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INFLATION AND THE DISTRIBUTION OF THE CORPORATE INCOME TAX BURDEN

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Abstract

This paper assesses the nature and extent of the effects of inflation upon the cross-sectional distribution of the corporate income tax burden from 1961 through 1984. The purpose of the study is to determine to what extent, if any, the failure to index the tax system has been mitigated by existing features of the tax code.

The study shows that some of the major effects of inflation upon the distribution of the corporate tax burden have been offset by liberalized investment tax credits, increased acceleration of depreciation allowances, and the deductibility of nominal, rather than real interest expense. However, even after taking into account these offsetting effects, an important remaining impact of inflation appears to have been a magnification of the already-existing cross-industry dispersion in real effective tax burdens.

I. INTRODUCTION

Several have suggested that the failure to index the tax system has contributed both to shifts in the magnitude of the aggregate corporate income tax burden, and a redistribution of that burden. Feldstein and Summers [1979] indicate that the rising inflation of the 1970s caused a substantial increase in the average effective tax rate for the corporate sector, and Feldstein [1980a, 1980b] maintains that increase was the primary cause of the weak performance of the stock market during that period. Within the corporate sector, the effects of inflation appear to have varied widely (Feldstein and Summers [1979]); some have suggested that increases in real tax burdens due to inflation have been largest among heavily capital-intensive industries (e.g., Gonedes [1981, p. 230], Revsine [1983]). To the extent that these distortions of the tax burden translate into intertemporal and inter-industry shifts of the cost of capital (see Feldstein, Green and Sheshinski [1978], Fullerton and Henderson [1984]), allocative efficiency can be reduced.

Comprehensive indexation of the tax system, as proposed by the U.S. Treasury Department in November 1984, could largely mitigate the allocative inefficiencies and redistributions of real income caused by the interaction between inflation and taxes. However, since indexation would be obtained only at the cost of greater tax complexity, it has been suggested that with moderate levels of expected inflation, it may be desirable to maintain continued reliance on "ad hoc adjustments... which could achieve the same ends as automatic indexation" (Sunley [1979]). For example, some offered systems equivalent to the Accelerated Cost Recovery System (ACRS) as make-shift solutions to the problem of not indexing depreciation for inflation (Meadows [1979], Pierson [1980], Feldstein [1981]). The combination of accelerated depreciation allowances and investment tax credits existing prior to ACRS

could also have at least partially offset the redistribution of tax burdens due to inflation. In addition, the allowance of LIFO inventory accounting methods and deductions for nominal interest expense could potentially have compensated for the failure to index the tax system.

This paper examines the inflation-related distortion of effective corporate tax burdens for 136 major U.S. corporations in 27 industries since 1961. The purpose of the paper is to determine to what extent, if any, those distortions have been mitigated by features of the tax code that could be viewed as ad hoc approaches to indexation. The paper focuses on actual inflation-adjusted ("real") effective tax burdens realized by corporations, so as to capture the complex interactions between taxes and inflation as they existed over the last 24 years. The analysis sheds light on some debates concerning the nature and magnitude of the effects of these interactions, and, under certain assumptions, offers implications concerning allocative inefficiencies due to inter-industry redistribution of tax costs.

The study analyzes the effects of inflation on (1) the mean real effective corporate tax rate, (2) the ranking of real effective tax rates across industries, (3) the relative tax burden of capital intensive industries, and (4) the cross-sectional dispersion of real effective tax rates. Although inflation has had important effects on each of these four measures, the effects on the first three have been largely offset by the effects of investment tax credit, accelerated depreciation, and the deductibility of nominal interest. Such tax benefits have been more than sufficient to offset inflation-induced increases in real effective tax rates in most industries, even including capital-intensive industries (where the failure to index depreciation is most serious), and even when inflation rates were highest. This finding is consistent with the evidence that suggests that

the weak performance of the stock market in the 1970s was not primarily attributable to heavy corporate tax burdens (see Fama [1981] and Bernard [forthcoming]), and is inconsistent with suggestions to the contrary by Feldstein and Summers [1979]. Another interesting finding is that inflation appears to have had little impact on the rankings of real effective tax rates across industries, indicating that differences in the effects of inflation, although they are large, do little to disturb the underlying cross-sectional ordering of effective tax burdens created by the various tax benefits allowed under the existing code.

One form of inflation-induced distortion in effective tax burdens has clearly not been offset by existing features of the tax system. Even though inflation appears to have had little impact on the ranking of real effective tax rates across industries, it has served to increase dispersion in those rates. By magnifying the already existing cross-sectional differences in tax rates, inflation may have magnified the importance of taxes in the allocation of capital. In that sense, features of the tax code that could be viewed as ad hoc approaches to indexation have not achieved the same ends as automatic indexation.

The remainder of the paper is organized as follows. Section II reviews previous related research, and outlines the specific questions to be investigated here. Section III describes the research methods employed to conduct the investigation. Results of the investigation are presented in Section IV. A summary and some implications are offered in Section V.

II. THE NATURE OF THE PROBLEM

Under the existing corporate income tax system, inventory and depreciation allowances are based on historical costs. Since, during inflationary periods, historical costs may be much less than current replacement costs, the effective tax rate on "real" (replacement-cost-based) income can rise. The notion that inflation increases effective tax rates on real income, especially for capital-intensive industries, has received much attention in the academic literature (e.g., Feldstein [1979, 1980a, 1980b], Feldstein and Summers [1979], Summers [1980]) and appears to be taken for granted in the popular press.[1] However, much of the research concerning inflation's impact on tax burdens has focused on data for the aggregate corporate sector (e.g., Shoven and Bulow [1975, 1976], Feldstein and Summers [1979], Gonedes [1981], Feldstein, Dicks-Mireaux, and Poterba [1983]), and thus is not useful in addressing questions concerning inter-industry distortion of tax burdens.

Those studies that have examined disaggregated data (for individual firms or industries) can generally be dichotomized according to whether they employed marginal or average effective tax rates. Studies that have estimated expected real marginal effective tax rates, or an essentially equivalent measure, include Tideman and Tucker [1976], Parker and Zieha [1976], Feldstein [1981], and Fullerton and Henderson [1984]; of these, Fullerton and Henderson [1984] is the most comprehensive and most closely related to this study. An advantage of these studies is that expected marginal tax rates are directly relevant in analyses of issues involving costs of capital, and thus, resource allocation (Fullerton [1984]). However, expected marginal tax rates are necessarily based on a hypothetical investment or combination of investments, given assumptions about the tax laws, financing, interest rates, inflation, and other parameters. The behavior of real marginal tax rates is quite

sensitive to variations in certain of these assumptions (Bradford and Fullerton [1981], Fullerton and Henderson [1984]). Therefore, it is important to examine the behavior of tax rates that reflect actual patterns of inflation, interest rates, investment and financing decisions, and the many complex interactions of tax regulations that are difficult to capture in a simulated environment.[2]

Several previous studies have measured real average effective tax rates actually experienced by firms or industries over some historical period (Parker [1976], Davidson and Weil [1976], Shoven and Bulow [1975, 1976], Falkenstein and Weil [1977], Davidson and Weil [1978], Feldstein and Summers [1979]). Such tax rates can capture additional tax burdens due to the failure to index the tax system, as well as reductions due to accelerated depreciation, investment tax credit, and other tax regulations; furthermore, average effective corporate tax rates are useful in studies of inter-industry distortions (Fullerton [1984]). However, previous studies that measured firm-specific or industry-specific real effective tax rates have offered little or no analysis of that data. Furthermore, since these studies generally used empirical data from a single year and none used data from a period in excess of three years, any conclusions that might be drawn would be limited. As explained by Tideman and Tucker [1976, p. 47], "it is not possible to determine the general effects of inflation on most firms' incomes by examining their inflation-corrected incomes for only one or two years." This is because inflation causes both immediate and delayed distortions in unadjusted income figures, and these distortions can vary across time in both sign and magnitude.

This study is the first based upon a large cross-section of firms over an extended period. The analyses include data from 1961 through 1984, during

which inflation rates varied from 1 percent to 13 percent. The database is sufficiently large to permit analysis of both immediate and delayed effects of inflation, while taking into account the numerous changes in the tax code that could potentially have offset those effects. The study thus provides a relatively comprehensive examination of the extent to which existing features of the tax code have approximated the effects of automatic indexation. Since the study is based on average tax rates, as opposed to marginal tax rates, conclusions concerning allocative efficiency must be drawn with caution. However, the primary analysis always focuses on average tax rates over lengthy periods (at least six years), and over the long run, as the nature of what is deemed marginal is expanded, average tax rates and marginal tax rates must converge.[3] For that reason, the study can provide some indications about the interaction between inflation, taxes, and resource allocation.

The primary analyses include examinations of each of four possible manifestations of the effects of inflation on the cross-sectional distribution of real effective tax rates: i) changes in the mean real effective tax rate, both across and within industries; ii) changes in the ranking of effective tax rates across industries; iii) shifting of the tax burden to more capital intensive industries; and iv) increases in the disparity of effective tax rates across industries.

Changes in mean real effective tax rates. Feldstein and Summers [1979] indicate that inflation caused an increase from 1954 to 1977 in the total income tax on corporate sector income, including taxes paid by shareholders and creditors. However, Gravelle [1980], using the same data but different assumptions, indicates that total income tax on corporate capital actually declined over that period, while inflation rates rose. Gravelle's evidence is generally consistent with that of studies that measured only taxes paid

directly by corporations. Shoven and Bulow [1975, 1976] and Gonedes [1981] also failed to detect any indication that the inflation of the 1960s and 1970s gave rise to higher aggregate real corporate effective tax rates. The effect of inflation on aggregate corporate tax rates is reexamined here to assess the pervasiveness of that result across individual industries, and to identify some specific reasons for the changes in aggregate real tax rates.

Changes in the ranking of effective tax burdens. When the tax system is not indexed for inflation, inflation can alter real effective tax rates in ways that vary according to differences in asset composition, capital structure, and accounting policies. Thus, the effects of inflation are not neutral across firms; inflation can change the ranking of real effective tax rates across firms and, potentially, can cause a reallocation of capital within the economy. Nonneutrality in the effect of inflation on tax burdens will be examined here by comparing real effective tax rates experienced within the existing tax system with those calculated under a fully-indexed tax system that otherwise preserves certain features of the existing tax structure.

Shifting of the tax burden to capital intensive industries. Several have noted that since capital intensive industries suffer most from the failure to index depreciation allowances for inflation, inflation must (ceteris paribus) cause those industries to bear a higher than average rate of tax on real income (see, for example, Meadows [1979], Gonedes [1981], Revsine [1983]). Revsine suggests that the "discriminatory" effect of inflation on taxes may partially explain the "pervasive malady that afflicts Smokestack America." Whether inflation has caused capital intensive firms to bear a larger share of the corporate income tax burden will be examined here by assessing the relationship between effective tax burdens and capital intensity, and changes in that relationship during periods of higher inflation.

Increases in the cross-sectional disparity in tax rates. Since the effects of inflation on real effective tax rates differ across firms, those effects would increase cross-sectional variation in tax rates, unless they are offset (negatively correlated with) other sources of cross-sectional disparity. An increase in cross-sectional variation in real effective tax rates could, in turn, magnify the importance of tax effects in allocating capital among industries. In this paper, the impact of inflation upon cross-sectional disparity is examined by comparing the observed variation in real effective tax rates with the variation in tax rates calculated under an alternative tax system insulated from inflation through indexation.

III. DATA AND RESEARCH METHODS

The primary analyses in this study employ data from 1961 through 1980. Our experience with the tax code since the passage of the Economic Recovery Tax Act of 1981 (ERTA) has been too brief to support a meaningful analysis of the same kind presented in the main body of the paper, but supplemental analyses of data of years from 1981 through 1984 is included.

The primary analysis examines the tax burdens of 136 U.S. corporations. The firms were selected in order to obtain two to ten representatives from each of 27 major industries and to satisfy data requirements.[4] The sample includes representatives from the following sectors: manufacturing, mining, petroleum refining, airlines, utilities, retailing, banking and other financial, and consumer services (see Table 1). The sample accounts for about one-fourth of the total U.S. corporate income taxes paid over the test period. The firms in the sample differ from those that might be selected at random in some respects. First, the data requirements create a bias toward large firms, and constrain attention to only those firms that 'survived' the

1961-1980 period. Second, in order to preserve the appropriateness of industry classifications within the sample, the firms were required not to have changed their major line of business during the test period, and no conglomerates were included. Even though it was not randomly chosen, however, this sample is of sufficient size and breadth to be of interest in its own right, and should provide a good indication of the tax burden borne by other large corporations since 1961.

The supplemental analysis for 1981-1984 is based on a subset of the sample used in the primary analysis. The 95 firms in the subset include representatives from 26 industries (see Table 1). Criteria used to select the subset of firms are discussed in section IV.E.

Real effective income tax rates are measured by comparing tax payments to a measure of replacement-cost-based income. Similar approaches were adopted in most prior related research (e.g., Shoven and Bulow [1975, 1976], Falkenstein and Weil [1977], Davidson and Weil [1978], Feldstein and Summers [1979]). The specific measure of replacement-cost income used here is equal to the sum of current cost income from operations, plus gains/losses on erosion in the value of net monetary accounts, as required for disclosure in reports to shareholders by Financial Accounting Standard No. 33 (FAS 33). The measure is referred to as "real distributable profit" because it is designed to approximate the change over time in the shareholders' equity interest in the physical capital of the firm, before dividends and taxes.[5] This measure of income is particularly well-suited for a study of this kind, for two reasons. First, measurement of income taxes as a fraction of real distributable profit can aid in assessing claims that the tax system has hindered the maintenance of shareholders' capital in certain industries.[6] If taxes exceed real distributable profit, then shareholders are unable to

maintain their claim to a given amount of physical capital. Second, since real distributable profit reflects adjustments not only for inflation in the prices of depreciable assets and inventory, but also adjustments to convert nominal interest to real interest, the real effective tax rates used here represent the ratio of tax payments to taxable income as it would be measured in a corporate tax system fully indexed for inflation. In fact, when income was measured for 1975-1980 using general price level adjustments similar to those that would have been required under the system of indexation proposed by the U.S. Treasury in November 1984, the across-industry correlation between the resulting effective tax rates and those used here was .96.[7]

The tax rate used here includes taxes paid directly by corporations, but excludes taxes borne indirectly through payments made by shareholders and creditors. Such an approach is appropriate when the focus lies on inter-industry distortions in taxes, under the assumption that the same opportunity cost of financing is faced by all industries (Fullerton [1984]). In this study, however, corporate tax rates must be used with some caution, since the tax benefits of the deductibility of nominal interest at the corporate level may be partially or fully offset at the personal level. The extent to which the benefit is actually offset depends on the tax rates faced by creditors, which is difficult to estimate. Feldstein and Summers [1979] estimate the marginal tax rate on interest income, averaged across various classes of debt holders, to be .42, large enough to offset the tax advantage of interest deductibility by corporations. However, Gravelle [1980] and Fullerton and Henderson [1984] arrive at much lower estimates (16 and 24 percent, respectively); furthermore, average tax rates on interest income would presumably be even lower than these marginal rates. This study does not attempt to resolve the debate, but does recognize the issue in discussions of

the analysis. In addition, the results are presented in such a way as to isolate the benefits of deductibility of nominal interest at the corporate level, so as to permit assessment of the sensitivity of the conclusions to various assumptions concerning tax at the personal level.

The precise definition of real effective tax rates used here is:

$$\text{Real Effective Tax Rate} = \frac{\text{Federal, State, and Foreign Income Taxes Currently Paid}}{\text{Real Distributable Profit}}$$

Details of the methods and data sources used to measure the real effective tax rate are discussed below.

III.A. Measurement of the Numerator

The numerator of the effective tax rate is equal to the annual federal, state, and foreign income tax liability. As Stickney and McGee [1982, page 130] indicate, "a combined measure of taxes payable is a more meaningful measure of tax burden... because income taxes paid to one government body can often be offset against either taxable income...or taxes payable...to another government body." Moreover, constraints on data availability preclude focusing on only federal income tax, since, prior to 1973, U.S. corporations were not required to segregate worldwide income tax by taxing authority.

Tax payments by a given corporation can be calculated using data from Standard and Poors' COMPUSTAT files, and other data disclosed in annual reports and 10-K's, according to the formula shown below.[8] Some previous related research (Shoven and Bulow [1975, 1976], Feldstein and Summers [1979], Stickney and McGee [1982]) has also estimated tax payments using data from annual reports or 10-K's, although each of those papers failed to recognize at least some of the adjustments required to arrive at taxes currently due.[9]

Income Tax Currently Payable =

Total Income Tax Expense
-Net Deferred Income Tax Expense (including Net Deferred Investment Credit)
-Tax Benefit of Net Operating Loss Carry Forward
+/-Adjustment for Certain Firms with Unconsolidated Subsidiaries

Tax expense as reported in the financial statements is essentially based upon income reported to shareholders, including income that may be deferred for tax purposes through the use of intertemporal income-shifting techniques such as accelerated depreciation. The above formula converts the reported tax expense to taxes actually payable. Tax currently payable is of course based upon taxable income, including some income from old investments that was previously deferred, and excluding some income on new investments that is deferred to the future. This study focuses on taxes currently payable, since the primary concern is with accounting methods used for tax purposes, rather than those used for financial reporting purposes. In addition, this approach preserves consistency with nearly all prior related research. The approach can be misleading over short horizons, since deferrals of income in a given year can be reversed in a later year. However, this limitation is overcome to a large extent in this study by either focusing on tax rates calculated over several years, and/or by separately identifying the effects of tax accounting methods that shift income temporally. At the same time, tax rates based on taxes payable, unlike those based on tax expense, will reflect the permanent deferral of tax that is achieved through the use of accelerated depreciation by firms that maintain or increase their size, as is the case for the sample of large, successful corporations examined here.

The above calculation of taxes payable includes an adjustment for 13 corporations with large 100 percent-owned domestic unconsolidated subsidiaries.[10] The modification is required because even if the subsidiary

is consolidated for tax purposes, the income tax disclosures in the parent company report exclude the subsidiary's payments or refunds. The formula also includes an adjustment for the tax benefits of net operating loss carryforwards. This adjustment is necessary, since such tax benefits are reported as separate line items, rather than as reduction in tax expense.

IIIB. Estimation of the Denominator

As discussed previously, replacement cost income is defined here as in Financial Accounting Standard No. 33. Corporations have been required to disclose inflation-adjusted profits in accordance with FAS 33 only since 1980, although some firms voluntarily provided the data for 1979. Thus, the FAS 33 data are available for the supplemental analysis (covering the years 1981-1984), but not for the primary analyses (covering the years 1961-1980). For the primary analysis, it was necessary to estimate real distributable profit, using specific price indexes furnished by the Bureau of Labor Statistics, and firm-specific data available from the COMPUSTAT Expanded Annual Industrial File, annual reports, 10-K's, and Moody's Manuals. Details of the estimation procedures are described in the Appendix. Below, an overview of the estimation process is presented, and the resulting estimates are compared to FAS 33 data reported for 1979 and 1980.

In order to calculate real distributable profit, three adjustments are made to conventional historical-cost accounting income. First, cost of goods sold are measured on the basis of replacement costs at the time of sale, rather than on original acquisition costs. Second, depreciation expense is calculated by applying the straight-line method to the current replacement cost of fixed assets. The third adjustment involves the calculation of the gain (loss) associated with the decline in the real value of net monetary

liabilities (assets) that occurs as the price level rises. This gain or loss is offset to the extent that nominal interest rates include a premium for anticipated inflation. For a net debtor, the gain can be viewed as the amount required to convert nominal interest expense into real interest expense.

The procedures used to estimate replacement cost income are similar to those used by others (see Noe [1980]), but incorporate more firm-specific information and should thus be more accurate (see Appendix). To assess the accuracy of the estimation procedure, estimated real distributable profit was compared to amounts reported by those sample firms that furnished current cost data for 1979 and/or 1980 in compliance with FAS No. 33. Table 2 summarizes the comparison of estimated and reported amounts of real distributable profit, scaled by either a measure of firm size (market value of common shares), or by the absolute value of reported distributable profit. Table 2 indicates that the average estimation error across all firms is close to zero. For individual industries (which are to serve as the basic element of analysis here), the median absolute estimation error is 12 percent of reported real distributable profit when data are aggregated over 1979 and 1980. Real effective tax rates used in the primary analysis should be subject to less error, since those rates are based on periods of at least six years, during which some measurement error would be further diversified. Furthermore, adjustments for most years are less subject to error than for 1979 and 1980, since those years were characterized by unusually high and diverse levels of specific price inflation. Finally, recall that, as noted previously, a different set of estimation procedures (based on general price level adjustments) gave rise to essentially the same real effective tax rates, suggesting that the analysis is robust to differences in measurement of price-level adjusted income.

IV. EMPIRICAL ANALYSIS

Overview

An overview of real effective tax rates from 1961 to 1984 is provided for the aggregate sample in Figure 1. Real effective tax rates for each industry for the 1961-1980 period appears in Table 3; Table 4 presents such tax rates by subperiod.[11] Analysis of the industry data is provided in Tables 5 and 6. Supplemental analysis of the 1981-1984 period is based on Table 7. Since Tables 3, 4 and 7 and some of the terminology used therein serve as a foundation for the subsequent analysis, those tables are reviewed prior to the discussion of the empirical results.

Although all industries must face the same set of statutory rates, effective tax rates can vary substantially. For example, Table 3 shows that real effective tax rates over the 1961-1980 period ranged from 13 percent for airlines to 55 percent for auto manufacturers. Table 3 reconciles each industry's real effective tax rate with the U.S. statutory corporate income tax rate in two basic steps. The first step is to reconcile the statutory rate with the rate of tax on book income, adjusted (if necessary) so as to measure depreciation on a straight-line basis.[12] Since book income is not adjusted for inflation, any deviation of the rate of tax on book income from the statutory rate cannot be due to the failure to index the tax system. Rather, the deviation is due to non-U.S. taxes, offset by tax credits, deductions, or income-shifting accounting techniques that affect the numerator of the tax rate, but which do not affect the denominator, book income.[13] Table 3 segregates these deviations into two categories: i) effects due to income-shifting techniques (most importantly, accelerated depreciation methods) and ii) other effects (most importantly, investment tax credits).

The sum of these effects reduces tax rates in all industries, by amounts ranging from 1 percentage point for auto manufacturers, to 34 percentage points for airlines.

The second step in reconciling the statutory rate with real effective tax rates is to explain the deviation between tax rates based on book income and real distributable profit. Table 3 decomposes the difference according to the three adjustments required to adjust income for inflation: the two adjustments necessary to index depreciation and cost of sales, and the adjustment to convert nominal interest expense (income) to real interest expense (income) (i.e., to recognize devaluation of debt). The adjustment associated with depreciation serves to increase real effective tax rates for all industries, by magnitudes ranging to 15 percentage points. The adjustment associated with the cost of sales is much smaller (less than 3 percentage points for 21 of the 27 industries), reflecting the use of LIFO inventory methods or high inventory turnover in many of the industries. The adjustment to recognize the devaluation of debt increases real effective tax rates for corporations that are net creditors, and decreases real effective tax rates for those that are net debtors. The net effect of all three adjustments serves to increase real effective tax rates in all industries except utilities and airlines, which are highly levered and thus benefit most from deductibility of nominal interest.

In Tables 3, 4, 7, and much of the subsequent analysis, the effect of the three inflation adjustments on the real effective tax rate is referred to as an 'inflation tax penalty.' As explained below, that amount can be interpreted as a measure of the incremental corporate income tax burden caused by the failure to index the tax system, while holding constant the effects of existing investment incentives on average tax rates. This is not to suggest

that if the tax system had been indexed, the same set of investment incentives would have been maintained.[14] The interpretation of the 'inflation tax penalty' is offered simply for purposes of discussing separately the effects of using a historical-cost-based system, on the one hand, and the potentially mitigating effects of investment incentives within that system, on the other hand.

The meaning of the 'inflation tax penalty' can be made more evident by first noting that, if inflation rates were always zero, real distributable profit would be equal to book income, and the real effective tax rate would be equal to the rate of tax on book income. Thus, the latter is sometimes referred to here as the 'zero-inflation tax rate.' The 'zero-inflation tax rate' reflects the benefits of investment incentives that exist within the historical-cost-based tax system; for example, airlines have a relatively low 'zero-inflation tax rate,' in part because of the benefits of investment tax credits.[15] If it is desired that real distributable profits be taxed at the 'zero-inflation tax rate,' regardless of the level of inflation, that could be accomplished through comprehensive indexation. That is, taxable income could be fully adjusted for inflation, so that it is equal to real distributable profit, and tax payments could be determined by taxing that profit at the 'zero-inflation effective tax rate.' This observation suggests one possible interpretation of the schedule of 'zero-inflation effective tax rates.' They can be interpreted as the rates that would prevail in a fully indexed tax system that otherwise preserves certain features of the existing tax system (specifically, variations in average tax rates due to credits, deductions, and other existing investment incentives). When the tax system is not fully indexed, actual tax payments deviate from those based on the 'zero-inflation effective tax rate.' This incremental tax burden, when scaled by real distributable profit, is equal to the 'inflation tax penalty':

Inflation tax penalty=

$$\frac{\text{Actual tax paid} - (\text{Zero-inflation tax rate} \times \text{Real distributable profits})}{\text{Real distributable profits}}$$

We now proceed to the analyses of the effect of inflation on those characteristics of the distribution of the corporate income tax burden discussed in Section II.

IV.A. The effect of inflation on mean real effective tax rates

IV.A.1. Mean real effective tax rate for the aggregate sample

Effective tax rates for each year, from 1961 through 1984, are presented for the aggregated sample in Figure 1. (Note that the 1981-1984 data are based on a subset of the sample used in 1961-1980; refer to section III.) Figure 1 indicates that, in spite of the high levels of inflation experienced in the late 1960s and the 1970s, corporate income taxes as a fraction of real distributable profit did not increase. In fact, the effective rate of income tax on real distributable profit (including federal, state, and foreign tax) generally declined since 1961, remained below 40 percent after 1971, and fell to 30 percent in 1984.

Some understanding of major reasons for the decline in the effective rate of tax on real distributable profit can be achieved by first focusing on the path of taxes as a fraction of historical cost-based-income (book income). Even though those rates include foreign, state, and local income taxes in addition to the U.S. tax, they are always below the U.S. statutory rate. Furthermore, the deviation between the effective rate of tax on book income and the statutory rate grew throughout the 1961-1984 period. The main reasons for the deviation include the introduction (in 1962) and subsequent liberalization of the investment tax credit regulations, and the increased acceleration of depreciation during the period. For example, for those firms in the

sample (about 83 percent) that disclosed sufficient information in annual reports to allow determination of the benefits of investment tax credit, the credit reduced the rate of tax on book income by 5 to 7 percentage points in each of the five years following 1975, when the credit was increased to 10 percent of qualified investment.[16] Acceleration of depreciation (relative to straight-line depreciation over economically useful lives) further reduced the tax rate on book income by 4 to 10 percentage points in each of the years from 1972 to 1980, as the benefits of the Class Life Depreciation System (CLDS) were phased in, and by 9 to 11 percentage points in the years 1981-1984, as ACRS took effect.[17] Therefore, investment tax credits and accelerated depreciation methods appear to account for most of the deviation between the statutory rate and the rate of tax on book income, at least for years subsequent to 1970, when the deviation is largest.

Even though benefits such as investment tax credit and accelerated depreciation have reduced the rate of tax on book income, the rate of tax on real distributable profit could have risen if the 'inflation tax penalty' were sufficiently large to offset those benefits. Figure 1 indicates that this is not the case. The 'inflation tax penalty' exceeded 5 percentage points only in four years (1975 and 1981-1983), and the real effective corporate income tax rate generally declined, even during some years of high inflation. A more precise characterization of the relation between inflation and real effective corporate tax rates is provided by the first regression at the bottom of Figure 1. It suggests that when both current and lagged impacts of inflation are considered, changes in inflation rates actually translated into a small decrease in the aggregate rate of tax on real distributable profit. The sum of the coefficients in that regression is -.31, indicating that a one percentage point increase in inflation was accompanied by a decrease in the

real effective tax rate of .31 of one percentage point. A decline in the effective corporate tax burden, even during inflationary periods, is consistent with the evidence of Gonedes [1981], and in conjunction with the work of Fama [1981] and Bernard [forthcoming], casts doubt on the assertion by Feldstein and Summers [1979] that the decline in the real value of aggregate stock indexes during the 1970s was attributable to higher real corporate tax burdens.

Whether the decline in corporate tax rates translates into a decline in total tax on corporate capital depends on the extent to which the benefits of nontaxation of gains on debt at the corporate level is offset by taxation of nominal interest at the personal level. The net 'inflation tax penalty' reflects a substantial increase in the tax rate (up to 17 percentage points) due to the failure to index depreciation and cost of sales, and an offsetting reduction due to nontaxation of gains on debt. Had it not been for this benefit, real effective tax rates would have remained above 40 percent from 1961 through 1982. (This is shown by the line labeled 'tax rate on real distributable profit, excluding gains on debt.') The second regression equation below Figure 1 indicates that if the benefits of nontaxation of gains on debt were completely negated at the personal level and therefore ignored in the calculation of the effective tax rate, increases in inflation rates would not be associated with decreases in tax rates. To the contrary, that regression suggests that a one percentage point increase in inflation rates would translate ultimately into an increase of .74 of one percentage point in the tax rate on real distributable profit, excluding gains on net debt. (The amount .74 is equal to the sum of the coefficients in the regression.) However, since the increase of .74 is not significantly different from zero at the .10 level (based on a standard test of linear restrictions), one could not

reject the hypothesis of no association between inflation and effective tax rates. In that sense, the evidence is not inconsistent with the conclusion of Fullerton and Henderson [1984] that aggregated total effective tax rates on corporate capital are relatively unaffected by inflation. The similarity in the results holds even though Fullerton and Henderson adopted very different measures of effective tax rates (i.e., marginal rather than average rates).

IV.A.2. Mean real effective tax rates by industry

Tables 3 and 4 allow assessment of whether the impact of inflation on real effective tax rates observed in the aggregate was pervasive across industries. Table 3 indicates that for the entire 1961-1980 period, inflation tax penalties ranged as high as 10 percent of real distributable profit. (That penalty was faced by steel manufacturers, the firms in the sample for which the failure to index depreciation was most serious.) However, for all but the first seven industries listed in Table 3, the reduction in tax rates due to tax benefits within the existing system (investment tax credit, accelerated depreciation, etc.) were more than sufficient to offset the inflation tax penalty, thus yielding real effective tax rates below the statutory rate. Moreover, even if the benefit of nontaxation of gains on debt were ignored, real effective tax rates would still be below the statutory rate for 18 of the 27 industries.

Table 4 provides information about how inflation tax penalties and real effective tax rates changed over time. As inflation rates increased from the 1961-1968 period to the 1975-1980 period, inflation tax penalties increased for 23 of the 27 industries. Nevertheless, because tax benefits within the existing historical cost based system were also increasing, real effective tax rates rose in only 7 of the 27 industries, and declined in 18 industries.

Even though the decline in real effective tax rates observed in the aggregate was also observed in most industries, some important exceptions exist. During 1975-1980, inflation tax penalties in four industries--tires and rubber, steel, autos, and textiles--were greater than 15 percent of real distributable profits. Two of those industries--tires and rubber, and autos--experienced real effective tax rates for 1975-1980 in excess of 70 percent. Tire and rubber manufacturers, which held relatively large investments in old plant assets during the late 1970s[18], experienced the largest inflation tax penalty associated with depreciation (41 percent) of all industries from 1975 through 1980. Auto manufacturers also experienced relatively large inflation tax penalties associated with depreciation (20 percent), and, relative to most capital intensive industries, benefited less from the deductibility of nominal interest.[19] While noting these important exceptions, though, we conclude that mean real effective corporate tax rates declined over the 1961-1980 period, in the aggregate and for about two-thirds of the individual industries. This decline occurred in spite of contemporaneous increases in inflation rates.

IV.B. Inflation and cross-sectional rankings of effective tax rates

Even if inflation tax penalties have not been sufficiently large to cause increases in real effective tax rates for most industries, inflation can have important effects on the allocation of capital within the economy. One reason is that if inflation tax penalties differ sufficiently across industries, the cross-sectional rankings of tax rates would be affected, potentially altering the relative costs of capital among firms. Table 5 presents data that helps assess the impact of the inflation tax penalty on the ranking of effective tax rates across the 27 industries in the sample.

If the inflation tax penalty were equal across all firms, then the 'zero-inflation tax rates' would be perfectly correlated with actual real

effective tax rates. To the extent that correlation is less than perfect, the inflation tax penalty has altered the cross-sectional ranking of effective tax rates. Correlations between 'zero-inflation tax rates' and real effective tax rates appear in the first two rows of Table 5.

The correlations at the top of Table 5 are all close to one; even in the high inflation years of 1975-1980, the correlation between 'zero-inflation tax rates' and real effective tax rates exceeds .83. For the entire 1961-1980 period, the correlation is about .95. (Similar results are obtained even when the benefits of nontaxation of gains on net debt are assumed to be zero.) The implication is that although inflation tax penalties do have some effect on the cross-sectional rankings of industries' tax rates, those effects are small relative to other factors that cause cross-sectional variation in tax rates.

IV.C. Inflation, taxation, and capital intensity

It was noted earlier that since capital-intensive firms are those most affected by the failure to index depreciation, inflation causes a shift of the tax burden to those firms, holding all else equal. Of course, all else is not equal; it has already been shown that much of the inflation tax penalty caused by the failure to index depreciation and cost of sales is offset by the nontaxation of gains on debt. Furthermore, liberalization of investment tax credit regulations and depreciation rules may have mitigated the effect of not indexing depreciation. Therefore, the actual relationship between capital intensity and real effective tax rates is an open empirical issue.

To determine whether effective tax rates on real distributable profit were higher, on average, for capital-intensive industries, tax rates were correlated with a measure of capital intensity. Since the focus of the paper is on the corporate income tax borne by income available to common sharehold-

ers, capital intensity was defined in terms of shareholders' 'exposure' (per dollar invested in common stock) to the failure of the tax authorities to index depreciation. That exposure is a function of the cost basis of depreciable plant. Thus, capital intensity was measured as the undepreciated balance of plant, property, and equipment, as a fraction of the market value of common stock.[20]

The correlations between real effective tax rates and capital intensity are presented in Table 5. For comparative purposes, correlations between 'zero-inflation tax rates' and capital intensity are also presented.

The negative correlation between the 'zero-inflation tax rates' and capital intensity indicates that benefits within the historical-cost-based tax system (primarily, investment tax credits and accelerated depreciation) have allowed capital-intensive firms to experience lower-than-average tax rates, at least before consideration of the inflation tax penalty. That result is not surprising. However, it is interesting that the correlations between the real effective tax rates and capital intensity are also negative. This indicates that inflation tax penalties have not been sufficiently large (on average) to offset the relative tax benefits experienced by capital intensive firms. Even when the benefits of nontaxation of gains on net debt are ignored, the correlations between real effective tax rates and capital intensity remain negative (though closer to zero). This indicates that the benefits of investment tax credit and accelerated depreciation alone have been large enough (on average) to offset the relative penalty faced by capital intensive industries due to the failure to index depreciation.

Note that during 1975-1980, the inflation tax penalty did cause the negative correlation between real effective tax rates and capital intensity to shift much closer to zero. Thus, by the mid- to late-1970s, inflation tax

penalties were large enough to reduce the relative tax advantage of the average capital intensive firm, but that relative advantage still persisted.

IV.D. Inflation and the dispersion of tax rates

Table 6 provides data useful in analyzing the impact of the inflation tax penalty on cross-sectional variation in effective tax rates. To understand Table 6, consider the pattern of tax rates that would exist if all the inflation tax penalties were equal to zero, and the real effective tax rates were equal to the "zero-inflation effective tax rates" discussed earlier. Standard deviations across the 27 industries in those tax rates appear in the first row of Table 6. They are followed by standard deviations in the inflation tax penalties, and, finally, by standard deviations in the actual real effective tax rates.

Over the 1961-1980 period, the presence of the inflation tax penalty caused the standard deviation of the real effective tax rates to rise from 8.1 percent to 9.7 percent, an increment of about one-fifth. During the inflationary years 1975-1980, the corresponding standard deviation increased by a factor of nearly one-third, from 11.3 percent to 14.8 percent.

The bottom half of Table 6 reconciles the variance of the zero-inflation tax rates with that of the real effective tax rates. Note the relatively large (especially in 1975-1980) variance in real effective tax rates attributed to the failure to index depreciation and cost of sales. The most striking feature of the reconciliation is how much of that variance is offset by the nontaxation of gains on net debt. When the effect of the latter is considered, the variance attributed to the inflation tax penalty (from 1961-1980) is reduced by nearly half. During 1975-1980, the mitigating effect of the nontaxation of gains on net debt was even more dramatic; it caused a reduction

by two-thirds in the variance attributed to the inflation tax penalty. The evidence indicates that those firms most affected by the failure to index depreciation and cost of sales also tend to be the firms most benefited by the failure to tax gains on erosion in the real value of net debt. Note, however, that if the benefits of nontaxation of gains on debt are offset completely at the personal level, the large dispersion in real corporate income tax rates due to the failure to index depreciation and cost of sales would persist fully in real total income tax rates. Thus, although the inflation tax penalty increases cross-sectional dispersion in real effective corporate tax rates regardless of whether gains on debt are considered, the increase is much larger when the benefits of nontaxation of gains on debt are ignored.

The analysis of Table 6 is complemented by one other study that examines the impact of inflation on the cross-sectional dispersion of tax rates. Fullerton and Henderson [1984] simulate variation in the cost of capital due to differing marginal tax rates for alternative hypothetical investments, based the U.S. tax code of 1980 and 1982. Even though the measure of the cost of tax is very different from that examined here, the essential conclusion is the same: increasing inflation induces an increase in the dispersion of the tax burden.

IV.E. Supplemental Analysis: the 1981-1984 Period

Table 7 presents a reconciliation of the U.S. statutory income tax rate with the real effective tax rates for 1981-1984. The analysis is based on 95 firms that were included in the primary sample, survived through 1984, and met certain data availability requirements.[21] The format of Table 7 differs from that of Table 3 only in that the components of the inflation tax penalty are presented in less detail.[22]

Statistical analysis of the distribution of the tax burden during 1981-1984 is difficult because 5 of the 26 industries experienced net losses (in real terms) for the period, rendering their tax rates meaningless. Those 5 industries are interesting in their own right, however, since 3 of the 5 (steel, airlines, and mining) paid taxes even though pretax real distributable profit was negative. Thus, these 3 industries provide extreme examples of tax burdens that exceed profits available for real growth in shareholders' claims to capital.

Inflation rates declined during 1981-1984, reducing any benefits of the deductibility of nominal interest. At the same time, depreciation deductions for older assets remained well below replacement costs in most industries. Thus, there are reasons to expect that real effective tax rates would have been higher in 1981-1984 than in 1975-1980, had the tax system not been altered by ERTA,. However, when analysis is restricted to the 21 industries with positive real distributable profits, real effective tax rates are lower in 17 cases, and conclusions concerning the distribution of the tax burden have much in common with the previous results. As in earlier subperiods, the ranking of effective tax rates was not substantially altered by inflation tax penalty in 1981-1984. (The rank correlation between the zero-inflation tax rate and the real effective tax rate for the 21 industries is .88.) The negative correlation between real effective tax rates and capital intensity noted in previous subperiods persisted through 1981-1984, due primarily to the increased acceleration of depreciation under ACRS. (The rank correlation is -.28.) This suggests that among these 21 industries, any shifting of the tax burden to capital intensive industries due to the failure to index the tax system was, on average, more than offset by other tax benefits, including ACRS. The dispersion of the real effective tax rates in 1981-1984 was larger

than in any previous subperiod, even when measured while excluding the 5 industries with negative denominators in the tax rate. (The standard deviation for the 21 industries in 1981-1984 was 16.2%; the corresponding measure for all 27 industries in 1975-1980 was 14.8%.)[23] Once again, the inflation tax penalty served to increase dispersion in effective tax rates; the standard deviation of the real effective tax rate was more than 40% higher than that of the zero-inflation tax rate.

V. SUMMARY, IMPLICATIONS, AND LIMITATIONS

This paper has examined the impact of inflation upon the distribution of the corporate income tax burden of 136 major U.S. firms from 1961 through 1980, and 95 of those firms from 1981 through 1984. The major conclusions of the analysis are as follows.

Inflation and mean real effective tax rates. Holding all else constant, the failure to index the tax system has raised the effective rate of tax on inflation-adjusted profits for the average firm. However, this increase has been offset, due to tax benefits existing within the historical-cost based system. For most industries in the sample, mean real effective tax rates actually declined from 1961-1968 to 1975-1980, and again from 1975-1980 to 1981-1984.

Inflation and rankings of real effective tax rates across industries. The differential impact of the failure to index the tax system appears small relative to other factors that cause tax rates to vary across industries. As a result, the "tax penalty" attributed to inflation had very little impact upon the cross-sectional rankings of effective tax rates.

Inflation and the tax burden of capital intensive industries. In spite of the failure to index depreciation deductions for inflation, more capital-

intensive firms, on average, enjoyed lower effective tax rates than other firms throughout the 1961-1984 period.

Inflation and the cross-sectional disparity in real tax rates. Incremental taxes paid as a result of the failure to index the tax system did increase variation in effective tax rates across industries. During 1975-1980, years of relatively high inflation, the increment in the standard deviation of effective tax rates was on the order of one-third. That increment was even higher in 1981-1984.

Implications

Professor George Break, in his October 1983 Presidential Address to the National Tax Association-Tax Institute of America, placed at the top of his agenda for tax reform the need to "face squarely" the "effects of inflation," including, most importantly, "the mismeasurement of property incomes that results from basing tax law on nominal, rather than price-adjusted (real) money values" [1984, p. 3]. Although the empirical evidence presented here cannot, in the absence of stated welfare objectives, yield implications for how or whether to reform the tax code, the evidence could be useful in discussions of tax policy. For example, if higher average effective tax rates are indicative of higher costs of capital, then the results suggest that the failure to index the tax system has increased cross-industry disparity in costs of capital, but has had little impact on ranking costs of capital across industries. This, in turn, would suggest that the failure to index the tax system has primarily served to magnify the importance of already-existing effects of taxes on capital allocation within the corporate sector.

The evidence concerning dispersion of tax rates has an interesting implication for one specific tax reform, ACRS depreciation. It was noted earlier that systems like ACRS were proposed as ad hoc methods of compensating

capital-intensive firms for the penalty they face as a result of the failure to index depreciation deductions for inflation. However, it was shown here that capital-intensive firms, on average, already experienced lower real effective tax rates prior to ACRS, in spite of the inflation tax penalty they faced. It should not be surprising, then, that the dispersion of real effective tax rates was even larger after ACRS than before ACRS. If a purpose of insulating tax burdens from inflation is to reduce the dispersion of tax rates and thus the importance of taxes in allocation decisions, this particular ad hoc approach to indexation appears not to have achieved that objective.

Limitations

The evidence presented in this study must be interpreted while considering several important limitations. The first caveat concerns the measurement of real effective tax rates. The literature of taxation includes many alternative measures of effective tax rates (see Fullerton [1984]). We have argued that the use of average real effective corporate tax rates is appropriate, given the focus of this study. Nevertheless, the reader should be aware of the measurement methods while interpreting the results. In particular, it should be noted that corporate tax rates do not include tax borne indirectly by corporate capital through taxes actually paid by creditors or shareholders. In addition, the average tax rates used here could be viewed only as approximations of long-run marginal tax rates that would be most directly relevant in issues concerning resource allocation. Finally, since taxes affect pricing decisions, it is difficult, at best, to determine who ultimately bears the cost of income taxes.

A second limitation of the study is that it is not possible to know what tax legislation might have evolved in the absence of inflation. Thus, al-

though several changes in the tax code have served to partially offset the effects of inflation on real effective tax rates, it is far from clear that those tax changes were actually instituted as imperfect alternatives to indexation. Nevertheless, whatever the intended purpose of the changes in the tax code, it remains that one realized effect was partial compensation for the failure to index taxes for inflation.

END NOTES

1. For example, see Forbes [1980], Pierson [1980] (in the Wall Street Journal), Jackson and Jones [1981] (in Business Week). Complaints about the effect of inflation on effective tax rates of capital intensive firms are also evident, as would be expected, in public reports issued by such firms. For example, see Bethlehem Steel's 1979 Annual Report to Shareholders, page 18, Firestone Tire and Rubber Company's 1981 Annual Report, page 37, or Goodyear Tire and Rubber Company's 1984 Annual Report, page 47.

2. Green [1984] also simulated inflation-adjusted tax rates for individual firms, but focused on average tax rates rather than on marginal rates.

3. Fullerton [1984] provides a set of industry-specific marginal tax rates based on 1973 data that are only weakly correlated with average tax rates. Causes for the discrepancies are discussed in Fullerton [1984], Gravelle [1985], and Fullerton [1985]. Several of the discrepancies involve issues that would be less important as the period over which the tax rates are measured is lengthened.

4. Firms in the sample were chosen primarily on the basis of data availability and to obtain 2 to 10 representatives from each of 27 industries, which are listed in Table 1. Annual income, tax expense, and depreciation must have been disclosed in Compustat from 1960 through 1980. In addition, because the sample was also used in other related research, it was required that quarterly income or income before depreciation, interest, and taxes must have been disclosed on Compustat from 1965 through 1980, and that quarterly security market returns be available on CRSP continuously from 1961 through 1980. No banks had all of the required CRSP and Compustat data. Therefore, banks listed on the CRSP tapes since 1969 were chosen. Accounting data not on Compustat was gathered from annual reports and 10-K.

   Thirty firms were excluded from the initial sample because information in annual reports concerning inventory was not sufficient to support a reliable estimate of real distributable profit, using the methods discussed in the Appendix. Nine other firms were excluded from the sample because they experienced major shifts in lines of business, and couldn't be classified within a single major industry for the entire 1960-1980 period.

5. To understand better how real distributable profit can approximate the amount of income that can be distributed without impairing the shareholders' claim to beginning-of-period operating capacity, consider how real distributable profit is determined. To calculate real distributable profits, all expenses are measured in terms of current replacement costs. Note that if revenues accruing to all equity holders (creditors and owners) are at least as great as these current replacement costs, the firm can replace the total physical capacity held at the beginning of the period by reinvesting those revenues. Then it remains to be determined whether the shareholders' equity in that total physical capacity has been preserved. To make this determination, one must

consider all transfers of wealth between creditors and shareholders, including interest payments, and the decline in the real value of debt due to inflation. Real distributable profit, unlike historical cost income, reflects both of these transfers. When these wealth transfers are added to/deducted from the excess of revenues over expenses based on current replacement costs, the resulting measure represents the amount that could be distributed to the shareholders, without impairing their equity in the physical capacity of the firm.

6. For example, see Revsine [1983] or "Living off Capital" in Forbes (November 10, 1980, p. 233).

7. General price level adjustments were made as follows. First, for any firms using LIFO inventory, cost of sales was converted to FIFO using footnote disclosures required by the SEC since 1973. Then FIFO cost of sales and depreciation were restated using procedures equivalent to those described in the Appendix, except that the Consumer Price Index was used in place of specific price indexes. Gains/losses on devaluation of debt were calculated in the same manner described in the Appendix.

8. Tax expense is reported as item 16 on the expanded industrial Compustat files. The portion of tax expense that is deferred, rather than currently payable, is reported as item 50. Where that item was missing, it was calculated as the change in the balance of deferred taxes and deferred investment tax credit (Compustat item 35). Deferred tax data were not on Compustat for banks, but were collected, when available, from annual reports. Such data were usually available in annual reports issued after 1969. Where data were not available for the banks, it was assumed that tax expense was currently payable.

   Data concerning the tax benefits of net operating loss carry forwards were collected from annual reports and from Moody's manuals.

9. Those papers failed to recognize that amounts reported to be currently payable (tax expense, less deferred taxes) are not equal to amounts actually currently payable in some cases. Those cases arise whenever a firm owns a subsidiary that is not consolidated in the financial statements, and when the tax benefits of loss carry forwards are realized.

10. See Stickney [1979] for a discussion of the distortion in tax rates that arises when subsidiaries are not consolidated. To the extent data were available in the financial statements of either the parent corporation or the subsidiary, this distortion of tax rates was eliminated by adding taxes paid by the subsidiary to the numerator and adding the tax expense of the subsidiary to the denominator.

11. Calculation of the tax rates involves aggregating the data both across years, and across firms within industries. The first step in this process was to allocate tax payments and income for non-December fiscal-year-end firms to calendar years, by assuming those flows occurred evenly throughout the fiscal year. Next, tax payments and real income were summed across firms within industries. The resulting sums were then deflated by the Consumer Price Index, so as to avoid placing undue weight

on more recent years simply as a result of inflation. Finally, tax payments were summed across years, and income was summed across years. The ratio of these sums is the effective tax rate.

12. The purpose of the adjustment is to allow separation of two offsetting effects: i) the effect of acceleration of depreciation (based on the difference between straight-line and tax depreciation on a historical cost basis) and ii) the effect of not indexing inflation (based on the difference between historical cost and replacement cost depreciation on a straight line basis. To make the adjustment, accelerated depreciation was converted to straight-line depreciation using the methods described in the Appendix as the first step in estimating replacement cost depreciation.

13. Since book income as measured here is always based on straight-line depreciation, the acceleration of depreciation for tax purposes is one income-shifting technique that will affect the numerator of the tax rate on book income without affecting the denominator. Other important income-shifting techniques include the installment sales method, the completed contract method of accounting for long-term contracts, and alternative methods for recognizing income and expenses associated with leases and pensions.

14. For a debate of the extent to which these investment incentives might have been instituted as a result of the failure to index the tax system, see Gravelle [1980] and the rebuttal of Feldstein and Summers [1980].

15. For the 7 airlines included in the sample, investment tax credits were sufficient to eliminate 73 percent of income tax liabilities from 1977 through 1980.

16. The effect of the investment tax credit on tax was determined as follows. Item 51 on the Compustat expand annual industrial file reports the amount of investment tax credit included in income reported to shareholders. For firms using the 'flow-through method' of accounting for investment tax credit, this is equal to the investment tax credit used to reduce the current year's tax liability. For other firms, which use the 'deferral method,' item 51 must be adjusted to determine the investment tax credit used as a reduction in taxes. The adjustment involves increasing the amount reported as item 51 by the increase in the Deferred Investment Tax Credit. Although Deferred Investment Tax Credit is not separately disclosed by Compustat, it can be calculated by deducting item 74 from item 35.

    Once the investment tax credit used as a reduction of the current tax liability was determined, it was aggregated for a given year over all firms for which data were available, and then divided by the sum of the book income for those firms, to arrive at the amounts reported here.

17. This reduction reflects the net effect of a decrease in taxes from application of CLADS or ACRS to new assets, and an increase from taxes currently payable but previously deferred through acceleration of depreciation on old assets. The estimate was derived by assuming that the deferred portion of income tax expense was accounted for primarily by

differences between tax depreciation and depreciation reported in financial statements. (A review of footnotes to annual reports verified the reasonableness of this assumption.) Deferred tax expense as a fraction of book income then represents the reduction in tax rates attributable to the acceleration of depreciation.

18. When capital intensity is measured as a ratio of net plant to either the market value or book value of common equity, the tire and rubber industry ranks fifth or sixth in capital intensity among the 27 industries in the sample. Using the ratio of accumulated depreciation to straight-line depreciation expense as a measure of the average age of net plant, the age of net plant for the four sample members of the tire and rubber industry was about nine years during the 1975-1980 period.

19. Over the 1975-1980 period, gains on net debt for the four auto manufacturers represented only about 13 percent of real distributable profits. Ten industries, including several capital intensive industries (utilities, airlines, steel manufacturers, tire and rubber manufacturers, and nonferrous metals) were ranked higher. Auto manufacturers net debt is reduced substantially because of large investments in the financial assets of wholly owned credit corporations.

20. Results obtained when undepreciated plant, property, and equipment was scaled by the book value of common stock are similar to those reported here.

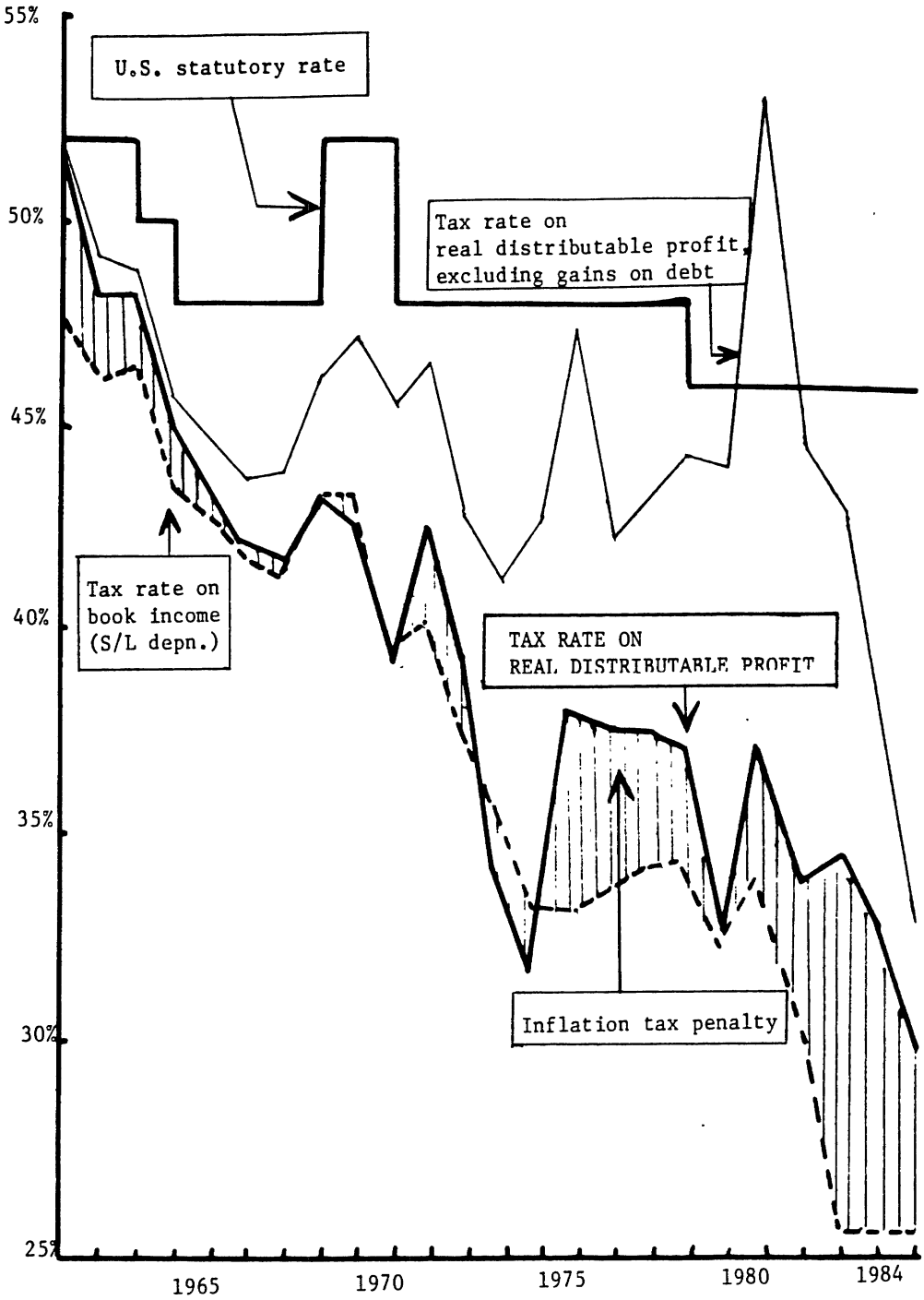
21. Complete data necessary to calculate taxes payable for 1981-1983 were required to be available on the COMPUSTAT files. In addition, current cost income from continuing operations, and the net monetary gain/loss must have been available for 1981-1983 on the Financial Accounting Standard No. 33 Database. Finally, comparable data for 1984 must have been available in annual reports received by the Business Library at the University of Michigan.

22. Replacement cost depreciation and cost of sales as reported according to the requirements of FAS No. 33 is frequently not comparable with the historical cost counterparts as reported on the COMPUSTAT tape. Other discrepancies between current cost income under FAS No. 33 and the historical cost income on COMPUSTAT also exist. For that reason, the difference between tax rates based on historical cost income and those based on replacement cost income cannot be decomposed for the 1981-1984 period in the same way as for the 1961-1980 period. Note that for the earlier period, replacement cost income was estimated in such a way to preserve comparability with historical cost income.

23. Note that while exclusion of the 5 firms with unusual experiences in 1981-1984 would tend to reduce the dispersion of tax rates, the use of a shorter period (4 years, rather than 6 or 7, as used in the primary analysis) would tend to increase the dispersion.

Figure 1

Effective worldwide tax rate for aggregate sample, 1961-1984



Regressions of changes in effective tax rates (R_t)
against current and lagged changes in inflation rates (I_t)
[Annual data, 1961-1984; t-statistics in brackets]

(1) R_t = Rate of tax on real distributable profit

$$\Delta R_t = -.01 - \underset{(2.65)}{.66}\,(\Delta I_t) + \underset{(1.69)}{.39}\,(\Delta I_{t-1}) - \underset{(-.13)}{.03}\,(\Delta I_{t-2}) + v_t$$

(2) R_t = Rate of tax on real distributable profit,
excluding gains on erosion of value of net debt

$$\Delta R_t = -.01 - \underset{(-.46)}{.14}\,(\Delta I_t) + \underset{(3.80)}{1.06}\,(\Delta I_{t-1}) - \underset{(-.58)}{.19}\,(\Delta I_{t-2}) + w_t$$

Table 1

Content of Test Sample

Industry	SIC Code	Number of Firms: 1961-1980	1981-1984
Mining	1000-1299	3	2
Food Processing	2000-2049	6	3
Soft Drinks & Candy	2065-2086	5	2
Tobacco	2100-2199	2	1
Textiles-Apparel	2200-2399	5	1
Paper & Related Products	2600-2699	5	5
Chemicals & Related Products	2800-2899	5	5
Drugs, Toiletries & Related	2830-2899	7	3
Petroleum Refining	2911	7	5
Tires & Rubber Products	3000-3099	4	3
Stone, Clay, Glass Products	3200-3299	8	5
Steel	3310	5	4
Nonferrous Metals	3330-3399	4	3
Machinery	3510-3549	5	4
Business Machines & Equipment	3570-3579	5	4
Electrical Equipment	3600-3629	2	2
Home Appliances	3630-3669	5	3
Auto Manufacturing	3711	4	4
Aircraft Manufacturing	3720-3729	4	3
Instruments & Related	3800-3899	5	4
Airlines	4511	7	4
Utilities	4800-4999	10	8
Retail Stores	5300-5399	7	7
Grocery Stores	5400-5499	5	3
Banks	6020-6029	5	4
Financial, Except Banks	6100-6299	2	0
Consumer Services	7000-7999	4	3
TOTAL	1000-7999	136	95

Table 2

Analysis of Accuracy of Estimates
of Real Distributable Profit

	Estimation error[a]	
	as fraction of value of common stock	as fraction of absolute value of real profit
Estimation error for individual firm-years: (147 firm-years from 1979 and 1980[b])		
Median estimation error	.00	.01
Median absolute estimation error	.02	.20
Estimation error for individual industry-years: (51 industry-years from 1979 and 1980)		
Median estimation error	.00	.00
Median absolute estimation error	.02	.16
Estimation error for individual industries for two-year period: (1979 and 1980 data combined for 26 industries)		
Median estimation error	.00	.00
Median absolute error	.02	.12
Estimation error for aggregate sample over two-year period: (1979 and 1980 data combined for 147 firms in 26 industries)	-.00	-.01

[a]Estimation error is equal to estimated real distributable profit, minus disclosed real distributable profit. The disclosed amount is equal to current cost income from operations, plus gain or loss on erosion in value of net monetary position, as reported in FAS 33 disclosures.

[b]Analysis includes all firms in sample for which FAS No. 33 disclosures were available for both current cost income from operations and gain/loss from erosion in value of net monetary position.

Table 3

Reconciliation of U.S. Statutory Tax Rate with Real Effective Tax Rate by Industry, 1961-1980

Industry	Average U.S. Statutory Rate, 1961-80[a]	Deviations from U.S. Statutory Rate: Foreign and state taxes offset by investment tax credits and other[b]	Effects of income-shifting accounting methods[c]	Total	Tax rate on book income[d] ('zero-inflation tax rate')	Inflation Tax Penalty: Due to failure to index depreciation[e]	Due to failure to index cost of sales[f]	Due to deduction of nominal (not real) interest[g]	Total (or net) penalty[h]	Real effective tax rate, 1961-1980[i]
Auto Manufacturing	.49	.00	-.01	-.00	.48	.06	.03	-.02	.07	.55
Textiles-Apparel	.49	-.02	-.02	-.04	.45	.09	.03	-.05	.07	.52
Instruments & Related	.49	-.02	-.01	-.03	.45	.03	.01	.02	.06	.51
Business Machines & Equipment	.49	-.02	-.01	-.02	.47	.04	-.00	.01	.04	.51
Food Processing	.49	-.02	-.03	-.05	.44	.04	.05	-.04	.06	.50
Tobacco	.49	-.01	-.01	-.02	.47	.02	.04	-.03	.03	.50
Drugs, Toiletries, & Related	.49	-.03	-.00	-.04	.45	.02	.02	.00	.04	.49
Home Appliances	.49	-.01	-.02	-.03	.46	.03	.01	-.02	.02	.48
Tires & Rubber Products	.49	-.03	-.03	-.06	.42	.08	.04	-.07	.05	.47
Grocery Stores	.49	-.02	-.03	-.05	.44	.06	.07	-.10	.03	.47
Soft Drinks & Candy	.49	-.02	-.02	-.04	.45	.02	.01	-.01	.02	.47
Electrical Equipment	.49	-.08	-.00	-.08	.41	.04	.01	-.00	.05	.45
Financial, except Banks	.49	-.06	-.02	-.08	.40	.00	-.00	.02	.02	.42
Machinery	.49	-.06	-.03	-.08	.40	.03	.01	-.03	.01	.42
Retail Stores	.49	-.06	-.05	-.11	.37	.02	.01	.00	.04	.41
Stone, Clay, Glass Products	.49	-.07	-.05	-.12	.37	.06	.01	-.04	.04	.41
Steel	.49	-.16	-.03	-.19	.30	.15	.02	-.07	.11	.40
Petroleum Refining	.49	-.07	-.05	-.13	.36	.07	.01	-.04	.04	.40
Consumer Services	.49	-.06	-.05	-.10	.38	.03	-.00	-.03	.00	.39
Banks	.49	-.14	-.02	-.16	.33	.00	.00	.05	.05	.38
Chemicals & Related	.49	-.10	-.05	-.15	.34	.05	.01	-.04	.02	.35
Aircraft Manufacturing	.49	-.10	-.08	-.19	.30	.04	.00	.01	.05	.35
Paper & Related	.49	-.13	-.05	-.17	.31	.06	.00	-.04	.02	.34
Nonferrous Metals	.49	-.17	-.04	-.20	.28	.07	.02	-.09	.00	.28
Mining	.49	-.21	-.02	-.23	.25	.03	.01	-.02	.02	.28
Utilities	.49	-.11	-.08	-.19	.30	.04	.00	-.08	-.04	.25
Airlines	.49	-.28	-.06	-.34	.15	.08	.00	-.09	-.01	.13

[a] Includes surcharges.

[b] Includes effects of foreign, state, and local taxes (included in tax rate on book income but not in U.S. statutory rate), effects of tax credits, effects of capital gains rates, effects of net operating loss carrybacks and carry forwards, and the effects of 'permanent differences' between taxable income and book income, such as interest on tax-exempt bonds, and the excess of percentage depletion over cost depletion.

[c] Includes primarily the effects of accelerated depreciation methods, installment sales accounting, and the completed contract method of accounting. The amount is calculated by divided deferred income taxes (increased, if necessary, to reflect adjustment of book income to straight-line depreciation method (see footnote d) divided by book income.

[d] Equal to taxes paid, divided by income reported to shareholders, after adjusting accelerated depreciation to straight-line depreciation if necessary.

[e] Equal to excess of replacement cost depreciation over straight-line historical cost depreciation, multiplied by the rate of tax on book income, and divided by real distributable profit.

[f] Equal to excess of replacement cost of sales over historical cost of sales, multiplied by the rate of tax on book income, and divided by real distributable profit.

[g] Equal to gain/loss on devaluation of net debt, multiplied by the rate of tax on book income, and divided by real distributable profit.

[h] Equal to real effective tax rate, less rate of tax on book income; also equal to sum of three components of the inflation tax penalty.

[i] Equal to taxes paid, divided by real distributable profit.

Table 4

Inflation Tax Penalties and Real Effective Tax Rates
by Industry and by Subperiod

Industry	Inflation Tax Penalty[a]				Real Effective Tax Rate[b]			
	1961-68	1969-74	1975-80	1961-80	1961-68	1969-74	1975-80	1961-80
Auto Manufacturing	.02	.07	.24	.07	.50	.53	.74	.55
Textiles-Apparel	.01	.06	.17	.07	.50	.55	.52	.52
Instruments & Related	.02	.04	.10	.06	.50	.50	.52	.51
Business Machines & Equipment	.01	.04	.06	.04	.50	.52	.50	.51
Food Processing	.02	.08	.06	.06	.48	.52	.49	.50
Tobacco	.02	.02	.03	.03	.49	.52	.48	.50
Drugs, Toiletries, & Related	.00	.02	.07	.04	.49	.47	.50	.49
Home Appliances	.00	.01	.05	.02	.47	.49	.47	.48
Tires & Rubber Products	.02	.01	.35	.05	.47	.38	.78	.47
Grocery Stores	.01	.10	.00	.03	.47	.56	.40	.47
Soft Drinks & Candy	.01	.02	.02	.02	.50	.47	.44	.47
Electrical Equipment	.02	.01	.09	.05	.52	.39	.43	.45
Financial, Except Banks	.01	.01	.03	.02	.48	.37	.42	.42
Machinery	.01	.00	.02	.01	.49	.41	.37	.42
Retail Stores	.02	.04	.06	.04	.42	.42	.39	.41
Stone, Clay, Glass Products	.03	.03	.06	.04	.43	.38	.40	.41
Steel	.10	.04	.24	.10	.48	.30	.31	.40
Petroleum Refining	.02	.03	.04	.04	.23	.34	.47	.40
Consumer Services	-.03	-.05	.03	.00	.42	.34	.39	.39
Banks	.04	.05	.06	.05	.42	.36	.36	.38
Chemicals & Related	.01	.00	.03	.02	.42	.37	.29	.35
Aircraft Manufacturing	.02	N/M[c]	.05	.05	.42	N/M[c]	.32	.35
Paper & Related	.03	.01	.03	.02	.41	.31	.30	.34
Nonferrous Metals	.01	-.04	.03	.00	.32	.21	.31	.28
Mining	.05	.02	.00	.02	.36	.27	.15	.28
Utilities	-.02	-.07	-.02	-.04	.43	.24	.10	.25
Airlines	-.02	-.02	.08	-.01	.18	.04	.21	.13

[a]Equal to excess of real effective tax rate over rate of tax on book income (adjusted, if necessary, to reflect straight-line depreciation in the calculation of income).
[b]Equal to taxes paid, divided by real distributable profit.
[c]Not meaningful, industry received net tax refund for subperiod.

Table 5

Impact of Inflation on Cross-sectional Ranking of Real Effective Tax Rates of 27 Industries[a]

	1961-1968	1969-1974	1975-1980	1961-1980
Correlation between actual real effective tax rate:' and 'zero-inflation effective tax rate:'				
product-moment correlation	.94	.96	.83	.96
rank correlation	.93	.92	.89	.95
Correlation between actual real effective tax rate and capital intensity:				
product-moment correlation	-.68	-.70	-.42	-.71
rank correlation	-.53	-.51	-.47	-.56
Correlation between 'zero-inflation effective tax rate' and capital intensity:				
product-moment correlation	-.70	-.69	-.70	-.71
rank correlation	-.62	-.55	-.58	-.62

[a]Correlations for 1969-1974 subperiod are based on only 26 observations; data for aircraft manufacturers were excluded, since that industry received a net tax refund and experienced negative tax rates.

Table 6

Impact of inflation on cross-sectional dispersion of real effective tax rates of 27 industries

Standard Deviation of Effective Tax Rates:

	1961 - 1968	1969 - 1974	1975 - 1980	1961 - 1980
Zero-inflation tax rate	8.3%	9.9%	11.3%	8.1%
Inflation tax penalty	2.4%	3.8%	8.4%	2.9%
Real effective tax rate	8.2%	12.2%	14.8%	9.7%

Reconciliation of variance in zero-inflation tax rate with variance in real effective tax rate:

	1961 - 1968	1969 - 1974	1975 - 1980	1961 - 1980
1) Variance in zero-inflation tax rate	69.0%	98.1%	126.7%	65.9%
2) Additional variance attributable to inflation tax penalty:				
2a) Due to failure to index depreciation and cost of sales	5.1	23.2	215.3	15.1
2b) Due to nontaxation of gains on net debt	3.1	16.2	73.0	14.1
2c) Due to offsetting (2a) and (2b)	(2.5)	(24.9)	(217.7)	(20.6)
Total additional variance due to inflation tax penalty	5.7%	14.5%	70.6%	8.6%
3) Two times covariance of zero-inflation tax rate and inflation tax penalty	(7.5%)	36.9%	21.7%	19.0%
4) Variance in real effective tax rate	67.2%	149.5%	219.0%	93.5%

Table 7

Effective Tax Rates by Industry,

1981-1984

Industry	Average U.S. Statutory Rate, 1981-84	Deviations from U.S. Statutory Rate: Foreign and state taxes offset by investment tax credits and other[a]	Effects of income-shifting accounting methods[b]	Total	Tax rate on book income[c] ('zero-inflation tax rate')	Inflation Tax Penalty: Due to failure to index depn., cost of sales, and other factors[d]	Due to deduction of nominal (not real) interest[e]	Total (or net) penalty[f]	Real effective tax rate, 1981-1984[g]
Steel	.46	NM*	NM*	NM*	NM*	NM*	NM*	NM*	NM*
Airlines	.46	-.17	-.09	-.26	.20	NM*	NM*	NM*	NM*
Mining	.46	NM*	NM*	NM*	NM*	NM*	NM*	NM*	NM*
Tires & Rubber Products	.46	-.01	-.02	-.03	.43	.58	-.16	.42	.85
Stone, Clay, Glass Products	.46	-.12	-.05	-.16	.30	.24	-.09	.15	.48
Petroleum Refining	.46	.01	-.09	-.08	.38	.11	-.04	.07	.45
Food Processing	.46	-.00	-.05	-.06	.40	.06	-.03	.04	.44
Tobacco	.46	.02	-.04	-.02	.44	.01	-.02	-.01	.44
Drugs, Toiletries, & Related	.46	-.05	-.04	-.09	.37	.06	-.00	.05	.42
Instruments & Related	.46	-.07	-.04	-.11	.35	.04	.03	.07	.42
Soft Drinks & Candy	.46	-.04	-.04	-.08	.38	.04	-.02	.02	.39
Business Machines & Equipment	.46	-.04	-.05	-.08	.38	.01	-.00	.01	.39
Banks	.46	-.11	-.01	-.12	.34	.01	.02	.03	.37
Textiles-Apparel	.46	-.08	-.05	-.13	.33	.06	-.02	.04	.37
Home Appliances	.46	-.12	.01	-.11	.35	-.01	-.00	-.01	.34
Consumer Services	.46	-.15	-.05	-.20	.26	.08	-.02	.06	.33
Grocery Stores	.46	-.11	-.05	-.16	.30	.11	-.09	.01	.31
Auto Manufacturing	.46	-.22	-.00	-.22	.24	.07	-.05	.02	.26
Retail Stores	.46	-.19	-.06	-.26	.20	.04	-.01	.03	.23
Paper & Related	.46	-.25	-.05	-.30	.16	.10	-.03	.07	.23
Chemicals & Related	.46	-.27	-.02	-.29	.17	.10	-.06	.03	.20
Electrical Equipment	.46	-.27	-.05	-.32	.14	.05	.00	.05	.19
Utilities	.46	-.33	-.04	-.37	.09	.06	-.03	.03	.12
Aircraft Manufacturing	.46	-.37	-.03	-.40	.06	.01	-.00	.01	.07
Nonferrous Metals	.46	-.78	-.04	-.71	-.25	NM**	NM**	NM**	NM**
Machinery	.46	NM**	NM**	-1.14	-.68	NM**	NM**	NM**	NM**

*Not meaningful; industry paid income tax, but real distributable profit was negative. Book income was positive only for airlines.

**Not meaningful; industry received tax refund for period. Real distributable profit was negative in each case, although book income was positive.

[a] Includes effects of foreign, state, and local taxes (included in tax rate on book income but not in U.S. statutory rate), effects of tax credits, effects of capital gains rates, effects of net operating loss carrybacks and carry forwards, and the effects of 'permanent differences' between taxable income and book income, such as interest on tax-exempt bonds, and the excess of percentage depletion over cost depletion.

[b] Includes primarily the effects of accelerated depreciation methods, installment sales accounting, and the completed contract method of accounting. The amount is calculated by divided deferred income taxes (increased, if necessary, to reflect adjustment of book income to straight-line depreciation method (see footnote d) divided by book income.

[c] Equal to taxes paid, divided by income reported to shareholders.

[d] Equal to excess of replacement cost depreciation and cost of sales over straight-line historical cost depreciation and cost of sales, multiplied by the rate of tax on book income, and divided by real distributable profit. Also includes effects of discrepancies due to exclusion of certain items of income current cost income as disclosed under FAS No. 33, that are included in book income.

[e] Equal to gain/loss on devaluation of net debt, multiplied by the rate of tax on book income, and divided by real distributable profit.

[f] Equal to real effective tax rate, less rate of tax on book income; also equal to sum of three components of the inflation tax penalty.

[g] Equal to taxes paid, divided by real distributable profit.

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APPENDIX

Procedures Used to Estimate Distributable Profit

The process of converting reported historical cost income to distributable profit involves three adjustments: cost of sales and depreciation must be adjusted to reflect current replacement costs and the gain (loss) on erosion in the value of debt must be added to (deducted from) income.

Adjustments to cost of sales. The restatement of cost of sales was carried out using methods that are similar to those of Falkenstein and Weil (1977). Inventory was separated into components that are accounted for using different methods (FIFO, LIFO, average costs). The portion of cost of sales that accounted for using FIFO or average cost methods was adjusted to reflect changes in specific price indexes that occurred subsequent to the time that inventory was acquired. Acquisition dates were estimated on the basis of inventory turnover. The portion of cost of sales that accounted for using LIFO was adjusted only in the case of a LIFO liquidation. The age of the liquidated LIFO layer was determined on the basis of changes in LIFO inventory balances in previous years, and the cost of the liquidated layer was adjusted using specific price indexes.

The specific price indexes used were among 1,142 wholesale price indexes furnished either by the Bureau of Labor Statistics or the CITIBANK data base. Indexes were matched with firm-years on the basis of information in segmental reporting disclosures, line of business disclosures, and descriptions of businesses in Moody's manuals and in annual reports. Weighted combinations of more than one index were used for about one-fourth of the firms in the sample. A single price index was used for remaining firms. In those cases where the impact of a LIFO inventory liquidation on income was disclosed, that information was used.

Adjustments to depreciation expense. The first step in adjusting the depreciation expense was to place historical cost depreciation on a straight-line basis for all firms. An adjustment was required only for some firm-years, since many firms already used the straight-line method. If a firm used accelerated depreciation for financial reporting, it was assumed that the specific accelerated method used was declining-balance depreciation, at rates that were 200 percent of the straight-line rate throughout the 1960s and declined gradually to 180 percent of the straight-line rate by 1980. The rate

was allowed to decline, since restrictions on the use of accelerated methods for tax purposes began to apply in July 1969, and since those firms using accelerated methods for financial reporting are likely to use depreciation rules similar to those used for tax purposes. If this percentage is denoted by R, then accelerated depreciation was converted to straight-line depreciation as follows:

$$\begin{aligned}\text{Straight-line depreciation} &= \text{Gross plant} \times \text{Straight-line rate} \\ &= \text{Gross plant} \times [\text{Accelerated rate} / R] \\ &= \text{Gross plant} \times \left[\left(\frac{\text{Accelerated deprec.}}{\text{Net plant}}\right) / R\right]\end{aligned}$$

The second step in the adjustment procedure was to determine when depreciable plant was acquired and to adjust for price changes since that date. This was done by examining the history of actual capital expenditures. (Since data on actual expenditures prior to 1960 was sparse, growth rates in capital expenditures were estimated in the early 1960's and were assumed to apply prior to that time.) Straight-line depreciation for a given year was then separated into components, each of which was matched with acquisitions of a prior year or the current year, assuming that depreciable assets were retired on a FIFO basis. Each component of depreciation was then adjusted to reflect the increase in the average price of fixed nonresidential capital (a component of the GNP deflator) from the year of acquisition until the year the depreciation expense was recorded.

The major improvement of this procedure over those used by others (e.g., Davidson, Stickney, and Weil [1976], Noe [1980]) is the use of the actual history of capital expenditures. Others relied on an average age of depreciable assets estimated by dividing accumulated depreciation by depreciation expense. The use of such an average causes a bias in estimated replacement cost depreciation that is positively related to the change in the rate of inflation since the acquisition of currently-depreciated assets.

Estimation of gain/loss on erosion in value of net debt. The gain/loss on the devaluation of net debt is equal to the integral over time of the product of the net monetary position (monetary assets, less monetary liabilities) and the rate of inflation in general prices. Since balance sheet data required to estimate net monetary positions are disclosed for most firms only on an annual basis, the estimate used here (and by others) is equal to the product of the annual inflation rate and the average of the beginning and ending net monetary positions.

Monetary accounts were defined to include cash, short-term investments, long-term investments in fixed income securities, current liabilities, long-term debt, and preferred stock. Since it is not possible to determine, on the basis of Compustat data, what portion of long-term investments are monetary, detailed information disclosed in annual reports and 10-K's were examined to identify monetary assets, if the balance of long-term investments (per Compustat) exceeded 10 percent of total assets. When data were available, monetary accounts of wholly-owned but unconsolidated subsidiaries were consolidated with the parent.

The definition of monetary accounts used here differs from that adopted by FAS No. 33 in that here, preferred stock was deemed monetary and deferred taxes were excluded from monetary liabilities. Preferred stock was considered to be monetary because it generally represents a claim to a fixed nominal income stream. Deferred taxes were excluded because of doubts concerning the propriety of regarding such taxes as a liability. Under current generally accepted accounting principles, deferred taxes are not accounted for as liabilities (see Accounting Principles Board Opinion 11).