was estimated to range from 6 percent to 15 percent of the direct revenue effect, while the feedback effect for the 1964 reduction in corporate taxes ran from a low of 3 percent to 200 percent (see Table 10). The 1968 surcharge for personal income taxes showed a range of 9 to 25 percent and the range for feedback from corporate tax increases under the same act ran from 8 to 71 percent. Estimates of the feedback for the Revenue Act of 1971 ranged from 6 percent to 18 percent, while those for the 1975 tax reduction showed a

range of 4 to 16 percent. If numbers of less than \$500 million are disregarded, the estimates by DRI and Wharton for individual income taxes under the 1964 act, the 1968 surcharge, and the two 1975 acts were within a 4 percentage-point spread and also were very close in dollar amounts. The BEA results in those cases, however, were substantially lower.

CONCLUSION

Treasury Department revenue estimates of specific tax legislation cannot be checked for accuracy by comparing them with actual figures, because actual figures can never be directly observed. In principle, large-scale econometric models can provide a basis for assessing the accuracy of the Treasury's projections. As shown above, however, the models do not generally provide consistent estimates of the direct effects of specific tax changes. This is so in part because the models' revenue estimating equations tend to be less well-developed than other features of the models. Where the models projected consistent estimates, the Treasury's figures usually fell within the range of the models' estimates. Since the models frequently differ on the precise effects of specific legislation, their results fail to yield a single standard by which to evaluate the Treasury's estimates.

The models also fail to provide consistent estimates of the amount of revenue feedback generated by specific tax law changes, particularly those altering corporate tax liabilities. Since revenue feedback cannot be measured directly, this finding suggests that the Treasury's decision to omit feedback estimates for particular tax changes and to include feedback only when estimating aggregate revenue collections is a reasonable one, given the current state of the art.

APPENDIX

APPENDIX

This appendix describes in greater detail how the revenue changes discussed in the text were estimated. It includes a review of the procedures used to estimate tax collections in the absence of a legislated tax change. In addition, two technical issues are explained: how corporate tax accruals are converted into receipts for purposes of comparison with Treasury projections, and how the models' estimates of the effects of particular tax measures are separated into direct effects (similar to those normally presented by the Treasury) and feedback. In explaining these conversions, the DRI model is used. Where differences exist among the structures of the three models, however, the differences are noted.

Personal Tax Collections

The first step in estimating personal tax revenues in the DRI model is to determine the effective tax rate on individual income. Many of the factors that affect this rate are variables representing particular tax legislation that has strongly influenced collections. More general factors, such as the unemployment rate and per capita income, though, are also included in the estimating equation. The full list of these variables appears in the personal receipts sections of Table A-1.¹

The revenue change caused by a tax measure is computed by removing or modifying the variable representing the relevant

-
1. The corresponding mechanism in the Wharton model includes references to tax devices such as the personal exemption, the standard deduction, and the statutory tax rates that apply to different income classes as well as a set of variables similar to those contained in the DRI model. The BEA model separates individual income tax receipts into withheld taxes and non-withheld taxes. Only withheld taxes are computed by the model. They are assumed to be determined by the effective tax rate, the tax base, and a series of variables reflecting important tax legislation. This last aspect of the BEA model is similar to the DRI methodology.

TABLE A-1. PERSONAL AND CORPORATE TAX EQUATIONS AS SPECIFIED IN THE DRI, WHARTON, AND BEA MODELS

Model	Estimated Variable	Factors Used to Generate the Estimate
<u>DRI</u>		
Personal Receipts	Receipts	Effective tax rate Taxable income base
	Effective tax rate	Unemployment rate Dummy variable representing '72 overwithholding and '73 correction Dummy for 1964 act Dummy for 1975 act Dummy for 1971 act Variable reflecting timing of collections during '68-'70 surcharge Percent effective change in collections due to rebate or surcharge Log of taxable per capita personal income
Corporate Accruals	Accruals	Statutory rate Before-tax profits Change in the investment tax credit rate Nonresidential investment in durable equipment
<u>Wharton</u>		
Personal Receipts	Log of number of exemptions	Log of total U.S. population

continued

Model	Estimated Variable	Factors Used to Generate the Estimate
	Value of standard plus itemized deductions	Personal income per capita Variables representing tax changes intended to benefit the lower tail of the income distribution, e.g., low income allowance, tax credits Total U.S. population
	Personal taxable income	Adjusted gross income Estimated value of standard and itemized deductions Estimated number of exemptions claimed Value per exemption
	Proportion of taxable income	Estimated per capita taxable income Time trend
	Receipts	Statutory rate for different income classes Estimated proportion of taxable income in each income class Dummy for 1964 act Dummy for 1968 surcharge Dummy for 1972 overwithholding Dummy for 1973 refunds for overwithholding

continued

Model	Estimated Variable	Factors Used to Generate the Estimate
Corporate Accruals	Accruals	Effective corporate tax rate in each sector of the economy Proportion of total value added in the economy by each sector Corporate profits before tax State and local tax accruals Foreign profits Correction for autocorrelation Deposits of earnings by the Federal Reserve Investment tax credit rate in each sector Level of investment in each sector
<u>BEA</u>		
Personal Receipts	Receipts Log of income tax withholdings	Income tax withholdings Nonwithheld taxes Statutory withholding rate Log of wages and salaries Dummy for graduated withholding of 1966 act Dummy for 1975 act

 continued

Model	Estimated Variable	Factors Used to Generate the Estimate
		Correction for auto-correlation Log of index for tax surcharges
Corporate Accruals	Log of accruals	Log of statutory rate Dummy for 1971 act Log of annual average of Wharton index of capacity utilization for manufacturing, mining, and utility sectors Dummy for 1971 act Time trend Dummy for high oil profits originating abroad during mid-1970s Before-tax profits State and local tax accruals Investment tax credits Deposits of earnings by the Federal Reserve Dummy for 1975 act

legislation and recalculating the effective tax rate using the equation described in Table A-1. Historical values of the other explanatory variables in that equation are used. The full model is then simulated to compute an estimate of how much revenue would have been collected during a given historical period had the tax change not been made. Table A-2 presents the levels of collections that were observed when the legislation considered in the text was enacted and the estimated levels that would have resulted if these tax changes had not occurred. The net difference (which includes direct effect and feedback terms) between these historical and hypothetical revenues is the change in revenues attributed to the particular tax policy.

Corporate Tax Accruals

To estimate changes in corporate tax accruals resulting from legislated tax changes, the rate on corporate profits in the corporate equation is reset to its pre-existing level.² The difference between tax accruals projected from this change and the observed level of receipts is then treated as the net effect of a particular tax measure on accruals.

Conversion of Accruals into Receipts

As indicated earlier, corporate tax accruals must be converted into receipts figures for purposes of comparison with Treasury projections.³ The method of adjustment uses a Treasury Department technique for converting corporate tax accruals into receipts.⁴ Estimates of the proportion of accruals paid in each

-
2. In estimating changes using the Wharton model, a set of effective tax rates on corporate profits for different sectors of the economy is reset to determine the effect of a specific tax measure. The BEA corporate equation used to forecast tax accruals contains a series of variables reflecting important legislation that, when altered, simulate hypothetical collections.
 3. The differences between NIA and Unified Budget items are outlined in Table A-3.
 4. See Office of Tax Analysis (Department of the Treasury) discussion paper, Estimating Fiscal Year Accrued Federal Corporate Income Taxes, September 1978.

Fiscal Year	Actual Receipts (NIA Basis)	Retrospective Estimate of Receipts Without a Tax Change		
		DRI	Wharton	BEA
Revenue Act of 1964				
<u>Personal</u>				
1964	50.0	52.7	54.0	52.7
1965	51.4	59.1	59.6	60.3
1966	56.7	64.6	67.5	68.7
<u>Corporate Accruals</u>				
1964	25.7	26.3	25.5	25.4
1965	27.1	29.2	26.5	27.2
1966	30.8	34.1	30.2	30.4
1968 Tax Surcharge				
<u>Personal</u>				
1969	90.7	83.1	81.0	82.4
1970	94.4	90.3	91.8	89.0
<u>Corporate Accruals</u>				
1969	37.0	33.8	37.3	33.8
1970	33.0	31.3	31.5	31.1
Revenue Act of 1971				
<u>Personal</u>				
1972	99.5	96.4	98.4	97.7
1973	110.2	109.1	114.1	106.2
The 1975 Tax Acts				
<u>Personal</u>				
1975	127.1	136.0	135.9	137.8
1976	136.5	149.9	145.9	149.3

TABLE A-3. DIFFERENCES BETWEEN UNIFIED BUDGET AND NIA ACCOUNTING METHODS

NIA Category	Components Appearing in Unified Budget			
Personal tax and nontax receipts	Individual income taxes	+	Estate and gift taxes	
Corporate profits tax accruals	Taxes on accrued profits	+	Deposits of earnings by Federal Reserve System	
Social insurance contributions	OASDHI	+	State unemployment insurance	+ Railroad retirement

NOTE: This table is intended to establish a framework for comparing figures appearing under the two concepts. It is not meant to suggest, however, an identity relationship between the left-hand and right-hand side of each row. A major distinction between the two methods involves timing. The NIA system records personal income tax receipts at the time of payment and corporate income tax receipts on an accrual basis--that is, when profits are earned rather than when taxes are paid. According to the unified budget method, only cash receipts are recorded, regardless of when earned.

quarter were made so that estimates of payments by fiscal year could be computed. Unfortunately, these fiscal year figures vary with economic conditions and changes in tax legislation. Since the nature of these relationships cannot be precisely determined, conversions of the econometric models' figures in this report necessarily assume that the observed distributions of payments remain unchanged.

Direct Effects and Feedback

The adjusted corporate figures and those representing the effects of changes in the personal income tax provisions can be separated into direct effects and feedback. This is done by modifying or removing the variable representing the relevant legislation and recomputing the effective tax rate using the equation described in Table A-1. Historical values for all other variables that help determine this rate in that equation are left unchanged. The recalculated tax rate is then applied to the historical tax base without simulating the model to produce an estimate of the amount of revenue that would have been collected had the tax change not taken place.⁵ The difference between this estimate and actual revenue collections during that period is the direct revenue effect.⁶ The difference between this estimate and

-
5. An alternative procedure is applied to the BEA model, because that model is not designed to replicate history. The direct effects of tax laws on receipts are computed separately and then entered into the model to determine the net effect.
 6. This method is inexact for large tax changes and may cause errors of several hundred million dollars in the resulting revenue estimates. This is because the values of the tax base and of the variables that determine the effective tax rate should be the unobserved values that would have occurred in the absence of the tax change, rather than the historical values. If one chose to rely to a greater degree on the models' characterization of economic relationships, the direct effect and feedback effect of various tax changes also could be approximated by estimating these unobserved values. To do so would require that the variable representing the legislation be modified, its effects removed, and the full econometric model simulated. The resulting estimates of the tax

the figure obtained when simulating the model is counted as feedback.

base and of the variables determining the tax rate would then replace the corresponding historical values in the calculation of the direct revenue effect as described in the text. Such a procedure is more in the spirit of the Treasury Department's estimates of direct revenue effects, although it would be even more sensitive to each model's underlying assumptions. The Treasury's estimates are made before the tax change is introduced, using forecasts of the tax base and of other economic variables that do not assume that the change has been made, and that the economy has reacted to it.



