Evidence on the "Tax Effects" of Inflation Under Historical Cost Accounting Methods

by

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Table of Contents

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1. Introduction

The potential effects of contemporary tax accounting methods under conditions of inflation have attracted substantial attention; see, e.g., Shoven and Bulow {1975} {1976}, Davidson and Weil {1976}, Hong {1977}, Nelson {1976}, and Kim {1979}. For the most part, there has been substantial interest in the potential joint effects of price-level changes and historical cost accounting methods on real tax burdens. Specifically, it is usually argued that the failure to use indexation (i.e., the continued use of historical cost methods) necessarily implies that real rates of income tax will vary directly with the rate of inflation. And this substantive effect of mere bookkeeping methods is often predicted even though the predicted effect is recognized to have adverse implications--such as those predicted for investment incentives and productivity. This appears to be the essence of the "tax effects of inflation" hypothesis. A terse but representative statement of its implications for fixed capital was recently provided by Meadows {1979; pp. 38-39} in an article on

> As prices rise, the real value of depreciation based on historic costs dwindles and a company's taxable income goes up faster than it would if depreciation reflected actual replacement costs. The resulting erosion of corporate income lowers return on investment and discourages businessmen from putting money into capital-intensive technologies, long-lived assets, and new, more efficient replacement equipment....

The major objective of this paper is to provide empirical evidence on some testable implications of this hypothesis. I shall argue that this evidence is, on balance, inconsistent with the "tax effects" hypothesis--at least for the post World War II period. This evidence is consistent with the hypothesis that the ultimate effects of indexing the tax system have been attained via devices other than formal indexation.

This evidence does not, of course, imply that the tax effects hypothesis does not describe what might have happened if "all other things"--including the rules of income taxation--were held constant. The apparent descriptive inadequacies of this hypothesis may simply be due to important changes in these "other things"--changes which are ignored by the partial equilibrium framework underlying the tax effects hypothesis.

The organization of this paper is as follows: Section 2 provides a review of the tax effects hypothesis and some of its implications. The data and models underlying our empirical results are considered in Section 3 and the results themselves are presented and discussed in Section 4. Remarks on potential reasons for the descriptive inadequacy of the tax effects hypothesis are provided in Section 5. A summary and discussion of basic implications are provided in Section 6.

The discussion of data given in Section 4 is somewhat brief. An extended discussion with more detailed references are given in the Appendix to this paper.

2. The "Tax Effects of Inflation" Hypothesis

2.1 The Basic Argument

The tax effects hypothesis can be decomposed into a hypothesis dealing with the expected rate of inflation and one dealing with the unexpected rate of inflation. Of course, the crux of both hypotheses turns on the use of "historical cost" accounting methods to compute taxable profits. But the joint effects of these methods and the expected rate of inflation on "real" economic profits and incentives may differ from the joint effects of these methods and the unexpected component of inflation.

The accounting methods that seem to attract most attention in statements of the tax effects hypothesis are depreciation methods and inventory accounting methods. We shall confine our attention to these methods.

Given the relative prices of all final outputs and factors of production, both nominal (i.e., "current dollar") sales and nominal costs will, for a given quantity of output, increase at a rate equal to the rate of inflation. Thus, nominal pre-tax "economic" profits will increase at this rate and real economic profits will remain constant.[1/] Given a proportional tax system based on nominal economic profits, nominal income taxes and nominal after-tax profits will also increase at the same rate. Thus, the real rate of taxation will, in this scenario, be unaffected by non-zero rates of actual inflation. Nor will the expected real rate of taxation be affected by the expected rate of inflation. In this setting of "pure inflation" (i.e., fixed relative prices) and income taxes based on nominal economic profits, neither the expected nor the unexpected component
of inflation will, by itself, have any substantive economic effect; nor, for

example, incentives to invest in units of capital stock.

In a partial equilibrium analysis, the picture is entirely different when the computation of taxes is based on "historical cost" accounting methods for, say, depreciable assets and costs of goods sold. Nominal sales, for a given quantity of output, will increase at a rate equal to the rate of inflation. And expected nominal sales will increase at the expected rate of inflation. But actual (expected) taxable profits and after-tax accounting profits will increase at a rate exceeding the actual (expected) rate of inflation. Thus, for a given quantity of output, the actual (expected) real rate of taxation will vary directly with the actual (expected) rate of inflation.

The same tax effect of a once-over unexpected rate of inflation could be attained in a zero-inflation world, for the same level of output, by unexpectedly increasing the tax rate applied to periodic profits over the remaining lives of depreciable assets currently on hand and over the additional periods needed to substitute current costs for the historical costs of units currently in inventory. A similar equivalence exists between a non-zero expected rate of inflation and an increasing expected tax rate in a world of no inflation, since the rate of change in the real tax rate varies directly with the rate of inflation, conditional on the level of output and the use of historical cost accounting methods for computing taxable profits.

These relationships between the real rate of taxation and the rate of inflation provide the basic underpinnings of the "tax effects" hypothesis. Conditional on these relationships it predicts that the strength of incentives to invest in "long lived" assets will vary inversely with the expected rate of inflation. It predicts an inverse relationship between actual (expected) real after-tax profits and unanticipated (expected) rates of inflation. It predicts windfall losses on existing units of capital when there is unexpected inflation or an unexpected change in expected inflation. It predicts that real aggregate taxes will increase faster than the two components of the inflation rate. It implies that the effects of both expected and unexpected inflation will be greater for more "capital intensive" or more "inventory intensive" firms. Moreover, the tax effects hypothesis implies that these effects of expected and unexpected rates of inflation will be stronger (or at least different) in high relative to low nominal tax rate periods.

2.2 Remarks on the Descriptive Adequacy of the Tax Effects Hypothesis

The tax effects argument--with respect to both expected and unexpected rates of inflation--seems to have attracted a substantial following, for both theoretical and empirical reasons.[2] But there are strong grounds for suspecting that it does not identify dominant influences on investment incentives or real economic profits.

One essential aspect of using historical cost accounting methods under conditions of non-zero rates of inflation is that tax deductible costs differ from the current costs of factors of production. Indexation is one of the recommended remedies for this. And the fact that our tax system is not a fully indexed one is a major underpinning of the tax effects hypothesis.

But there are alternative ways of attaining the effects of indexation. The tax code may permit the use of service lives for depreciable assets that differ substantially from economic service lives.[3] Also, it may permit the use of depreciation methods resulting in depreciation charges that differ substantially from the current costs of the services of capital, particularly in the early years of an asset's life (via "accelerated" depreciation methods). Moreover, various subsidy schemes--such as investment tax credits—may be established. Given the nature of the legislative process leading to these possibilities--in particular, the sort of "horse trading" that seems to take place--it is certainly not obvious that their availability is independent of formal indexation's availability. In other words, if the tax system were indexed, existing subsidy programs and existing rules regarding service lives and depreciation methods might be very different. These programs and rules may have been introduced in lieu of indexation.[4/]

Why one form of indexation rather than another is ultimately chosen is not explained here. This issue may turn on administrative efficiencies, wealth redistribution objectives, "political realities", etc.. The major object of analysis here is whether the end results of indexation were attained—and thus whether the tax effects hypothesis is, by itself, descriptively adequate.

The descriptive adequacy of the tax effects argument may be adversely affected by simultaneity problems too. Specifically, expected and unexpected rates of inflation may summarize (i.e., be a proxy for) governmental responses to observed after-tax real economic profits and observed rates of increase in the capital stock. It is not clear that these components of inflation rates are really exogenous variables.

Suppose, for example, that after tax real profits are deemed to be "too low." This may motivate the government to initiate stimulative policies that induce positive unexpected rates of inflation. Estimated correlation coefficients for unexpected rates of inflation and after-tax real profits (as measured in, e.g., the National Income and Product

Accounts) will be negative, as predicted by the tax effects hypothesis. But this empirical result is not due to the unexpected rate of inflation's affect on real after-tax profits.

Inverse variation between the expected rate of inflation and capital stock growth may turn on similar forces. The government may initiate stimulative policies because the productivity of capital and (as a result) employment are "too low." These policies may induce higher expected rates of inflation. In the end, one may observe negative covariation of the expected rate of inflation and the growth of capital.

Alternative explanations of what is predicted by the tax effects hypothesis should not be surprising. After all, empirical evidence consistent with one hypothesis may also be consistent with another--even conflicting--hypothesis. And the "tax effects" hypothesis represents just one of several perspectives on the connection between inflation and profitability, investment incentives, etc. It appears, however, that our evidence is, on balance, not even consistent with the tax effects hypothesis. As far as tax issues are concerned, this evidence is, therefore, apparently inconsistent with the view that accounting methods are permitted to have unintended substantive effects.

3. Data and Models

3.1 Variables Modeled and Sources of Data

The evidence presented here deals primarily with investment incentives (to the extent reflected in rates of investment in fixed capital), real profits, effective real tax rates, and the tax shield provided by interest deductions. In each case the variable of interest is used as the dependent variable in a regression model which uses the contemporaneous expected and unexpected rates of inflation and the contemporaneous rate of change in industrial production as independent variables. The latter rate of change is included in order to account for the effects of contemporaneous "business activity" on each dependent variable of interest.[5] Accounting for these effects is motivated by the fact that many predictions of the tax effects hypothesis are conditional upon changes in business output or "business activity." The estimation results pertain to the resulting estimated regression functions and our interpretations invoke the regression function perspective, as developed in, e.g., Cramer {1946}. For each variable of interest, we shall be interested in the expected value of that variable taken conditionally on the contemporaneous values of the expected and unexpected rates of inflation--and assuming linear regression functions.

The major sources of the annual data used to compute the values of our dependent variables are: (1) The National Income and Product Accounts of the United States, 1929-1974: Statistical Tables (Bureau of Economic Analysis, U.S. Department of Commerce, 1977). Data from this source are referred to as NIPA data. (2) Fixed Nonresidential Business and Residential Capital in the United States, 1925-1975 (Bureau of Economic Analysis, U.S.

Department of Commerce, June, 1976). Data from this source are referred to as BEA data. (3) Annual issues of the U.S. Internal Revenue Service's Statistics of Income volumes containing data for corporations. Data from this source are referred to as IRS data. And (4) Historical Statistics of the United States: Colonial Times to 1970 (Bureau of the Census, U.S. Department of Commerce, 1975), Part 2, Series V 108-140, pp. 924ff.

The data obtained from source (2) were revised in accordance with data supplied by John A. Gorman and John C. Musgrave of the Bureau of Economic Analysis; they also supplied data on inventory stocks. We refer to the latter as BEA data too.

The fourth source was used to obtain data that are actually available in the third source. Data obtained from either one are referred to as IRS data.

Some of the NIPA data used here are the revised values provided in the July 1977 and July 1978 issues of the Survey of Current Business (published monthly by the U.S. Department of Commerce).

The Consumer Price Index (CPI) is used to measure the rate of inflation. Our data on actual and expected rates of inflation were kindly supplied by G. William Schwert of the University of Rochester.

The Federal Reserve Board's Index of Industrial Production (Total) for the year t - 1 to t is used to measure the level of output for year t. Annual values of this index, from the year 1919, were taken from Table A-5 of Industrial Production: 1976 Edition (Board of Governors of the Federal Reserve System, December, 1977).

Additional remarks on the data used here as well as our estimates of the expected annual rate of inflation are provided in the Appendix to this paper. An overview of the variables used to define the dependent variables for our estimated regression models and the sources used to get observations on these variables is provided by Exhibit 1.

3.2 Models

Estimation results are presented for the entire period 1929-1974 and for various sub-periods for the following regression model:

$$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\xi}_t$$

where $\tilde{Y}_t$ denotes the dependent variable of interest; q_t denotes the rate of change in industrial production from time t - 1 to time t; $E(\tilde{\pi}_t)$ denotes the expected annual rate of inflation for the period from t - 1 to t, conditional on information available before the end of period t; and $\tilde{\pi}_t$ denotes the rate of inflation from period t - 1 to t. The variable $(\tilde{\pi}_t - E(\tilde{\pi}_t))$ is therefore, the unexpected rate of inflation with respect to the period ending at time t. Estimation results are also provided for this model with the constraint, $\beta_3 \equiv 0.0$. Tilde (~) denotes a random variable.

The lagged variable, $\tilde{Y}_{t-1}$, was used in order to attack serial correlation problems that will be obvious from the estimation results presented below. Its introduction was not motivated by economic theory.

One of the sub-periods considered here is 1929-1946. In some cases, use of data for one year, 1946, seemed to dramatically affect the estimation results--at least relative to what was expected. Thus, estimation results were always obtained for the period 1929-1945 and for the period 1929-1946. I still do not know why 1946 occasionally had a seemingly important effect. The reason may turn on some quirk of the data-construction methods used by our sources of data. Or it may turn on interesting substantive issues--such as the 1946 conversions of some fixed assets from so-called Government Owned but Privately Operated (GOPO) facilities to privately owned and privately operated facilities. Pertinent remarks on this issue are provided by Gordon {June, 1969}.

The following types of estimation results are given in each table: (1) The estimated value of β_i and the corresponding t-statistic, for each i; (2) The estimated standard deviation, σ_ξ, of the disturbance, $\tilde{\xi}_t$; (3) The sample value of the adjusted coefficient of multiple determination, $\bar{R}^2$; (4) The standardized runs statistic, z, for the disturbance, $\tilde{\xi}_t$; and (5) The estimated value of the lag-i serial correlation coefficient, ρ_i, of the disturbance, $\tilde{\xi}_t$, for lags 1 to 5.

4. Estimation Results

4.1 Effective Tax Rates

A seemingly direct way of testing the "tax effects" hypothesis is to assess the influence of inflation on various measures of real tax burdens. Conditional on a proportional income tax system, the tax effects hypothesis predicts that aggregate tax liabilities will increase faster than the actual rate of inflation--because taxable income is predicted to increase faster than this rate. This implies, in turn, that aggregate taxes will, for a given real output level, increase faster than before tax net operating cash flows. Equivalently, the real rate at which these cash flows are taxed should be an increasing function of both the expected and the unexpected components of inflation. And the effect of each component should vary directly with the nominal tax rate as well as, for example, the capital intensity and "inventory intensity" of production.

Estimation results dealing with this issue are presented in Table 1. Both the numerators and denominators used for the tax rates underlying this table are in current dollars. Thus, the tax rates are in real terms. The denominators are intended to be proxies for the before-tax cash payoff to capital--which is the pre-tax cash flow variable relevant to capital budgeting issues. Results for two tax rates are presented. The first is for total profits taxes, i.e., federal, state, and local profits taxes. The second is only for federal profits taxes. As can be seen, this turned out to be a distinction that made no major difference.

For the overall period, 1929-1974, when Y_{t-1} is excluded from the model, the estimation results seem consistent with the tax effects hypothesis as far as the expected rate of inflation is concerned. As can be seen, this appears to be primarily attributable to the pre-war period. Moreover, when Y_{t-1} is included in the model, the results are consistent with $\beta_1=0.0$. In addition, contrary to the tax effects hypothesis, the overall and pre-war results appear inconsistent with a positive effect of the unexpected rate of inflation.

Also contrary to the tax effects hypothesis is the apparent inconsistency between the estimation results and a positive effect of the expected rate of inflation for the post-war period, 1947-1974. For this period, nominal corporate income tax rates were, on average, above those prevailing over the 1929-1946 period.

For the post-war period, the importance of the unexpected rate of inflation seems to be critically dependent on whether Y_{t-1} is included in our regression model. But even when Y_{t-1} is included, the significance of the unexpected rate's influence does not seem to be overwhelming.

Alternate measures of real tax burdens are considered in Table 2. This table deals with the tax component of the rental rate per unit of capital--in real terms.[6/] The tax effects hypothesis predicts that this component's importance is an increasing function of each component of inflation, because aggregate nominal taxes should increase faster than the actual rate of inflation.

The estimation results presented in Table 2 seem to tell the same basic story as that told by Table 1's results. As far as the expected rate of inflation is concerned, the results for 1929-1974 seem consistent with the tax effects hypothesis--when the constraint $\beta_3=0.0$ is imposed. But this consistency appears to turn on the pre-war data, rather than the data for the higher nominal tax rate period 1947-1974.

For the pre-war period, the estimated value of β_2 has a sign inconsistent with the tax effects hypothesis. In any event, the estimation results for β_2 seem inconsistent with statistical significance for this period as well as for the post-war period.

The estimation results for both β_1 and β_4 are clearly dependent on whether Y_{t-1} is included in the model, at least for the pre-war and overall periods. The point estimate and statistical significance of β_1 (β_4) decreases(increases) when Y_{t-1} is included. But over the post-war period, the results for β_1 (β_4) are always consistent with $\beta_1 = 0$ ($\beta_4 \neq 0$). Such differences between pre-war and post-war results--which may be due to structural shifts--will also appear in results described later.

Results for a third measure of the real tax burden are presented in Table 3. This measure pertains to total profits taxes per unit of aggregate domestic output (for all corporations), which is a proxy for total sales of current output. This measure is also in real terms. For a given level of output, the tax effects hypothesis predicts that aggregate taxes should increase faster than the rate of inflation and that the rate of increase in total sales should be equal to the rate of inflation. Thus, the "tax bite" per dollar of sales should be an increasing function of each component of the actual inflation rate.

On balance, the results presented in Table 3 are consistent with those described above. Specifically, the tax effects hypothesis does not seem to have much descriptive adequacy over the time period where one expects it to be more adequate, viz, the post-war period. It is also worth noting that (as before) the pre-war results are quite dependent on whether Y_{t-1} is included in the model. In addition, and perhaps more perplexing, the pre-war results seem unusually dependent on the data for 1946 as can be seen by comparing the results for 1929-1945 with those for 1929-1946.

Table 4 provides some results based on our IRS data. This table deals with rates of return on total assets before and after federal income taxes.

The tax effects hypothesis presumes that both components of inflation have the same effect on taxable income--and thus on tax liability and after-tax income. Specifically, given a constant nominal tax rate, taxable income, taxes, and after-tax income should all increase at the same rate. And the latter rate should exceed the actual rate of inflation and, therefore, both the expected and unexpected rate of inflation. (By definition, the sum of the latter two rates equals the actual rate). Thus, per unit of capital, both before and after-tax income should increase faster than both components of inflation.

The consistency between the results in Table 4 and these implications of the tax effects hypothesis seem weak. For the pre-war period, the estimated value of β_1 has a sign opposite to that of the estimated value of β_2--for both before-tax and after-tax rates of return. For the post-war period, the statistical significance of β_2 and, in the case of before-tax returns, β_1 depends on whether Y_{t-1} is included in the model. But even when statistical significance seems to prevail, the results seem inconsistent with rates of return that increase at rates in excess of both components of the rate of inflation.

On balance, the tax effects hypothesis does not seem to identify dominant forces pertaining to profitability. One expects, therefore, that it will not identify dominant forces pertaining to investment incentives. Results on the latter are presented in the next section.

4.2 Rates of Investment

There are, of course, various ways of measuring rates of investment in fixed capital. The results presented in Tables 5-9 are based on several different approaches. Each one deals with a different aspect of investment behavior. But they all seem to "tell the same story".

The results presented in Table 5 pertain to the rates of growth in fixed capital implied by capital expenditures, for both gross fixed capital and net fixed capital conditional on straight-line (SL) depreciation and .85F service lines. (The service life assumption affects gross fixed capital via its effect on withdrawals.) Data for different service life assumptions led to essentially the same results. So did data based on double-declining balance depreciation. SL and DDB are the two methods for which BEA data are available.

Both the numerators and denominators used for the investment rates for period t are in terms of the period t price level. Thus, the rates are in real terms. There is, of course, some measurement error here, and for other variables based on the same denominators. Some sort of average of beginning of period and end of period capital stock data might be more appropriate. But experimentation along these lines seemed to lead nowhere.7/

The tax effects hypothesis implies that the expected value of the rate of capital expenditure conditional on the expected rate of inflation is decreasing in the latter expected rate. The estimation results conditional on the constraint β_3=0.0 are inconsistent with this for the overall period, 1929-1974, and for both the pre-war and post-war period and for investment rates based on both gross fixed capital and net fixed capital.

When Y_{t-1} is allowed to enter with a non-zero coefficient, the results are, with one exception, still inconsistent with the tax effects hypothesis. The exceptional results are those for 1947-1974 based on gross fixed capital. But, insofar as investment incentives are concerned, the results based on net fixed capital seem more relevant. And these results are decidedly inconsistent with the tax effects hypothesis.

Note that the results based on net fixed capital are not simply inconsistent with the predicted negative effect of $E(\tilde{\pi}_t)$. They are, at least for the 1929-1974 and 1929-1946 periods, consistent with a positive effect. The lower nominal tax rate and the lower expected rates of inflation that prevailed during the pre-war period--relative to 1947-1974--may be important reasons for this.

On balance, the unexpected component of the inflation rate seems to have no important effect on the expected rate of investment. This seems plausible. Unanticipated events of period t should have no systematic effect on investment rates chosen during period t.

Of course, capital expenditure rates pertain to gross investment expenditures. These rates are not, therefore, adjusted for "outflows" of units of capital due to depreciation or sales. The capital expenditure rates for period t are valuable sources of information because they pertain to commitments made during the current period. But one can argue that these rates are chosen so as to attain desired net investment rates.

To get some insights on net investment, one can look at results based on the rates of growth implied by successive values of capital stock. Such results are presented in Tables 6-8. The data used for these tables are constant-dollar data. Hence, the growth rates underlying these tables are in real terms.

Table 6 provides results on total capital stock, which equals residential plus nonresidential fixed capital. The residential component is based on straight-line depreciation and the .85F service life assumption. (For residential capital, data based on different depreciation methods and service lives are not available from the BEA data file.) If the implications of the tax effects hypothesis are descriptively adequate, then the real rates of growth in total fixed capital should vary inversely with $E(\tilde{\pi}_t)$.

As can be seen from Table 6, the behavior of total fixed capital is inconsistent with the tax effects hypothesis. Indeed, for the overall period, 1929-1974, and for some of the subperiods, the estimation results for β_1 are consistent with a significantly positive value. This result holds for both gross total capital and net total capital.

Tables 7 and 8 provide results for nonresidential and residential capital, respectively. The results for nonresidential fixed capital are substantially consistent with those for total fixed capital. Since nonresidential fixed capital is the dominant component of the total, this is not surprising. For the most part, the results for residential fixed capital are consistent with a value of β_1 that is insignificantly different from zero. Thus, these results are also inconsistent with the tax effects hypothesis--which implies $\beta_1 < 0.0$.

As can be seen from the post-war results with β_3 not constrained to equal zero, the results for residential capital are not completely inconsistent with the tax effects hypothesis. For this subperiod, the results for β_1 are consistent with $\beta_1 < 0.0$. The difference between these results and those for nonresidential capital may be due to the allegedly "biased" effects of macroeconomic stabilization policies on construction activities. In any event, the fact the $\beta_1 < 0.0$ is not inferred for non-residential capital too implies that the tax effects hypothesis, by itself, is not descriptively adequate.

Table 9 provides results on another aspect of investment incentives, viz, the real rate of growth in inventory. When expected rates of inflation are positive, the tax effects hypothesis implies that incentives to invest in inventory will be adversely affected too--because of the joint effects of historical cost accounting methods and positive expected rates of inflation. As can be seen from Table 9, the estimation results for β_1 appear inconsistent with $\beta_1 < 0.0$ and, thus, inconsistent with the tax effects hypothesis.

On balance, the results in Tables 6-0 pertaining to β_2 do not suggest that the unexpected component of inflation has a systematic important influence on rates of growth in fixed capital or inventory. This seems plausible. One should not expect investment decisions to be affected by unanticipated events.

Nor should one overlook the limitations of our results. The influence of one year's data, viz, those for 1946, is quite puzzling. So is the seemingly erratic influence of the rate of change in industrial production. Whether these mysteries are induced by inadequacies in our data or in our models is still not clear, on the basis of the results presented here or unreported results. Nevertheless, the inconsistencies between all of the results presented thus far and the tax effects hypothesis seem too consistent to be attributable to these puzzles.

Illustrative results for rates of gross investment based on IRS data are presented in Table 10. These results pertain to the growth rate in net fixed assets implied by capital expenditures. They are based on historical cost data. Thus, the results do not deal with real rates of growth, as did the BEA data used earlier. In spite of this difference, the estimation results described in Table 10 are consistent with those presented earlier, in the sense that these results appear inconsistent with the crux of the tax effects hypothesis regarding expected rates of inflation.

This consistency may, however, turn on a mechanical detail. And the same detail may have affected the estimation results for β_2, which pertains to the unexpected component of inflation.

The numerator of the rate used for Table 10 is a periodic outlay and, therefore, in terms of "current dollars." As a result, it reflects the effects of periodic inflation to a greater extent than does the denominator of this rate. Consequently, the positive covariation between this rate of investment and both components of the inflation rate may turn on the numerator's being in terms of current dollars and the denominator's being in terms of historical dollars (and thus in terms of earlier periods' price levels). This possible mechanical explanation is not relevant to the results based entirely on BEA data. But it may be relevant to some results described below, which are also based (at least in part) on IRS data.

Summing up, our major inference is that the tax effects hypothesis--by itself--does not fare well as far as descriptive adequacy is concerned. The results presented below provide more support--albeit indirect--for this inference and they point to some possible reasons for the inadequacy of the tax effects hypothesis.

4.3 Tax Shield Provided by Interest Deductions

The major predictions of the tax effects hypothesis turn on firms' not being permitted to deduct--for tax purposes--the current values of the services of factors of production used during a given period. The services provided by units of depreciable capital and units of inventory are of particular interest here. This predicament is, of course, a major feature of a tax system based on historical cost accounting methods. And it is the feature that indexation is supposed to eliminate.

But this feature can be circumvented without indexation, at least with respect to expected rates of inflation, if nominal interest rates incorporate unbiased forecasts of rates of inflation. (Nominal interest rates set when debt is issued cannot, by themselves, take unexpected rates of inflation into account.) If they do, then financing acquisitions of factors' services with debt--on which interest expense is tax deductible--provides a means of getting a tax deduction for the expected value of the difference between historical costs and current costs per dollar of outlay for factors of production. Presumably, prevailing nominal interest rates are also incorporated into the costs of acquisitions made via "noninterest-bearing" trade credit, which affect, in turn, tax-deductible "costs of goods sold" and other factor costs. Thus, the use of debt bearing explicit interest charges does not seem essential for hedging against expected rates of inflation.

The results presented in Table 11 deal with the extent to which firms alleviated the expected tax effects of inflation via the use of debt. Two different interest expense variables are used here. In the upper panel, interest expense is adjusted for the interest imputations made in the NIPA accounts. Since these imputations are not directly taxed, this variable does not seem to be precisely what we want. But it is an interest expense variable often used in works relying on NIPA data (see e.g., Holland and Myers {May, 1978}) and it is a variable for which data (for "all corporations") are available for the pre-war period. Data on the seemingly more appropriate variable, net monetary interest, are only available for the post-war period. Results based on this variable appear in the lower panel of Table 11.

The fact that the NIPA imputations are appropriately disregarded when measuring tax shields is not the only reason for favoring, on grounds of principle, the net monetary interest variable. When the net interest variable is used to measure the debt-induced tax shield against expected inflation, double-counting is a result. In the NIPA accounts, imputed interest is presumed to be paid by financial businesses to nonfinancial businesses, individuals, and governmental units--in order to account for financial services for which no explicit charges are made. If non-financial businesses (the only potential recipients relevant here) really do receive such services, then presumably the total explicit costs of the productive factors used is less than it would otherwise be. Thus, if the NIPA imputations are allowed to lower nonfinancial business' interest cost then there should be a simultaneous upward adjustment in the total explicit cost incurred for so-called financial services. Presumably, the latter additional explicit costs would be tax deductible. Thus, not making this upward adjustment double counts the imputations that distinguish the NIPA accounting system's net interest variable from its net monetary interest variable.

As indicated, data for net monetary interest are available for the post-war period. Data are available for both the pre- and post-war periods for the net interest variable. Both types of data seem to tell the same story over the post-war period, as far as the results presented in

Table 11 are concerned. I shall therefore assume that net interest is an adequate proxy for net monetary interest for the other time periods considered here.

The interest/cash-flow variable used for Table 11 is a measure of the relative importance (in real terms) of the tax-shield provided by debt bearing explicit interest charges. (Reliance on this measure presumes that the net shield provided by "noninterest bearing" debt is equal to zero for the corporate sector as a whole.) This ratio should be an increasing function of the expected rate of inflation if it is to offset, at least in part, the increasing real rate of taxation induced by the joint effects of price level changes and a proportional tax system based on historical cost accounting methods. Since nominal interest rates are not expected to incorporate unanticipated inflation, the conditional expected value of our interest/cash-flow variable should be unaffected by $(\tilde{\pi}_t - E(\tilde{\pi}_t))$. The results for all periods are consistent with this implication.

Insofar as the expected rate of inflation is concerned, our results for the post-war period are consistent with the predicted positive value for β_1 when Y_{t-1} is not in our regression model. The statistical significance implied by our results disappears, however, when Y_{t-1} is allowed to enter with a non-zero estimated coefficient. But during the pre-war period, the results for β_1 are consistent with a nonpositive value of β_1. The shift from a pre-war nonpositive value to a post-war value that is at least nonnegative is a shift in the "right direction," in the sense that it is consistent with a relatively greater use of the debt-induced tax shield during the higher nominal tax rate (and higher inflation rate) period. Such a shift may provide part of the explanation for the apparent descriptive inadequacy of the tax effects hypothesis. Specifically, such a shift is consistent with firms' adopting--and the tax authorities' permitting--actions that serve to reduce real tax burdens.

It is, perhaps, worth noting that the results for our net interest variable were among the few that were seriously affected by introducing the industrial production variable into our model. When the constraint $\beta_4 = 0.0$ was in force, the pre-war results for β_1 were always substantially consistent with a significantly negative value--whether or not Y_{t-1} was allowed to have a non-zero coefficient. When the percentage change in industrial production was included in our model, the estimation results for β_1 became quite dependent on whether or not Y_{t-1} was included in our model--for reasons that are not obvious to me.

A measure of the debt induced tax shield based on our IRS data underlies the results in Table 12. Since the numerator of the interest/ total assets variable used here is more of a current dollar variable than is the denominator, this variable may be positively related to both components of inflation because of mechanical reasons. The same sort of issue arose regarding our use of investment rates based on IRS data (see Table 10). But when Y_{t-1} is not in our model, the results for β_1 are consistent with a significantly negative (positive) value over the pre-war (post-war) period, whereas the results for β_2 are consistent with a value insignificantly different from zero. Thus, a mechanically induced positive association with both components of inflation is not guaranteed. More importantly, these results appear consistent with the pre-war/post-war shift described above--a shift that alleviates the inflation-induced increase in real tax rates presumed by the tax effects hypothesis.

4.4 Capital Gains on Fixed Capital and Inventory

This induced increase in real tax rates can also be alleviated by positive real capital gains on fixed capital and inventory--two types of assets presumed to be of special importance by the tax effects hypothesis. This hypothesis predicts, for example, that unanticipated increases in the expected rate of inflation will lead to windfall-type capital losses--because such increases are equivalent to unanticipated increases in real rates of taxation. And, of course, positive constant expected rates of inflation imply positive expected rates of change in real tax rates. The implications of these inflation induced increases in expected real tax rates would be substantially weakened if, contrary to the tax effects hypothesis, nominal capital gains were positively associated with the expected rate of inflation--implying that the expected capital gain varies directly with the expected rate of inflation. More generally, holdings of units of fixed capital and of units of inventory would both be complete hedges against expected (unexpected) rates of inflation if, for each type of asset, $\beta_1 = 1.0$ ($\beta_2 = 1.0$).

The data on nominal capital gains were obtained as follows. Consider, for illustrative purposes, units of capital stock on hand at time t-1. Let $\tilde{r}_{dt}$ denote the percentage change in the number of units of capital stock (i.e., depreciation or appreciation in real terms) per unit of capital stock on hand at time t-1. If the productivity of the capital stock is proportional to the number of units, then $\tilde{r}_{dt}$ is the rate of real economic depreciation when $\tilde{r}_{dt} < 0.0$.

The nominal capital gain, from t-1 to t, per unit of capital stock on hand at time t-1 is equal to

$$\tilde{R}_{Kt} = (1+\tilde{r}_{Pt})\ (1+\tilde{r}_{dt}) - 1.0.$$

The values of $\tilde{r}_{Pt}$ and $\tilde{r}_{dt}$ can be obtained from our BEA data on the current value and constant value of fixed capital. Let $\tilde{P}_t$ denote the price per unit of capital at time t; let $\tilde{K}_t$ denote the number of units on hand at time t, and let t=0 denote the "base year" used for constant dollar data. The current dollar and constant dollar values of the net fixed capital stock at time t are, therefore, given by $\tilde{P}_t\tilde{K}_t$ and $P_o\tilde{K}_t$, respectively. Using these values, for time t-1 and time t, one gets

$$\tilde{r}_{Pt} = \frac{\tilde{P}_t}{P_{t-1}} - 1.0 = \frac{(\tilde{P}_t\tilde{K}_t) \ / \ (P_o\tilde{K}_t)}{(P_{t-1}K_{t-1}) \ / \ (P_oK_{t-1})} - 1.0.$$

and

$$\tilde{r}_{dt} = \frac{\tilde{D}_t}{K_{t-1}} = \frac{P_o\tilde{D}_t}{P_oK_{t-1}}$$

where $(P_o\tilde{D}_t)$ is the constant dollar value of depreciation for the period t-1 to t. $\tilde{D}_t$ is, therefore, the implied total loss of units of productive capacity.

Note that the value of $\tilde{R}_{Kt}$ is not the value of the total return per unit of capital over the period t-1 to t, because it does not incorporate a measure of the real output per unit of capital stock. The latter variable is a flow component of the total return to capital--which is implied by use of this factor of production. This component is, in effect, analogous to the dividend component of the total return on common stock. And the value of $\tilde{R}_{Kt}$ is analogous to the conventional capital gain component. We shall deal with the output (or flow) component in Sec. 4.5, below.

Estimation results for capital gains rates are presented in Tables 13 and 14. Table 13 presents results for fixed nonresidential capital conditional on two depreciation methods: straight-line and double-declining balance. As will be seen, these different methods did not lead to essentially different results. Nor did different service-life assumptions. (Only results for service lives equal to .85F are presented here.) Table 14 provides results for residential capital and for inventory. For inventory, $\tilde{r}_{dt} \equiv 0.0$ for each t. The results for residential capital are based, as before, on the straight-line depreciation method and the .85F service-life assumption.

The results for fixed nonresidential capital are consistent with a positive effect of expected inflation on the conditional expected value of the capital gains rate. For the post-war period, the results for β_1 and β_2 are substantially consistent with $\beta_1 = 1.0$ and $\beta_2 = 1.0$ when Y_{t-1} is not in the model. When it is in, the results are still quite consistent with $\beta_2 = 1.0$, but not with $\beta_1 = 1.0$. Since $\tilde{Y}_{t-1}$ and $\tilde{E}(\tilde{\pi}_t)$ are positively correlated, the apparent dependency between the estimated values of β_1 and β_3 should not be surprising. Of course, since both $\tilde{Y}_{t-1}$ and $\tilde{E}(\tilde{\pi}_t)$ are positively serially correlated, the positive covariation of $\tilde{Y}_{t-1}$ and $\tilde{E}(\tilde{\pi}_t)$ may be "spurious," in the sense described by Granger and Newbold {1974}. In any event, it does seem that fixed nonresidential capital served as at least a partial hedge against both components of inflation. This may provide part of the explanation as to why the tax effects hypothesis does not, on the basis of our results, seem to have much descriptive adequacy. The results for holdings of residential capital and inventory may fill in additional parts of this puzzle. These results are presented in Table 14.

The results for residential capital are roughly the same as those for nonresidential fixed capital, particularly for the post-war period. When the constraint $\beta_3 = 0.0$ is imposed, residential capital seems to be a complete hedge against both components of inflation over this period. When $\beta_3 \neq 0.0$ is allowed, it seems to be at least a partial hedge against expected inflation and a complete hedge against unexpected inflation.

The results for inventory are quite different. Inventory always seems to provide more than a complete hedge against the unexpected component of the inflation rate. And for at least the overall and postwar periods, it seems to be at least a complete hedge against the expected component. Both of these features of inventory holdings would have alleviated the adverse predictions of the tax effects hypothesis with respect to firms' post-tax real profitability.

In summary, it seems that the resources presumed to be most affected by the joint implications of inflation and historical cost accounting methods were sources of (at least partial) hedges against both components of inflation. This possibility seems to be overlooked in the literature on the tax effects of inflation--which draws quite heavily, it appears, on partial equilibrium analyses. Such analyses abstract from the potentially alleviating forces being considered here.

4.5 Real Output Rates

Results for proxies for the flow component of the return to total fixed capital plus inventory are described in Tables 15 and 16 (BEA data) and Table 17 (IRS data). The "cash flow" and "total profits tax" data used for Tables 15 and 16 are identical to those used before. The denominators used for these tables were computed using our BEA data on total fixed capital (i.e., residential plus nonresidential fixed capital) and on inventory holdings. The numerators and denominators used here are both in terms of current dollars. Thus, the computed output rates are in real terms.

Given the previously discussed results on capital gains, the results in Tables 15 and 16 would be inconsistent with the adverse predictions of the tax effects hypothesis if they are consistent with real output rates that are at worst unaffected by either component of inflation. In this case, the inferences made earlier about capital gains would apply to total period returns, too.

On balance, the results in Table 15, for both after-tax and before-tax net operating cash flows, are consistent with nonnegative values of both β_1 and β_2. And in some cases the results are consistent with significantly positive values of β_1. As can be seen from Table 16, which pertains to returns on net capital (and, thus, is probably more relevant), essentially the same story is told by the after-tax real output rates conditional on straight-line depreciation and .85F service lines. (Different depreciation methods and service life assumptions led to essentially the same results.) The only seemingly important inconsistency with $\beta_1 \geq 0.0$ appears in the before-tax real output rate for the post-war period conditional on the SL method and .85F service-life assumption. But this is contrary to the tax effects hypothesis, in its pure form, because it pertains to before-tax not after-tax returns. The before-tax real returns are not predicted to be increasing functions of either component of inflation by that hypothesis. Indeed, it predicts constant before-tax real returns (conditional on an output level) and decreasing after-tax real returns.

The difference between the data used for the top and bottom panels of Table 16 is due to the adjustment for total profits taxes. Taken at face value, the results in Table 16 for the post-war before-tax returns are consistent with the statement that inflation is a proxy for "business conditions" and that positive expected rates of inflation are "bad for business." The corresponding after-tax results are consistent with the tax system's alleviating the effects of adverse business conditions.

The results described in Table 17 are conditional on IRS data. These results are for the ratio of period t sales to time t-1 total assets. This is supposed to be another proxy for the flow component of the total periodic return to capital. These IRS data are, as indicated earlier, conditional on whatever historical cost accounting methods were used by firms for tax reporting. Thus, these data are quite different--at least in principle—from the BEA data used above. Nevertheless these results are, on balance, consistent with the BEA-based results. Of course, the positive point estimates of β_1 may be due to the mechanical detail described earlier. But the fact that the point estimates of β_2 are not always positive too makes this explanation seem implausible.

In any event, the same basic message seems to be supported by all the results taken together. The real flow component of the total periodic return to capital seems to have been at least unaffected by both components of the rate of inflation.

5. Remarks on the Descriptive Inadequacy of the Tax Effects Hypothesis

5.1 Tax Code Issues

Our results are consistent with the existence of forces that at least alleviated the effects predicted by the "tax effects hypothesis", particularly with respect to the post-war period. Changes in the income tax code (or its application) that had the same ultimate effect that formal indexation would have had can induce such forces. An examination of the parts of the federal income tax provisions pertaining to depreciation suggests that such changes did take place, especially when one compares the post-war to the pre-war period.[8/]

During the pre-war period, the changes that took place seemed to be in the direction of reducing firms' latitude of choice. For example, the various editions of Bulletin F--which supplied guideline service lives for depreciable assets--seemed to have been motivated by such an objective. The first edition of Bulletin F, published in 1920, appeared willing to rely upon "prevailing business practices," without supplying any data-based guidelines. The next edition, published in 1931, was accompanied by a document entitled Preliminary Report on Depreciation Studies, which stipulated the "probable useful life" and the corresponding straight-line depreciation rate for each of 2700 different kinds of industrial assets. The third edition of Bulletin F, published in 1942, also specified guideline service lives--now for 5000 different types of assets.

Changes in the direction of restrictiveness are also implied by the informational and "burden of proof" demands placed on taxpayers. Treasury Decision 4422 (which constituted an amendment to existing regulations) is illustrative in this regard. Evidently IRS inferred, on the basis of its own studies, that the depreciation deductions taken by many firms had been "excessive", in the sense that continued application of past depreciation methods would lead to "fully depreciated assets" before the assets' useful lives were attained. As a result, Treasury seemed to want to reduce depreciation taken in future years to the extent that it was thought to be excessive in the past. This supposedly constituted important motivation for Treasury Decision 4422 (issued in February, 1934).

This Decision made three important changes:

(1) It required that taxpayers supply detailed schedules of information to be used in substantiating depreciation deductions.

(2) It required that all future depreciation charges be limited to what would be needed to recover undepreciated balances over assets' remaining useful lives.

(3) It placed the burden of justifying depreciation deductions on taxpayers. Before this change, a deduction could not be disallowed unless IRS could show--with "clear and convincing evidence"--that a deduction claimed by a taxpayer was unreasonable.

Developments with respect to depreciation methods seemed to have been consistent with moves toward greater restrictiveness over the pre-war period. No taxpayer was required, as a matter of law, to use any particular method. But for the pre-1945 years, the straight-line method seemed to be the only one to which IRS gave (at least unofficial) <u>prior</u> approval.

(In general, the acceptability of all accounting methods depends upon the IRS Commissioner's approval.) It is, for example, the only method explicitly mentioned in the 1931 edition of Bulletin F. Pronouncements with respect to the declining-balance method seemed to reflect this IRS position. In 1927, it ruled that neither approval nor disapproval of the declining-balance method would be given in advance of an audit of a taxpayer's annual return. This ruling was not officially modified until 1946, when IRS ruled that it would approve of the declining-balance method's use in advance of an audit if this method "accords with the method of accounting regularly employed in keeping the books of the taxpayer."[9/] And in another 1946 ruling, it limited the rate used under the declining-balance method to a maximum of 150 percent of the straight-line rate that would otherwise be appropriate. The positions adopted by the Treasury in cases that went before the Tax Court in the pre-1946 period are consistent with an intention of restricting the use of the declining balance method.

Developments during the war period (e.g., the provisions regarding emergency facilities and the capital gains/losses treatment of gains and losses on property used in a trade or business) and developments during the post-war period seemed to reflect a different attitude. For example, the Internal Revenue Code of 1954 provides advance approval of two basic accelerated methods: the sum-of-the-years' digits method and the declining-balance method, with the rate used for the latter limited to twice the appropriate straight-line rate computed without regard to salvage value. Advance approval of the straight-line method was also reiterated. (These provisions applied to post-1953 acquisitions.)

In 1962, a revised edition of Bulletin F was published. This edition provided guideline lives for classes of assets (rather than for specific items). These suggested lives were claimed to be 30-40 percent shorter than those provided in the earlier (1942) edition of Bulletin F. In addition, a so-called "reserve ratio test" was specified, which could have been used to justify even shorter lives. (Justification based on "all the facts and circumstances" was, in general, also still available.) When it appeared that many firms would fail the reserve ratio test, the test was changed in 1965 (via Revenue Procedure 65-13)!

Around 1971, it appeared that the modified reserve ratio test would still not be passed by many firms. This is the setting that led, in part, to the Class Life Asset Depreciation Range (ADR) System, for assets placed in service in 1971 or later, and a new Class Life System (CLS) for assets placed in service before 1971 (for taxable years ending after December, 1970). The CLS system specifically eliminates the reserve ratio test for pre-1971 acquisitions. The ADR provisions allowed for service lives shorter than the guideline lives proposed in 1962.

And, of course, the year 1962 witnessed the enactment of the "investment tax credit." This credit was suspended in 1966, restored in 1967, suspended again in 1969, restored again in 1971, and further extended and revised after that time. Each of these developments seemed to have been motivated by "prevailing economic conditions."[9/]

Admittedly, this sort of analysis of historical developments lends itself to "ex post reasoning" and unintentional selectivity. For this reason, I do not want to lean too heavily on the above remarks. But the basic point of my argument does seem justifiable. Relative to what took place in the pre-war period, the post-war developments were substantially in the direction of liberalization of provisions pertaining to depreciation deductions. And these developments can account for the apparent post-war descriptive inadequacy of the tax effects hypothesis, at least relative to its descriptive power with respect to the pre-war period. Moreover, given the sorts of arguments advanced in favor of these developments, it seems plausible that they were intended to have the same effects (on, e.g., profitability and investment incentives) that formal indexation would have had.

Post-war developments regarding the use of LIFO for tax reporting--when viewed relative to pre-war developments--seem to point in the same direction; see, e.g., Butters and Niland {1949; ch. 3} for remarks on early post-war events. The increased relative importance of tax deductible interest charges also serves to alleviate the changes in real tax burdens predicted by the tax effects hypothesis.

5.2 Relative Price Changes and Real Wealth Shifts

The tax effects hypothesis draws heavily on the tools of partial equilibrium analyses. Ignored by its presumptions and predictions are such things as changes in relative prices and the distribution of wealth. Once the latter sorts of things are taken into account, the predictions of the tax effects hypothesis seem much less convincing. For example, if non-zero rates of inflation are accompanied by wealth redistributions because of the sorts of assets (nominal vs. nonmonetary) held by various types of agents, then one can expect, in general, shifts in patterns of consumption. And these shifts may be relatively advantageous to firms for which fixed capital services and inventory services are important factors of production. In short, such potential shifts in demand functions can alleviate the cost function shifts predicted by the tax effects hypothesis (because of predicted changes in real tax burdens). And they can lead to real capital gains on current holdings of units of fixed capital and units of inventory.

The evidence presented here is not based on tests dealing specifically with this issue of demand and cost function shifts. But the empirical results on, e.g., firms' capital expenditure rates and rates of growth in net capital--which reflects firms' decisions about allocating real resources--seem consistent with such favorable shifts.

Additional remarks and evidence on the importance of relative price changes and changes in the distribution of real income are provided by Minarik {Summer, 1978} and Nulty {1970}. Remarks on evidence dealing specifically with real wealth redistribution due to capital gains and losses (realized and unrealized) are provided by Eisner {1979}.

5.3 The Expenditure Side of the Government Budget

The major predictions of the tax effects hypothesis are based on the changes in real tax burdens implied by a nonindexed income tax system and non-zero rates of inflation. This partial equilibrium approach abstracts from the critical "other side" of the government budget: the expenditure side. If the predicted changes in resources drawn from the private sector are accompanied by changes in the pattern of real governmental expenditures, then there are even stronger reasons for expecting the sorts of relative price and real wealth changes mentioned above. In technical terms, the changes on the tax side may not be "distributionally neutral", in the sense defined by, e.g., McClure and Thirsk {1975}.

Such changes on the expenditure side seem particularly likely when stabilization goals are actively pursued. As indicated in Sec. 2.2, this may lead to relationships between the components of inflation rates and, say, corporate profitability and investment incentives. But the implied relationships and their interpretations would differ from those associated with the tax effects hypothesis. In short, expected and unanticipated rates of inflation may simply be serving as proxies for governmental actions motivated by stabilization goals. Changes on the expenditure side of the government budget may also result from active pursuit of income transfer goals. In this regard, see, e.g., Browning and Johnson {1979}.

6. Summary and Implications

The general topics of interest here are the potential substantive economic effects of accounting techniques, conditional on the prevailing economic conditions and institutional structure. The joint effects of historical cost accounting methods and price-level changes were the specific objects of analysis in this paper.

It is usually argued that the failure to use indexation (i.e., the use of historical cost accounting techniques) necessarily implies that real rates of income tax will vary directly with rates of inflation. This substantive effect of mere bookkeeping methods is often predicted even though the predicted effect is recognized to have adverse implications. This is the so-called "tax effects" hypothesis whose descriptive adequacy was investigated in this paper.

I inferred that the empirical results presented here are not consistent with the tax effects hypothesis. The results are consistent with the joint hypothesis that (1) the effects of indexing the tax system were attained via the government's providing alternative options to firms (in the form of, e.g., liberalized depreciation rules), and (2) firms exploited available devices (e.g., the use of debt-induced tax shields) to alleviate the changes in real tax burdens jointly implied by price-level changes and a tax code based on historical cost accounting methods, and (3) these predicted changes in real tax burdens were alleviated by favorable demand function shifts (due, e.g., to patterns of governmental expenditures, relative price changes, etc.).

In any event, what does seem most clear is that fixating exclusively structure and conditional on prevailing economic conditions--may not lead to a descriptively adequate model. This seems, moreover, to be a very likely result when the decision makers whose decisions are being (implicitly) modeled are among those who can alter accounting techniques or the effects of techniques. Why, for example, would firms knowingly allow their real tax burdens to increase when they can adopt techniques (e.g., accelerated depreciation methods) that prevent or mitigate the effects of such results? Why are firms not assumed to exploit other features of the prevailing rules of taxation--such as the tax deductibility of interest charges--for the same reason? And why is the government presumed to allow such increases in real tax burdens independently of their implications for the overall level of economic activity and for the pattern of real resource allocations? A model that does not account for such potential private and public sector responses and that also assumes rational economic behavior seems somewhat strange. More importantly, it seems likely to omit variables that are important for attaining descriptive adequacy.

I suspect that the same sorts of issued are relevant to areas other than the tax effects of inflation and historical cost accounting techniques. It is claimed, for example, that the FASB's recently adopted "expensing" rules for R&D expenditures will have adverse implications for investments in R&D and innovative behavior; see e.g., Horwitz and Kolodny {1979}. But why would rational economic agents allow this to occur solely because of bookkeeping mechanics? Perhaps if it does occur, its occurrence is really independent of these mechanics. But those whose "oxen are gored" by its occurrence may find these mechanics and the FASB to be handy scapegoats. Or perhaps the effects of the techniques are consistent with the objectives of the "powers that be" and, as a result, these effects would have been induced via alternative routes if not by the techniques.

Similar issues can be raised with respect to recent debates over oil and gas accounting and accounting for foreign currency translations. See, for example, Collins, Dent, and O'Conner {1978}, Collins and Dent {1979}, and Dyckman and Smith {1979}, with respect to oil and gas accounting, and Dukes {1978} and Burns {1976}, with respect to foreign currency translations.

Footnotes

1. By nominal "economic" profits, I mean profits computed in terms of the currently prevailing prices of outputs and of the services provided by factors of production. Real economic profits equals nominal profits after abstracting from general price level changes. Going from nominal to real profits involves, at an operational level, some heady issues of price-index construction which we bypass here. For extensive discussions of this topic see Griliches (1971).

2. Useful summaries of major positions are provided in Aaron (1976), Feldstein (1979), Cagan and Lipsey (1978), and Shoven and Bulow (1975) (1976). The paper by Tideman and Tucker in the Aaron compilation (pp. 33-74) is particularly useful.

3. The evidence presented by Coen (March, 1975) is consistent with tax service lives for equipment that are substantially different from those revealed by actual investment behavior, conditional on IRS's Asset Depreciation Range (ADR) System. The differences seem to be larger for structures.

4. Indeed, they may even go beyond indexation, as measured by the difference between, say, historical cost capital consumption allowances and current value capital consumption allowances. Note, for example, that for each of the years 1962-1973, the NIPA Capital Consumption Adjustment for All Corporations was positive. This indicates that historical cost depreciation (per tax reports) exceeded the NIPA estimate of current value depreciation in each of those years. (The NIPA estimate is based on .85F service lives and straight-line depreciation.) See Table 1.15, Line 16 (pp. 46-47) in The National Income and Product Accounts of the United States, 1929-1974: Statistical Tables (Bureau of Economic Analysis, U.S. Department of Commerce, 1977). The total NIPA adjustment can be decomposed into an adjustment for depreciation methods, but still using historical cost, and an adjustment for the difference between historical and current costs. In Table 8.7 of the NIPA accounts, these two adjustments are given by, respectively, "Adjustment of capital consumption allowances to consistent accounting at historical cost" and "Adjustment of consistent accounting at historical cost to current replacement cost." The first adjustment is supposed to make the data for all firms conditional on straight-line depreciation and .85F service lives. It is, therefore, intended to abstract from "liberalized" provisions pertaining to depreciation methods and service lives. Over the 1962-1973 period, this first adjustment exceeds the second adjustment, which is supposed to deal only with the difference between current and historical costs. A recent analysis of the potentially similar effects of formal indexation and accelerated depreciation methods is provided by Feldstein (September, 1979).

5. All regression model results discussed below were also obtained for models that did not include, as an independent variable, the contemporaneous

rate of change in industrial production. Noteworthy differences between these unreported results and those presented here are discussed at appropriate points in the text.

6. Pertinent expressions for this rental rate are given in, for example, Hall and Jorgenson (1967) (1971).

7. "Constant dollar" data could also be used to define real rates. But such data were not available for all the series and years of interest here (e.g., constant dollar Gross Domestic Product for all pre-1947 years). So long as our exploratory analyses did not imply that the choice of data type made an essential difference, we chose to use current dollar data when available.

8. The discussion provided below draws heavily on the following references: Montgomery (1917) (1936), Montgomery, Taylor and Richardson (1946), (1947), Mertens (1973), Coughlan and Strand (1969), Commerce Clearing House (1978), Grant and Norton (1955), and McCarthy (1968) (1974).

9. Such a tie-in between tax reporting and financial reporting is usually associated with adopting the LIFO inventory method for tax reporting. The indicated 1946 ruling regarding depreciation method surprised me.

10. It is also well to note that subsidy programs such as the investment tax credit can be substantially nonneutral. Thus, they can contribute to shifts in the distribution of real wealth, such as those considered below in Sec. 5.2. For analyses of this feature of the investment tax credit, see, e.g., Sunley (1973) and Bradford (1978).

APPENDIX

REMARKS ON DATA

Detailed descriptions of the data series used here are given in the data sources identified in the text. Repeating those details here seems pointless, and no attempt to do this is made. Instead, we briefly describe the BEA Capital Stock Data, some of our NIPA series, and our expected rates of inflation.

BEA Capital Stock Data

The BEA capital stock data pertain to fixed nonresidential business and residential capital in the United States. Detailed tabulations based on historical costs, current costs, and constant-dollar costs are presented for stocks of durable equipment and nonresidential structures owned or operated by private business and for residential capital located in the U.S.. These capital stock data are consistent with the data prepared by BEA for its National Income and Product Accounts (NIPA). In addition, the data are presented under various service-life assumptions and under various depreciation methods. These data result from a larger project which also deals with stocks of business inventories.

BEA's capital stock data were obtained by applying the "perpetual inventory method" to data on investment flows. That is, data on stocks are obtained by cumulating investment flows, adjusting for withdrawals, and, for net capital stocks, adjusting for depreciation.

The data on investment flows used by BEA are those that enter the estimates of Gross National Product (GNP). Specifically, these flows consist of: (1) the nonresidential and residential fixed investments that are included in the "gross private domestic investment" component of GNP, and (2) the government purchases of residential capital that are included in the "government purchases of goods and services" component of GNP.

The BEA capital stock data pertain to newly produced assets and to stocks stemming from (net) acquisitions by business of secondhand items from other sectors. Such acquisitions were, according to BEA, quite large after World War II, when private businesses acquired equipment and structures that were owned by the government during this war.

BEA used original acquisition prices to value intersector transfers of used assets other than government surplus assets. Some of these government surplus assets are also valued at their original acquisition prices. But those that were "less suited to postwar than war use" were valued at (what are claimed to be) the prices that business would have been willing to pay for new assets of equal productivity designed specifically for the civilian uses to which these government surplus assets were put. "Government-owned privately-operated" (GOPO) assets are excluded. Remarks on the importance of these assets are given in Gordon (1969).

For nonresidential fixed capital, BEA provides net capital stock data under alternative assumptions about service lives and depreciation methods (viz., straight line and double declining balance). The results presented in the text are based on the data for service lives equal to 85% of those specified in the 1942 edition of the Internal Revenue Service's Bulletin F*. Table A.1 gives the .85F lives used by BEA and it indicates the types of assets included in BEA's categories of assets.

Various price indices were used by BEA in order to obtain its current dollar, and the related constant dollar, data. BEA attempts to adjust for quality changes to the extent that such changes are reflected in the contemporaneous relative prices of new and old capital goods. In general, one unit of a new item is considered to be equivalent to one unit of the old item multiplied by the ratio of the acquisition cost of the new item to the contemporaneous acquisition cost of the old item for an "overlap" time period. If there is no overlap period, BEA effects a hypothetical comparison by estimating what it would have cost to produce the new item in a period in which the old item was available.

NIPA Data

The NIPA data (as revised in 1977 and 1978) resulted from a comprehensive benchmark revision of the national income and product accounts (NIPA's) of the U.S. completed in 1976. Definitions of some of the series used in this paper are given below.

Corporate Profits Before Tax is the income of corporations organized for profit and mutual financial institutions that accrues to U.S. residents, measured before profits taxes, before deduction of depletion charges, after exclusion of capital gains and losses, and net of dividends received from domestic corporations. In addition to profits earned from domestic operations, this number includes net receipts of dividends and branch profits from abroad.

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*U.S. Treasury Department, Bureau of Internal Revenue, Bulletin F (Revised, January, 1942)--Income Tax, Depreciation and Obsolescence, Estimated Useful Lives and Depreciation Rates, Washington, 1942

Table A.1

BEA-Service Life Assumptions by type of Asset

Type of Asset	.85F Life (years)
Equipment	
Furniture and Fixtures	15
Fabricated metal products	18
Engines and turbines	21
Tractors	8
Agricultural machinery (except tractors)	17
Construction machinery (except tractors)	9
Mining and oilfield machinery	10
Metalworking machinery	16
Special industry machinery, n e c	16
General industrial, including materials handling, equipment	14
Office, computing, and accounting machinery	8
Service industry machines	10
Electrical machinery	14
Trucks, buses, and truck trailers	9
Autos	10
Aircraft	9
Ships and boats	22
Railroad equipment	25
Instruments	11
Other equipment	11
Nonresidential structures	
Industrial buildings	27
Commercial buildings	36
Religious buildings	48
Educational buildings	48
Hospital and institutional buildings	48
Other nonfarm nonresidential buildings	31
Railroad structures	51
Telephone and telegraph structures	27
Electric light and power structures	30
Gas structures	30
Other public utility structures	26
Farm nonresidential buildings	38
Petroleum, gas, and other mineral drilling and exploration	16
All other private nonresidential structures	31

Residential captial

1-to-4 unit structures:	
New	80
Additions and alterations	40
5-or-more unit structures:	
New	65
Additions and alterations	32
Mobile homes	16
Nonhousekeeping	40
Equipment	11

Government-owned, privately operated

Atomic Energy Commission: Equipment	25
Structures	32
National Aeronautics and Space Administration:	
Equipment	15
Structures: Manufacturing	32
Nonmanufacturing	37
Department of Defense: Equipment	19
Structures	32
Maritime Administration:	22

Source: Bureau of Economic Analysis, Fixed Nonresidential Business and Residential Capital in the United States, 1925-1975 (U.S. Department of Commerce, June, 1976), Table B, pp. T-6-T-7

In other important respects, this profits number is defined in accordance with U.S. Federal income tax regulations.

Profits tax liability consists of Federal, State, and local taxes on corporate income.

Net interest consists of interest paid by domestic business less interest received by it, plus net interest received from abroad. In addition to monetary interest flows, net interest includes interest in kind (i.e., "imputed interest"), as described in the text.

Capital consumption allowance consists of depreciation charges and accidental damages to fixed business capital. For nonfarm business, these amounts are as reported on Federal income tax returns. For farms, they are based on NIPA calculations.

Capital consumption adjustment equals the tax-return-based capital consumption allowance less a capital consumption allowance based on estimates of economic service lives, straight-line depreciation, and replacement cost.

Gross domestic product is a measure of production that excludes the NIPA "rest-of-the-world" production. Specifically, it is the market value of goods and services produced by labor and property located in the U.S.

Expected Rates of Inflation

The expected annual rates of inflation used here were kindly supplied by G. William Schwert (University of Rochester).

His estimates resulted from time series analyses of monthly and annual percentage changes in the Consumer Price Index. The specific results used here are those associated with what appeared to be the most adequate time series model, relative to those considered by Schwert and to the strict martingale model.

Schwert's analyses encompassed four different methods of forecasting annual rates of inflation. Two methods involved computing forecasts of annual rates from forecasted monthly rates, for the months within each calendar year for which a forecast was desired. The other two methods involved forecasting annual rates of inflation with models applied directly to annual data. Some details on the four methods are given below:

Forecast Method #1: Annual forecasts based on one-step ahead predictions of monthly rates of inflation. Model applied to monthly data is first-order moving average model for first differences (i.e., IMA(1,1)). Consecutive one-step ahead forecasts for the months of a given year are summed to get the implied forecast for the entire year, for the years 1913-1975. The model for monthly rates was separately estimated for sub-periods ranging in length from 6 to 12 years (i.e., 72 to 144 months). Thus, the monthly forecast errors are actually residuals. This is, in general, not the case for the corresponding annual forecast errors.

Forecast Method #2: Forecasts of annual rates of inflation are based on consecutive K-step ahead forecasts of monthly rates for the months within a year of interest, for K=1,2,...,12. The model used for a given year's monthly forecasts is estimated using monthly data from January, 1913 to December of the preceeding year. (Thus, the 1-step ahead forecast from the model estimated using data up to December of a given year is always for January of the next year, the 2-step ahead forecast is for February of the next year, etc.,) The monthly forecasts for a given year were summed to get the implied annual forecast for that year, for each of the years 1916-1975. (Data from 1913-1915 provided "start up" data.)

Forecast Method #3: Forecasts of annual rates are based upon the second-order autoregressive model applied directly to annual data for the years 1912-1976. The first forecast is for 1914. Forecast errors are, therefore, residuals from the estimated model.

Forecast Method #4: Forecasts of annual rates are based upon the third-order moving average model applied to first differences of annual data from the period 1912-1976. The first forecast is for 1914. ("Back forecasting" was used here.)

Various properties of the annual forecast errors induced by these four methods and the strict martingale model (applied to annual data) were examined. Bias, serial correlation, standard deviations, and mean-squared errors were among the properties examined, for the overall period 1916-1975 and for the two sub-periods 1916-1946 and 1947-1975. On the basis of these results, I inferred that Forecast Method #1 is the more adequate model.

At first glance, it might seem inappropriate to use this model--which is based on monthly data--in conjunction with our annual data (i.e., the BEA, NIPA, and IRS data). But these other data presumably reflect the effects of decisions that were made and events that occurred throughout each year, rather than at, say, the beginning of each year. Changes in expected rates of inflation are among the potential intra-year influences on these decisions and events. The expected annual rates derived from our expected monthly rates can be viewed as summarizing the inflation expectations corresponding to the annual observations on our other variables of interest. As with other sorts of aggregation, this type of summarization may involve a "loss of information" (on, e.g., the timing of intra-year changes in inflation expectations and the timing of changes in investment plans). I do not believe, however, that it involves any internal theoretical inconsistency.

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Exhibit 1

Summary of Variables Used (Directly or To Derive Another Variable) and Sources of Data.
All Data are for "All Corporations" and, Except for Gross Domestic Product, in Millions of Dollars.
Gross Domestic Product (Variable (9)) is in Billions of Dollars.
Except for IRS Data, Data are Annual Data for Calendar Years 1929–1974.
IRS Data are Annual Data for Fiscal Years 1929–1974.

	Variable Used	Table(s)	Data Source
(1)	Capital expenditures in current dollars.	5, 10	BEA
(2)	Gross fixed capital stock in current dollars.	5, 2, 15	BEA
(3)	Net fixed capital stock in current dollars assuming straight-line depreciation and service lives equal to 85% of those suggested in IRS's 1942 edition of Bulletin F (i.e., .85F service lives) or (where noted) double-declining balance depreciation and .85F lives.	5, 2, 13, 16	BEA
(4)	Profits tax liability in current dollars.	1, 2, 11, 3, 15, 16	NIPA
(5)	Profits before taxes in current dollars.	1, 11, 15, 16	NIPA
(6)	Capital consumption allowances in current dollars per national income accounts.	1, 11, 15, 16	NIPA
(7)	Net monetary interest in current dollars.	1, 11, 15, 16	NIPA
(8)	State and local profits taxes in current dollars.	1, 11	NIPA
(9)	Gross domestic product in current dollars.	3	NIPA
(10)	Depreciation in constant dollars for BEA capital stock conditional on straight-line depreciation or (where indicated) double-declining balance depreciation and service lives equal to .85F.	13	BEA
(11)	Net fixed capital stock in constant dollars conditional on straight-line depreciation or (where indicated) double-declining balance depreciation and service lives equal to .85F.	13, 6, 7	BEA
(12)	Net fixed residential capital in current dollars and (where indicated) in constant dollars assuming straight-line depreciation and service lives equal to .85F.	14, 7	BEA
(13)	Inventory stocks in current dollars and in constant dollars.	14, 3, 9, 15, 16	BEA
(14)	Total before tax income conditional on historical cost accounting methods used for tax reporting.	4	IRS
(15)	Total federal income tax liability conditional on tax reports.	4	IRS
(16)	Total assets conditional on historical cost accounting methods used for tax reporting.	4, 12, 17	IRS
(17)	Total receipts conditional on historical cost accounting methods used for tax reporting.	17	IRS

	Variable Used	Table(s)	Data Source
(18)	Interest expense conditional on historical cost accounting methods used for tax reporting.	6, 8	IRS
(19)	Net fixed assets conditional on historical cost accounting methods.	7, 8	IRS
(20)	Net interest in current dollars, after adjustments for imputations.	11	NIPA
(21)	Gross fixed capital stock in constant dollars.	6, 8	BEA
(22)	Gross fixed nonresidential capital stock in constant dollars.	7, 8	BEA
(23)	Depreciation in constant dollars for BEA residential capital stock, conditional on straight-line depreciation and .85F service lines.	14	BEA

Table 1

Estimated Regression Models for Relative Importance of Income Taxes. NIPA Data for "All Corporations" in Current Dollars

(All dollar amounts in millions of dollars).

$$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

Notes

(1) (Total Tax/BTxflo) ≡ Total Income Taxes divided by Before Tax Net Cash Flow. The latter is equal to the sum of (a) Profits before Taxes, (b) Capital Consumption Allowances, and (c) Net Monetary Interest. Total Taxes is equal to Federal, State, and Local Income Taxes. Net Monetary Interest is equal to Monetary Interest paid minus Monetary Interest Received.

(2) (Total Tax-State & Local Tax)/BTxflo) ≡ Federal Income Taxes divided by Before Tax Net Cash Flow.

(3) See appendix for additional details on data.

(4) t-statistics are provided below point estimates or β_0, β_1, β_2, β_3, and β_4.

Total Tax/BTxflo	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
1929-1974	.236 15.525	.927 2.872	- .418 - .462		.159 1.266	.087	.204	- 4.975	.803	.649	.495	.350	.225
1929-1974	.025 1.700	- .105 - .739	.409 1.158	.898 15.321	.136 2.802	.034	.881	- .692	.316	.174	- .161	- .234	- .376
1929-1945	.203 6.573	1.744 2.275	- 1.359 - .569		- .006 - .024	.011	.414	- 2.566	.676	.378	.114	- .090	- .406
1929-1945	.026 .869	- .095 - .214	.220 .196	.897 6.774	.186 1.532	.049	.876	- 2.566	.450	.293	- .323	- .396	- .687
1929-1946	.198 7.579	1.581 3.291	- 1.850 - 1.186		.047 .275	.104	.432	- 2.248	.658	.350	.117	- .098	- .383
1929-1946	.028 1.056	- .018 - .057	.418 .534	.892 7.077	.163 2.065	.047	.881	- 2.248	.432	.282	- .321	- .389	- .666
1947-1974	.314 20.936	- .878 - 2.761	.327 .454		.093 .552	.045	.175	- 4.189	.801	.591	.449	.393	.367
1947-1974	.050 1.677	- .387 - 2.417	.804 2.322	.877 9.132	- .117 - 1.399	.021	.814	.112	.428	.204	- .032	- .095	- .219

T.1

Total Tax-State & Local Tax)/Btxflo

929-1974	.220 14.436	.907 2.806	- .408 - .450		.159 1.265	.087	.196	4.975	.809	.658	.502	.354	.222
929-1974	.025 1.757	- .076 - .537	.418 1.176	.894 15.270	.126 2.581	.034	.879	- 1.014	.325	.178	- .157	- .239	- .388
929-1945	.189 6.122	1.731 2.257	- 1.333 - .559		- .005 - .019	.108	.410	- 2.566	.678	.372	.114	- .094	- .412
929-1945	.024 .834	- .107 - .240	.218 .194	.900 6.745	.184 1.505	.050	.875	- 2.566	.455	.291	- .320	- .402	- .678
929-1946	.185 7.044	1.564 3.255	- 1.835 - 1.176		.049 .290	.104	.427	- 2.248	.660	.345	.117	- .103	- .387
929-1946	.026 1.025	- .029 - .092	.417 .532	.896 7.048	.160 2.024	.048	.879	- 2.248	.438	.279	- .317	- .395	- .658
947-1974	.297 18.646	- .879 - 2.610	.375 .491		.077 .429	.048	.150	- 4.619	.806	.610	.485	.445	.420
947-1974	.043 1.581	- .286 - 1.736	.908 2.580	.890 9.649	- .150 - 1.771	.022	.824	- .281	.385	.184	- .032	- .084	- .227

T12

Table 2

Estimated Regression Models for Income
Taxes Per Unit of Fixed Capital
NIPA and BEA data for All Corporations

(All dollar amounts in millions of dollars).

$$\tilde{}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

Notes

(1) (Taxes/Gfxcap) ≡ Total Income Taxes diviced by Gross Fixed Capital. The latter consists of equipment, structures, and residential capital.

(2) (Taxes/Net SL) ≡ Total Income Taxes divided by Net Fixed Capital. Depreciation is determined by the straight-line (SL) method assuming service lives equal to .85F.

(3) See appendix for additional details on data.

(4) t-statistics are provided below point estimates of β_0, β_1, β_2, β_3, and β_4.

axes/Gfxcap	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
929-1974	.034	.246	- .243		.024	.019	.248	- 3.697	.805	.571	.395	.216	.130
	10.107	3.450	- 1.218		.865								
929-1974	.002	.006	- .038	.884	.058	.007	.893	- .692	.273	- .084	- .137	- .172	- .219
	.983	.180	- .491	15.764	5.431								
929-1945	.028	.433	- .563		- .028	.026	.418	- 2.588	.625	.349	.124	- .123	- .353
	3.795	2.385	- .996		- .462								
29-1945	.005	.085	- .119	.853	.032	.010	.903	- .987	.522	.018	- .279	- .584	- .553
	1.160	.978	- .503	7.819	1.212								
29-1946	.027	.396	- .675		- .016	.025	.433	- 2.248	.599	.287	.109	- .135	- .342
	4.317	3.479	- 1.827		- .402								
29-1946	.004	.048	- .228	.853	.043	.010	.904	- 1.158	.480	- .023	- .227	- .472	- .407
	1.028	.759	- 1.402	8.021	2.387								
47-1974	.045	- .087	- .123		.093	.008	.245	- 2.571	.666	.395	.345	.199	.219
	16.680	- 1.525	- .952		3.081								
47-1974	.005	- .010	.026	.092	.786	.004	.762	1.189	.092	- .188	.125	- .021	.028
	.936	- .298	.350	5.421	7.287								

T13

Taxes/Net SL

1929-1974	.064 9.277	.490 3.332	- .550 - 1.335		.053 .934	.040	.241	- 4.344	.801	.553	.361	.166	.076
1929-1974	.004 .835	.003 .052	- .132 - .837	.887 15.777	.121 5.536	.015	.892	- 1.194	.329	- .072	- .143	- .183	- .244
1929-1945	.059 3.733	.920 2.354	- 1.224 - 1.006		- .059 - .450	.055	.413	- 2.588	.621	.341	.118	.111	.334
1929-1945	.010 1.141	.166 .902	- .313 - .621	.855 7.930	.071 1.284	.022	.905	- .987	.522	.015	- .273	- .592	- .546
1929-1946	.057 4.243	.839 3.428	- 1.467 - 1.845		- .033 - .383	.053	.427	- 2.248	.595	.277	.103	- .126	- .325
1929-1946	.008 1.018	.092 .683	- .532 - 1.550	.856 8.151	.095 2.469	.022	.905	- 1.242	.479	- .022	- .224	- .481	- .405
1947-1974	.082 14.544	- .189 - 1.581	- .251 - .923		.184 2.893	.017	.223	- 4.189	.702	.479	.498	.411	.424
1947-1974	.007 .719	- .018 - .279	.071 .484	.813 8.176	.167 5.077	.009	.792	.415	.092	- .204	.091	- .001	.013

T-4

Table 3

Estimated Regression Models for Total Income Taxes per unit of Real Output. NIPA Data for Output and Taxes for All Corporations in Current Dollars: Output in billions of dollars and Taxes in Millions of Dollars.

$\tilde{}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$

ax/GDP	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
929-1974	61.358 12.561	379.41 3.660	-235.48 - .811		38.060 .947	28.028	.270	- 4.363	.832	.656	.509	.349	.245
929-1974	5.546 1.370	15.740 .342	114.68 1.014	.879 15.536	73.391 4.730	10.699	.894	.323	.223	- .075	- .077	- .130	- .179
929-1945	53.243 5.482	698.59 2.892	-507.59 - .675		-48.164 - .593	33.930	.492	- 2.588	.648	.350	.161	- .095	- .394
929-1945	10.526 1.437	162.20 1.250	225.89 .654	.860 7.167	25.684 .693	14.884	.902	- 2.566	.457	.066	- .327	- .439	- .493
929-1946	50.834 6.109	602.13 3.945	-798.10 - 1.610		-16.923 - .315	32.972	.502	- 2.248	.603	.298	.154	- .115	- .376
929-1946	8.040 1.109	60.288 .574	- 85.809 - .341	.859 6.970	58.893 2.169	15.274	.893	- .122	.387	- .059	- .194	- .283	- .400
47-1974	79.044 15.201	-140.67 - 1.279	- 93.848 - .376		120.32 2.056	15.533	.104	- 4.189	.750	.539	.553	.487	.553
47-1974	3.278 .367	18.218 .323	207.44 1.643	.874 8.847	107.28 3.761	7.562	.788	1.293	.042	- .238	.045	.055	.076

Notes

(1) (Tax/GDP) ≡ Total Income Taxes divided by Gross Domestic Product. Total Income Taxes is equal to the sum of Federal, State, and Local Income Taxes.

(2) See appendix for additional details on data.

(3) t-statistics are provided below point estimates of β_0, β_1, β_2, β_3, and β_4.

T15

Table 4

Estimated Regression Models for
Rates of Return on Total Assets.
IRS data for All Corporations in terms of
Historical Costs; all Dollar Amounts in
Millions of Dollars.

$$\ldots_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$$

Notes

(1) (TIncB/TA) ≡ Total Before-Tax Income for the period divided by Total Assets at the beginning of the period. Interest Expense is not deducted in the computation of Total Income.

(2) (TIncA/TA) ≡ Total After-Tax Income for the period divided by Total Assets at the beginning of the period.

(3) See appendix for additional details on data.

(4) t-statistics are provided below point estimates of β_0, β_1, β_2, β_3, and β_4.

IncB/TA	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
929-1974	.061	.416	- .219		.028	.023	.399	- 4.955	.786	.587	.473	.357	.364
	15.289	4.927	- .925		.865								
929-1974	.006	.105	.163	.845	.076	.008	.926	.788	.022	- .153	- .196	- .018	- .082
	1.631	3.017	1.903	17.156	6.445								
929-1975	.046	.503	- .907		- .004	.025	.607	- 2.588	.555	.365	.189	- .114	- .261
	6.514	2.883	- 1.669		- .077								
929-1945	.008	.148	- .145	.768	.061	.010	.939	- .987	.453	- .080	- .373	- .468	- .525
	1.571	1.811	- .617	8.111	2.469								
929-1946	.046	.526	- .839		- .012	.024	.626	- 2.751	.550	.286	.165	- .091	- .249
	7.776	4.816	- 2.367		- .308								
929-1946	.009	.163	- .099	.768	.056	.009	.942	- .640	.418	- .080	- .346	- .388	- .441
	1.749	2.673	- .601	8.447	3.251								
47-1974	.074	.126	.057		.109	.011	.262	- 4.610	.826	.689	.583	.438	.347
	20.179	1.614	.320		2.636								
47-1974	.015	.110	.208	.716	.121	.006	.771	- .782	.057	- .165	.154	.268	- .063
	1.745	2.540	2.063	7.376	5.221								

TIncA/TA

1929-1974	.046 18.577	.300 5.711	- .109 - .737		.018 .858	.014	.471	- 4.316	.761	.563	.465	.374	.420
1929-1974	.012 4.970	.111 4.456	.124 2.019	.515 14.587	.047 5.508	.006	.914	- 1.939	.162	- .000	- .227	- .200	- .121
1929-1945	.035 9.261	.322 3.439	- .603 - 2.068		.004 .125	.013	.711	- 1.513	.490	.350	.258	- .059	- .141
1929-1945	.014 5.854	.127 3.394	- .185 - 1.717	.421 9.690	.040 3.519	.004	.967	- 2.070	.509	.110	- .210	- .503	- .678
1929-1946	.036 11.085	.351 5.959	- .516 - 2.698		- .005 - .261	.013	.727	- 1.676	.489	.258	.219	- .018	- .136
1929-1946	.015 6.241	.152 5.204	- .110 - 1.388	.422 9.689	.032 3.861	.004	.966	- 1.745	.396	.072	- .209	- .421	- .500
1947-1974	.055 24.291	.148 3.113	.092 .851		.068 2.673	.007	.416	- 3.380	.798	.651	.489	.326	.171
1947-1974	.022 3.560	.140 4.291	.174 2.301	.387 5.323	.074 4.259	.005	.727	- .144	.239	- .062	- .149	- .052	- .055

T.7

Table 5

Estimated Regression Models for
Rates of Investment in Fixed Capital.
BEA data for "All Corporations" in Current Dollars.

(All dollar amounts in millions of dollars).

$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$

Notes

(1) (Capex/Gfxcap) ≡ Capital Expenditures divided by Gross Fixed Capital. The latter consists of equipment, structures, and residential capital.

(2) (Capex/Net SL) ≡ Capital Expenditures divided by Net Fixed Capital. Depreciation is determined by the straight-line (SL) method assuming service lives equal to .85F

(3) See appendix for additional details on data.

(4) t-statistics are provided below point estimates of β_0, β_1, β_2, β_3, and β_4.

apex/Gfxcap	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
929-1974	.055	.220	.225		- .036	.020	.149	- 4.906	.828	.671	.653	.677	.591
	16.003	3.026	1.106		- 1.265								
929-1974	.005	.015	.097	.908	- .0003	.008	.860	- .605	.356	- .191	- .237	- .108	- .091
	1.445	.464	1.166	14.469	- .025								
929-1945	.034	.149	- .028		- .028	.013	.026	- 1.143	.410	- .470	- .430	.173	.420
	8.820	1.563	- .095		- 8.820								
929-1945	.010	.064	.008	.734	- .007	.012	.238	- .461	.397	- .363	- .446	.010	.228
	.838	.687	.029	2.084	- .237								
929-1946	.036	.220	.183		- .051	.013	.444	- 1.676	.331	- .467	- .342	.192	.248
	10.549	3.542	.909		- 2.321								
29-1946	.009	.088	.098	.780	- .015	.011	.591	- 1.745	.320	- .375	- .386	.082	.132
	.808	1.157	.558	2.382	- .644								
47-1974	.070	- .010	.008		.047	.007	.034	- 2.683	.682	.637	.420	.259	.064
	28.938	- .199	.068		1.732								
47-1974	.014	- .100	.038	.824	.014	.005	.613	.415	.082	- .056	.224	.243	- .052
	1.545	- 2.805	.512	6.068	.787								

Capex/Net SL

1929-1974	.102 18.032	.411 3.417	.273 .810		- .067 - 1.442	.033	.180	- 5.553	.832	.678	.579	.519	.402
1929-1974	.010 1.517	.135 2.672	.353 2.675	.876 15.091	.012 .624	.013	.874	- 2.512	.380	- .129	- .247	- .219	- .237
1929-1945	.068 11.976	.272 1.937	- .063 - .144		- .058 - 1.240	.020	.127	- .987	.402	- .186	- .345	- .052	- .250
.929-1945	.029 1.634	.190 1.502	.132 .342	.567 2.272	- .019 - .433	.017	.352	- 1.035	.264	- .492	- .446	.254	.029
.929-1946	.070 14.172	.367 4.076	.225 .764		- .089 - 2.805	.020	.516	- 1.158	.389	- .175	- .345	- .121	- .263
929-1946	.029 1.663	.250 2.761	.334 1.316	.592 2.449	- .038 - 1.115	.017	.650	- 1.242	.227	- .439	- .401	.131	.001
947-1974	.124 30.804	.132 1.554	- .119 - .619		.094 2.088	.012	.134	- 2.683	.634	.285	- .029	- .157	- .357
947-1974	.022 1.379	.032 .603	.026 .222	.777 6.588	.125 4.527	.007	.687	.385	.084	- .080	- .144	.023	- .030

Table 6

Estimated Regression Models for Real Rates of Growth in Total Fixed Capital.

BEA Constant-Dollar Data for All Corporations

$$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$$

	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
PGross													
1929-1974	.018 4.859	.245 3.066	.249 1.114		- .053 - 1.721	.022	.158	- 5.220	.841	.715	.643	.602	.494
1929-1974	.000 .116	.090 3.122	.292 3.795	.899 17.513	.002 .150	.007	.900	- 2.206	.351	- .117	- .269	- .171	- .227
1929-1945	- .006 - 2.031	.071 .998	.008 .003		- .031 - 1.271	.010	.0000	- 1.035	.204	- .403	- .411	.034	- .072
1929-1945	- .003 - 1.270	.078 1.246	.096 .484	.502 2.192	- .015 - .661	.009	.197	- 1.035	.133	- .558	- .453	.338	.110
1929-1946	- .004 - 1.470	.150 3.097	.237 1.509		- .056 - 3.286	.010	.492	- 1.242	.184	- .349	- .357	- .117	- .104
1929-1946	- .002 - .775	.133 3.179	.270 2.011	.557 2.450	- .030 - 1.707	.009	.633	- 1.242	.112	- .471	- .362	.144	.043
1947-1974	.030 12.099	.196 3.783	.051 .435		.038 1.390	.007	.353	- 3.307	.688	.361	.083	- .108	- .296
1947-1974	.002 .373	.048 1.257	.108 1.525	.818 6.673	.076 4.381	.004	.770	.385	.165	.058	- .166	- .016	- .074

Notes

(1) PGross ≡ the annual percentage change in gross total fixed capital stock. The latter consists of gross residential plus gross residential plus gross nonresidential fixed capital, conditional on the .85F service life assumption.

(2) PNet ≡ the annual percentage change in net total fixed capital stock. The latter consists of net residential plus net nonresidential fixed capital, conditional on straight-line depreciation and the .85F service life assumption.

(3) See appendix for additional details on data.

(4) t-statistics are provided below point estimates of β_0, β_1, β_2, β_3, and β_4.

T.10

PNet

1929-1974	.017 3.149	.422 3.678	.412 1.282		- .075 - 1.681	.031	.224	- 5.220	.777	.562	.427	.366	.230
1929-1974	- .000 .014	.166 2.895	.508 3.385	.826 12.199	.004 .186	.014	.832	- 2.151	.366	- .146	- .285	- .168	- .213
1929-1945	- .014 - 2.421	.229 1.544	.051 .110		- .055 - 1.103	.021	.0000	- 1.035	.335	- .286	- .412	- .029	- .184
1929-1945	- .008 - 1.265	.176 1.271	.208 .485	.482 1.872	- .022 - .441	.019	.166	- 1.035	.210	- .488	- .468	.301	.062
1929-1946	- .011 - 2.151	.352 3.617	.420 1.328		- .095 - 2.767	.021	.498	- 1.242	.317	- .261	- .392	- .133	- .199
1929-1946	- .005 - .936	.269 2.778	.509 1.769	.512 2.015	- .051 - 1.341	.019	.594	- 1.242	.175	- .433	- .404	.141	.020
947-1974	.032 6.464	.256 2.450	- .028 - .119		.106 1.914	.015	.220	- 2.683	.676	.297	- .131	- .239	- .356
947-1974	.001 .121	.080 1.327	.121 .941	.756 7.794	.142 4.718	.008	.776	- 1.068	.201	- .001	- .257	- .045	- .153

T.11

Table 7

Estimated Regression Models for
Real Rates of Growth in
Nonresidential Fixed Capital

BEA Constant-Dollar Data for All Corporations

$= \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$

Notes

(1) PGross ≡ The annual percentage change in gross nonresidential fixed capital stock, conditional on the .85F service life assumption.

(2) PNet ≡ The annual percentage change in net nonresidential fixed fixed capital stock, conditional on straight-line depreciation and service-life equal to .85F.

(3) See appendix for additional details on data.

(4) t-statistics are provided below estimates of β_i's.

ss	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
-1974	.018 4.761	.252 3.141	.258 1.150		- .055 - 1.777	.022	.167	- 5.220	.833	.703	.628	.586	.475
-1974	.000 .139	.095 3.217	.302 3.835	.894 17.183	.001 .054	.008	.898	- 2.206	.346	- .122	- .281	- .172	- .221
-1945	- .006 - 2.126	.077 1.062	.006 .025		- .032 - 1.323	.010	.0000	- 1.035	.195	- .410	- .408	.056	- .057
-1945	- .004 - 1.273	.082 1.273	.098 .480	.494 2.098	- .016 - .701	.009	.185	- 1.035	.127	- .567	- .449	.355	.122
1946	- .004 - 1.568	.158 3.199	.248 1.547		- .058 - 3.365	.011	.508	- 1.242	.176	- .354	- .352	- .098	- .092
1946	- .002 - .778	.138 3.196	.277 2.004	.553 2.362	- .032 - 1.733	.009	.636	- 1.242	.108	- .480	- .359	.157	.054
1974	.029 11.848	.203 3.859	.055 .462		.038 1.374	.007	.362	- 2.683	.679	.321	.002	- .191	- .360
1974	.002 .464	.061 1.565	.118 1.612	.795 6.488	.076 4.244	.005	.765	- 1.134	.176	.056	- .215	- .087	- .102

T.12

PNet

1929–1974	.017 3.060	.439 3.798	.429 1.326		- .078 - 1.751	.031	.238	- 4.625	.764	.539	.398	.337	.195
1929–1974	.000 .001	.178 2.990	.526 3.403	.817 11.843	.002 .097	.015	.827	- 2.817	.360	- .154	- .296	- .164	- .211
1929–1945	- .014 - 2.344	.247 1.606	.060 .126		- .059 - 1.144	.022	.006	- 1.035	.328	- .294	- .411	- .006	- .166
1929–1945	- .008 - 1.214	.187 1.295	.214 .480	.475 1.798	- .024 - .473	.020	.162	- 1.035	.205	- .498	- .466	.319	.076
1929–1946	- .011 - 2.071	.372 3.705	.438 1.343		- .100 - 2.819	.022	.511	- 1.242	.310	- .269	- .390	- .112	- .183
1929–1946	- .005 - .886	.283 2.771	.523 1.749	.506 1.942	- .054 - 1.360	.020	.597	- 1.242	.171	- .442	- .403	.155	.032
1947–1974	.031 5.860	.273 2.442	- .022 - .085		.108 1.811	.016	.209	- 2.683	.695	.314	- .130	- .229	- .323
1947–1974	- .000 - .027	.096 1.546	.140 1.049	.755 8.136	.144 4.618	.008	.787	- 1.068	.201	- .013	- .301	- .089	- .164

Table 8

Estimated Regression Models for Real Rates of Growth in Residential Fixed Capital

BEA Constant-Dollar Data for All Corporations

$$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
PGross													
1929–1974	.026	.053	.027		- .004	.030	.0000	- 5.811	.948	.879	.820	.747	.662
	4.884	.477	.088		- .095								
1929–1974	.001	- .009	.053	.945	.017	.010	.888	- 2.562	.492	.063	.123	.116	- .186
	.250	- .253	.525	18.729	1.212								
1929–1945	.004	- .083	- .095		.012	.008	.0000	- 2.566	.550	- .064	- .326	- .396	- .419
	1.889	- 1.402	- .513		.619								
1929–1945	- .001	- .014	.056	.605	.013	.004	.742	- 2.566	.708	.425	- .135	- .636	- .881
	- .383	- .442	.587	6.112	1.297								
1929–1946	.005	- .048	.011		.001	.008	.0000	- 2.248	.489	- .054	- .362	- .477	- .395
	2.600	- 1.262	.091		.070								
1929–1946	- .000	.008	.121	.615	.006	.004	.729	- 2.751	.625	.373	- .138	- .539	- .799
	- .085	.373	1.875	6.277	.910								
1947–1974	.037	.030	- .066		.042	.031	.0000	- 4.622	.931	.843	.769	.673	.550
	3.578	.135	- .131		.363								
1947–1974	.007	- .198	- .171	.949	.039	.009	.897	- 2.683	.428	- .083	- .123	- .090	- .304
	1.960	- 2.883	- 1.126	15.365	1.101								

Notes

(1) PGross ≡ the annual percentage change in gross residential fixed capital stock, conditional on the .85F service life assumption.

(2) PNet ≡ the annual percentage change in net residential fixed capital stock, conditional on straight-line depreciation and .85F service lives.

(3) See appendix for additional details on data.

(4) t-statistics are provided below estimates of β_i's.

et

29-1974	.026 2.945	.068 .371	.047 -.091		- .002 - .026	.050	.0000	- 6.153	.956	.887	.817	.737	.649
29-1974	.000 .112	- .013 - .230	.095 .603	.954 20.077	.019 .879	.015	.901	- 3.165	.531	.131	.104	.063	- .211
9-1945	- .014 - 4.090	- .102 - 1.179	- .111 - .412		.019 .652	.012	.0000	- 2.566	.614	.039	- .326	- .504	- .593
9-1945	- .009 - 4.052	- .019 - .381	.097 .648	.615 5.507	.019 1.244	.007	.678	- 2.566	.712	.398	- .143	- .655	- .876
9-1946	- .013 - 4.234	- .046 - .834	.056 .312		.001 .049	.012	.0000	- 2.248	.546	.035	- .358	- .578	- .558
9-1946	- .008 - 3.925	.022 .682	.220 2.125	.625 5.550	.007 .608	.007	.649	- 2.751	.597	.326	- .145	- .543	- .773
7-1974	.054 3.407	- .181 - .535	- .191 - .249		.064 .354	.048	.0000	- 4.619	.940	.847	.740	.617	.474
7-1974	.013 2.258	- .299 - 2.826	- .232 - .967	.920 14.917	.039 .685	.015	.892	- 2.696	.490	.028	- .084	- .154	- .354

Table 9

Estimated Regression Models for
Real Rates of Growth in Inventory.

BEA Constant-Dollar Data for All Corporations

$\tilde{}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$

Inv	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
929-1974	.008	.689	.865		.126	.041	.468	- 2.136	.242	.014	- .094	- .000	.221
	1.056	4.536	2.032		2.111								
929-1974	.005	.624	.979	.131	.127	.041	.470	- 2.126	.087	.012	- .091	- .012	.279
	.662	3.812	2.232	1.061	2.132								
929-1945	- .011	.427	- .034		.187	.050	.449	- 1.232	.406	- .221	- .392	- .129	.032
	- .719	1.190	- .029		1.557								
929-1945	- .015	.008	.476	.510	.253	.043	.587	.287	.063	- .229	- .389	.127	.204
	- 1.190	.022	.467	2.157	2.330								
929-1946	- .002	.818	1.170		.065	.052	.544	- 1.035	.261	- .212	- .305	- .262	.036
	- .116	3.388	1.446		.735								
29-1946	- .002	.660	1.861	.335	.071	.051	.567	.066	- .011	- .228	- .143	- .164	.075
	- .157	2.477	1.946	1.278	.831								
47-1971	.009	.332	- .193		.466	.027	.477	- 1.926	.342	- .146	- .244	- .201	.202
	.963	1.731	- .442		4.563								
47-1974	.008	.312	- .204	.367	.469	.028	.456	- 1.908	.329	- .157	- .262	- .211	.237
	.742	1.506	- .457	.292	4.483								

Notes

(1) PInv ≡ the annual percentage change in inventory.

(2) See appendix for additional details on data.

(3) t-statistics are reported below estimates of β_i's.

Table 10

Estimated Regression Model for
Capital Expenditures per unit of
Fixed Assets.
IRS Data for Fixed Assets in
Terms of Historical Costs (in Millions)
BEA Historical Cost Data for Capital Expenditures
All Data for "All Corporations".

$$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

CEFix	β_0	β_1	β_2	β_3	β_4	σ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
1929–1974	.094	.619	.459		- .108	.048	.175	- 6.243					
	10.988	3.270	.920		- 1.532								
1929–1974	.007	.224	.558	.901	- .013	.013	.939	- .298					
	1.607	4.093	4.102	21.820	- .673								
1929–1945	.041	.289	.009		- .064	.015	.310	- 1.035	.334	- .169	- .269	.206	- .028
	9.865	2.766	.027		- 1.840								
1929–1945	.017	.200	.191	.608	- .030	.013	.466	- 1.513	.217	- .513	- .454	.497	.239
	1.419	1.978	.640	2.121	- .861								
1929–1946	.045	.431	.438		- .111	.016	.733	- .974	.252	- .204	- .182	.088	- .136
	11.226	5.873	1.838		- 4.283								
1929–1946	.015	.277	.503	.716	- .054	.013	.810	- .740	.124	- .422	- .300	.215	.084
	1.215	3.164	2.483	2.506	- 1.716								
194701974	.128	.382	.088		.062	.013	.320	- 3.062					
	26.985	3.131	.389		1.150								
1947–1974	.029	.252	.209	.698	.135	.009	.674	- .548					
	1.389	2.852	1.315	4.877	3.340								

Notes

(1) CEFix ≡ Capital Expenditures for period t divided by Net Fixed Assets at the beginning of period t. The value of Net Fixed Assets was not available from IRS data for 1962, nor was it available for 1974 at the time these results were obtained.

(2) See appendix for additional details on data.

(3) t-statistics are provided below point estimates of β_i's.

(4) Estimated regression results for CEFix have two missing observations: one for 1963 and, due to the use of Y_{t-1}, one for 1964. See note (1). Estimates of ρ_1, for each i, were not computed for intervals that included these years.

T.17

Table 11

Estimated Regression Models for
Relative Importance of Interest
NIPA data for All Corporations in Millions of
Current Dollars

$$= \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$$

Int/Btxflo	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
9-1974	.1215 9.168	- 1.035 - 3.683	.107 .136		- .152 - 1.392	.076	.303	- 3.697	.613	.551	.556	.568	.514
9-1974	.028 1.761	- .160 - .711	- .300 - .562	.758 7.110	- .064 - .865	.051	.685	- 1.656	- .049	- .331	.140	.019	- .063
9-1975	.156 6.415	- 1.894 - 3.126	- .573 - .304		.034 .169	.085	.553	- 1.513	.138	- .265	- .051	.165	.146
9-1945	.100 1.577	- 1.296 - 1.475	- 1.000 - .513	.326 .944	.025 .124	.085	.549	- 1.513	- .043	- .298	.003	.189	.008
9-1946	.164 7.807	- 1.568 - 4.060	.409 .326		- .071 - .523	.083	.568	- 1.242	.115	- .257	- .026	.083	.223
)-1946	.106 1.711	- .973 - 1.383	- .122 - .090	.340 1.012	- .071 - .525	.083	.569	- 1.158	- .045	- .304	.019	.076	.086
-1974	.039 3.838	.813 3.756	.448 .911		- .122 - 1.060	.031	.307	- 4.619	.787	.639	.750	.769	.613
-1974	- .002 - .578	.067 .963	.014 .107	.102 18.203	.052 1.652	.008	.953	- .747	.149	- .307	- .034	.197	- .266

Notes

(1) (Net Int/Btxflo ≡ Net Interest divided by Before Tax Net Cash Flow. The Net Interest variable incorporates the effects of NIPA's imputed interest, which is in the form of uncharged financial services. In the NIPA accounts, imputed interest is assumed to be paid by financial businesses to individuals, government, and businesses. Btxflo is equal to the sum of (a) Profits before Taxes, (b) Capital Consumption Allowances, and (c) Net Monetary Interest.

(2) (MntInt/Btxflo) ≡ Net Monetary Interest divided by Btxflo. Net Monetary Interest is equal to Monetary Interst Paid minus Monetary Interest Received.

(3) See Appendix for additional details on data.

(4) t-statistics are provided below point estimates of β_i's.

T-80

ntInt/Btxflo

947-1974	.062 5.432	.901 3.727	.451 .822		- .130 - 1.013	.034	.301	- 3.823	.782	.641	.755	.762	.568
947-1974	- .004 - .797	.093 1.130	- .076 - .489	1.017 16.941	.086 2.255	.009	.946	- .549	.177	- .294	.058	.088	- .268

T.19

Table 12

Estimated Regression Models for
Interest Expense.
IRS Data for All Corporations in Terms of
Historical Costs; Dollar Amounts in Millions.

$$= \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \tilde{\epsilon}_t$$

Notes

(1) (Int/TA) ≡ Interest Expense for period t divided by Total Assets at the beginning of period t.

(2) See appendix for additional details on data.

(3) t-statistics are provided below point estimates of β_i's.

t/TA	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
29-1974	.013	.034	.025		- .011	.007	.0000	- 6.181	.961	.920	.885	.847	.774
	9.942	1.268	.328		- 1.025								
29-1974	- .001	.011	.011	1.122	- .001	.001	.974	- 3.454	.308	- .064	.075	.35	.363
	- 3.148	2.471	.927	39.853	- .837								
29-1945	.010	- .043	.011		.003	.002	.453	- 1.553	.460	- .070	.074	.355	.389
	16.601	- 2.884	.239		.665								
29-1945	.001	- .006	- .002	.871	.000	.001	.958	.066	- .396	.150	- .147	- .142	.425
	.911	- 1.164	- .167	12.031	.267								
29-1946	.010	- .042	.015		.003	.002	.542	- 1.242	.408	- .068	- .080	.349	.395
	19.652	- 4.476	.495		.888								
29-1946	.001	- .005	.001	.871	- .000	.001	.965	1.433	- .442	.203	- .121	- .195	.435
	.988	- 1.228	.161	12.489	- .003								
7-1974	.011	.177	.127		- .032	.007	.298	- 4.189	.822	.684	.759	.747	.672
	4.722	3.622	1.145		- 1.235								
7-1974	- .000	.023	.032	1.068	- .004	.001	.984	.415	.114	- .515	- .012	.160	- .190
	- .727	2.640	1.894	32.532	- 1.007								

T,20

Table 13

Estimated Regression Models for
Capital Gains on Fixed Nonresidential
Capital (Equipment + Structures).
BEA data for All Corporations.

$$\tilde{Y}_t = \beta_0 + {}_1E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

Notes

(1) Capital gains rate is defined to be $(1+k) = (1+p)(1+d)$, where p is the rate of price change per unit of capital stock and d is the rate of depreciation per unit of capital stock ($d < 0$).

(2) CGSL ≡ the Capital gains rate conditional on the straight-line (SL) depreciation method and .85F service lives.

(3) CGDD ≡ the capital gains rate conditional on the double-declining-balance (DD) method of depreciation and .85F service lives.

(4) See appendix for additional details on data.

(5) t-statistics are provided below point estimates of β_i's.

	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
CGSL													
1929-1974	.921	.650	.704		.032	.019	.750	- 2.770	.503	.578	.371	.454	.303
	282.225	9.375	3.626		1.204								
1929-1974	.488	.344	.982	.470	.036	.016	.827	- 2.620	.184	.062	.148	.350	.137
	4.947	3.808	5.662	4.389	1.601								
1929-1945	.934	.746	.877		.0003	.016	.874	.832	- .355	- .085	- .250	.397	- .036
	207.283	6.656	2.512		.009								
1929-1945	1.278	1.021	.578	- .371	- .012	.015	.882	.592	- .175	.158	- .223	.280	- .131
	5.043	4.440	1.434	- 1.351	- .327								
1929-1946	.931	.633	.538		.037	.016	.883	- .237	- .305	- .114	- .303	.490	.098
	227.958	8.454	2.209		1.395								
1929-1946	1.195	.828	.257	- .285	.033	.016	.883	- .237	- .206	.053	- .263	.421	.043
	4.527	3.971	.689	- .998	1.224								
1947-1974	.910	.860	.984		.005	.017	.692	- 2.976	.766	.499	.362	.201	.134
	158.735	7.087	3.573		.073								
1947-1974	.408	.467	1.073	.547	.023	.010	.896	- 1.855	.408	- .224	- .143	- .145	- .130
	5.620	5.155	6.675	6.917	.620								

CGDD

1929-1974	.894 234.973	.558 6.905	.630 2.785		.052 1.656	.022	.641	- 4.975	.682	.725	.578	.636	.515
1929-1974	.352 3.832	.208 2.467	1.000 5.587	.606 5.892	.047 2.017	.016	.803	- 2.513	.229	.034	.184	.366	.163
1929-1945	.914 207.712	.699 6.385	.863 2.534		.014 .381	.015	.875	.832	- .332	.058	- .277	.371	- .121
929-1945	1.083 4.413	.835 3.676	.723 1.790	- .186 - .689	.008 .220	.016	.870	.592	- .218	.192	- .254	.304	- .191
929-1946	.911 223.856	.573 7.673	.483 1.994		.055 2.089	.016	.873	- .237	- .277	- .002	- .315	.459	.020
929-1946	.981 3.888	.623 3.165	.406 1.083	- .771 - .277	.055 2.003	.017	.863	- .237	- .242	.043	- .299	.439	- .002
947-1974	.879 156.281	.781 6.566	.925 3.427		.011 .177	.017	.663	- 3.728	.785	.546	.427	.284	.215
947-1974	.390 5.758	.420 5.024	1.024 6.694	.552 7.233	.022 .628	.009	.893	- .782	.383	- .259	- .122	- .093	- .103

T-22

Table 14

Estimated Regression Models for Capital Gains on Fixed Residential Capital and Inventory.
BEA data for All Corporations.

$$\tilde{Y}_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

Notes

(1) Capital gains rate is defined to be (1+k) = (1+p)(1+d), where p is the rate of price change per unit of capital stock and d is the rate of depreciation per unit of capital stock (d < 0). The BEA data for residential capital allow for only one depreciation method and one service life: striaght-line and .85F, respectively. For inventory, d = 0.

(2) CGRes ≡ the capital gains rate on Fixed Residential Capital.

(3) CGInven ≡ the capital gains rate on inventory.

(4) See appendix for additional details on data.

(5) t-statistics are provided below point-estimates of β_i's.

CGRes	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
1929-1974	.975 200.803	.877 8.506	.664 2.298		.053 1.335	.028	.700	- 1.842	.329	.093	.044	.305	.169
1929-1974	.602 4.978	.527 3.587	.951 3.412	.382 3.091	.069 1.876	.025	.752	- 1.223	.166	- .217	.005	.317	.025
1929-1945	.990 103.579	.991 4.168	.740 .999		.025 .313	.033	.742	- .518	.126	- .273	- .258	.035	- .269
1929-1945	.777 2.602	.751 1.817	.990 1.188	.216 .715	.050 .560	.034	.731	- .461	- .003	- .322	- .180	.192	- .285
	.988 120.747	.900 5.999	.466 .957		.054 1.030	.032	.779	- .237	.116	- .267	- .307	.066	- .137
1929-1946	.754 2.701	.669 2.128	.839 1.263	.237 .837	.071 1.244	.033	.774	- .237	- .014	- .322	- .220	.214	- .181
1947-1974	.965 124.115	1.025 6.230	.982 2.629		.010 .109	.023	.614	- 1.068	.282	- .334	- .233	.201	.291
1947-1974	.551 4.132	.557 2.698	1.008 3.146	.429 3.108	.007 .095	.020	.717	- .782	.175	- .578	- .292	.313	.339

T 23

Inven

29-1974	1.003 175.559	.926 7.636	2.473 7.280		.076 1.608	.033	.770	- .818	.207	- .062	- .066	- .137	- .030
29-1974	.869 7.209	.787 4.523	2.624 7.191	.134 1.113	.074 1.570	.033	.772	- .189	.100	- .056	- .066	- .132	.003
29-1945	1.010 103.816	.644 2.663	3.303 4.385		.127 1.557	.034	.802	.518	- .051	- .059	- .478	- .060	.172
29-1945	1.064 5.251	.703 2.095	3.257 4.053	- .054 - .267	.125 1.470	.035	.785	.518	- .035	- .070	- .498	- .081	.178
29-1946	1.009 122.306	.611 4.040	3.204 6.520		.137 2.577	.033	.857	.769	- .048	- .065	- .470	- .058	.180
29-1946	1.054 5.550	.653 2.782	3.140 5.443	- .046 - .239	.138 2.493	.034	.845	.769	- .033	- .077	- .496	- .076	.187
57-1974	.982 121.939	1.586 9.313	2.111 5.461		.053 .582	.024	.816	0.0000	.394	.099	- .249	- .391	- .169
57-1974	.780 6.552	1.311 5.680	2.267 5.911	.203 1.695	.049 .563	.023	.829	- .360	.141	.082	- .274	- .305	- .151

T.24

Table 15

Estimated Regression Models for
Real Output Rates Computed
With Respect to Total Gross Fixed
Capital Plus Inventory
NIPA Current Dollar Data for All
Corporations (in Millions of Dollars) Used
for Flows
BEA Current Dollar Data for All
Corporations (in Millions of Dollars)
Used for Asset Stocks

$\beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$

Notes

(1) Btxflo/Gross) ≡ Before tax cash flow for period t divided by gross total fixed capital plus inventory. See note (1) of Table 11 for details on computation of cash flow. Total fixed capital consists of total residential plus total nonresidential fixed capital, conditional on .85F service lives.

(2) (Atxflo/Gross) ≡ cash flow minus total profits taxes divided by gross total fixed capital plus inventory. See note (1) .

(3) See appendix for additional details on data.

(4) t-statistics appear below estimates of β_i's.

	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
lo/Gross													
-1974	.011	.430	- .278		.055	.026	.391	- 3.768	.794	.581	.470	.376	.358
	23.342	4.501	- 1.039		1.474								
-1974	.006	.001	.114	.910	.115	.007	.960	- .121	- .004	- .089	- .169	.164	.042
	1.300	.024	1.622	24.283	11.785								
-1945	.089	.628	- .784		- .004	.029	.598	- 1.513	.539	.280	.216	.081	- .022
	10.594	2.995	- 1.199		- .057								
-1945	.004	.021	.185	.927	.107	.007	.976	- .987	.107	- .046	- .334	- .160	- .098
	.582	.316	1.058	13.752	5.623								
1946	.089	.602	- .862		.004	.028	.614	- 1.242	.514	.217	.201	.072	- .035
	12.402	4.590	- 2.023		.097								
1946	.004	.017	.173	.927	.109	.007	.977	- 1.158	.115	- .043	- .324	- .151	- .094
	.598	.333	1.370	14.373	8.107								
1974	.125	- .043	- .121		.146	.008	.462	- 3.036	.680	.449	.165	- .180	- .467
	46.730	- .753	- .948		4.872								
1974	.050	- .056	- .057	.570	.150	.005	.786	- .385	.094	- .183	.040	.233	- .204
	4.077	- 1.573	- .697	6.100	7.895								

T,25

Atxflo/Gross

1929-1974	.077 32.265	.231 4.562	- .077 - .543		.035 1.801	.014	.416	- 3.757	.789	.547	.447	.417	.444
1929-1974	.010 2.093	.023 .900	.133 2.224	.839 14.305	.064 7.771	.006	.902	- 1.290	.296	.028	- .257	.028	.002
1929-1945	.066 19.654	.272 3.236	- .328 - 1.253		.020 .717	.012	.702	- 2.040	.414	.004	.081	.047	.109
1929-1945	.009 1.115	.009 .175	.187 1.456	.823 7.586	.071 5.256	.005	.948	- .461	.319	- .133	- .469	- .084	.226
1929-1946	.067 23.257	.279 5.324	- .304 - 1.786		.018 .960	.011	.717	- 2.195	.409	.005	.071	.049	.081
1929-1946	.010 1.320	.039 .997	.262 2.478	.813 7.508	.062 6.213	.005	.946	- .740	.227	- .226	- .325	.025	.107
1947-1974	.087 30.399	.035 .573	- .024 - .176		.073 2.249	.009	.111	3.845	.836	.599	.333	.204	.095
1947-1974	.018 1.851	- .048 - 1.327	- .051 - .662	.781 7.327	.078 4.318	.005	.722	- 1.202	.272	.098	- .156	.009	.009

T126

Table 16

Estimated Regression Models for
Real Output Rates Computed
With Respect to Total Net Fixed
Capital Plus Inventory
NIPA Current Dollar Data For All
Corporations (in Millions of Dollars) Used
For Flows
BEA Current Dollar Data for All
Corporations (in Millions of Dollars)
Used for Asset Stocks

$= \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\pi_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\varepsilon}_t$

flo/Net	β_0	β_1	β_2	β_3	β_4	σ_ε	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
9-1974	.174	.680	- .548		.109	.041	.407	- 3.768	.770	.524	.388	.282	.251
	24.059	4.431	- 1.274		1.824								
9-1974	.010	- .026	.097	.905	.200	.011	.961	- .727	.063	- .107	- .161	.197	.003
	1.428	- .526	.858	24.241	12.768								
9-1945	.159	1.121	- 1.361		- .007	.052	.599	- 1.513	.532	.234	.187	.141	.061
	10.608	3.005	- 1.171		- .052								
-1945	.006	.004	.244	.935	.190	.012	.979	- 1.035	.109	- .071	- .387	- .137	- .147
	.588	.039	.842	14.634	5.961								
-1946	.158	1.055	- 1.562		.015	.050	.612	- 1.242	.498	.176	.175	.125	.045
	12.365	4.514	- 2.059		.183								
-1946	.006	- .014	.192	.936	.196	.012	.979	- 1.242	.122	- .068	- .374	- .130	- .138
	.568	- .162	.919	15.269	8.780								
-1974	.202	- .161	- .237		.247	.013	.504	- 2.683	.625	.396	.202	- .168	- .579
	46.972	- 1.771	- 1.150		5.101								
-1974	.084	- .138	- .106	.561	.235	.008	.803	.028	.075	- .259	.062	.229	- .287
	4.286	- 2.410	- .803	6.118	7.677								

Notes

(1) (Btxflo/Net)≡ Before tax cash flow for period t divided by net total fixed assets plus inventory, conditional on straight line depreciation and .85F service lives. See Note (1) to Table 15.

(2) (Atxflo/Net) ≡ cash flow minus total profits taxes divided by net total fixed capital plus inventory. See note (1).

(3) See Appendex for additional details on data.

(4) t - statistics reported below estimates of β_i's.

T. 27

xflo/Net

029-1974	.127 37.504	.346 4.802	- .173 - .858		.073 2.621	.020	.486	- 2.562	.722	.402	.254	.224	.231
029-1974	.023 2.701	.033 .793	.155 1.605	.789 12.414	.110 8.329	.009	.891	- 1.290	.300	- .023	- .276	.028	- .018
29-1945	.118 19.530	.488 3.244	- .551 - 1.176		.037 .742	.021	.703	- .518	.423	- .053	.002	.106	.203
29-1945	.013 .883	.018 - .191	.303 1.315	.851 7.421	.128 5.175	.009	.946	- .461	.311	- .154	- .519	- .148	.155
29-1946	.118 23.050	.487 5.178	- .555 - 1.820		.038 1.148	.020	.715	- .237	.405	- .042	.002	.108	.185
29-1946	.015 1.093	.031 .425	.417 2.231	.839 7.446	.113 6.402	.009	.945	- .422	.240	- .241	- .390	- .024	.065
47-1974	.141 34.177	- .014 - .158	- .072 - .363		.125 2.689	.012	.161	- 4.189	.804	.528	.182	.006	- .118
7-1974	.038 2.361	- .092 - 1.678	- .085 - .697	.716 6.381	.117 4.095	.008	.684	- .549	.296	.094	- .160	- .021	- .005

T128

Table 17

Estimated Regression Models for Sales Ratios. IRS Data for All Corporations in Terms of Historical Costs, in Millions of Dollars

$$Y_t = \beta_0 + \beta_1 E(\tilde{\pi}_t) + \beta_2(\tilde{\pi}_t - E(\tilde{\pi}_t)) + \beta_3 Y_{t-1} + \beta_4 q_t + \tilde{\epsilon}_t$$

Notes

(1) (Sales/TA) ≡ Total sales for period t divided by total assets at the beginning of period t. IRS's "total receipts" used to measure sales.

(2) See appendex for additional details on data.

(3) t-statistics reported below estimates of β_i's.

Sales/TA	β_0	β_1	β_2	β_3	β_4	σ_ϵ	$\bar{R}^2$	z	ρ_1	ρ_2	ρ_3	ρ_4	ρ_5
1929-1974	.604 23.674	2.132 3.936	- .491 - .323		- .482 - .230	.146	.242	- 5.190	.873	.792	.756	.711	.686
1929-1974	.030 1.619	.521 4.440	.777 2.592	.926 32.074	.248 5.890	.029	.971	.323	- .176	- .103	- .002	.035	- .102
1929-1945	.444 19.503	1.884 3.226	- 2.922 - 1.657		- .082 - .432	.080	.644	- 1.513	.540	.281	.184	.092	- .045
1929-1945	.083 2.419	.554 2.602	- .419 - .711	.793 10.798	.212 3.285	.024	.967	.518	- .135	- .017	- .273	- .105	.221
1929-1946	.449 23.095	2.058 5.777	- 2.398 - 2.073		- .139 - 1.105	.077	.682	- 1.677	.524	.208	.155	.105	- .052
1929-1946	.086 2.489	.699 4.080	.021 .049	.795 3.372	.795 10.736	.025	.968	.266	- .271	.052	- .139	- .209	.213
1947-1974	.729 71.523	.681 3.162	- .055 - .112		.295 2.570	.030	.363	- 3.457	.777	.608	.457	.336	.357
1947-1974	.299 3.477	.727 4.769	.417 1.164	.558 5.014	.400 4.779	.021	.682	- 2.976	.417	.337	.580	.296	.182