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# THE INFLATION-ADJUSTED RATE OF RETURN ON CORPORATE DEBT AND EQUITY: 1966 - 1980

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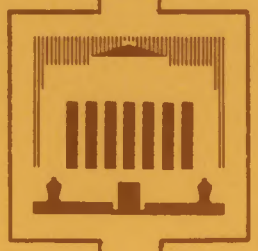

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# THE INFLATION-ADJUSTED RATE OF RETURN ON CORPORATE DEBT AND EQUITY: 1966-1980

by

Stuart C. Gilson

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## CONTENTS

## ABSTRACT

This report has two main objectives: First, to determine whether the real tax rate on investment income has proven sensitive to inflation; Second, to determine the extent to which real returns to debt and equity, based on published data, differ from those based on inflation-adjusted data. The scope of the inflationary distortion in corporate income is assessed, and the resulting estimate is used to calculate the real after-tax rate of return on Canadian corporate debt and equity for the 1966-80 period. The author departs from previous studies of the Canadian corporate sector in his definition of returns to corporate activity. His definition reflects the view that the cost of corporate capital is governed by the after-tax returns accruing to individual investors from their debt and equity claims on the corporate sector. Two empirical regularities are found: 1) The real after-tax rate of return on debt and equity calculated with full inflation accounting is consistently below the rate based on unadjusted data, and 2) The inflation-adjusted real tax rate on investment income appears to increase with inflation over the sample period.

## RÉSUMÉ

La présente étude vise deux objectifs fondamentaux: premièrement, elle cherche à établir si le taux réel d'imposition des revenus de placement a été sensible à l'inflation, et deuxièmement, à déterminer dans quelle mesure les taux de rendement réels des actions et obligations calculés à partir des conventions comptables existantes diffèrent de ceux qui se fondent sur une comptabilité corrigée en fonction de l'inflation. Elle évalue l'ampleur de la distorsion que l'inflation exerce sur le revenu des sociétés et utilise l'estimation obtenue pour calculer le taux de rendement réel, après impôt, des obligations et des actions des sociétés canadiennes entre 1966 et 1980. L'auteur retient une définition du rendement des sociétés canadiennes qui s'écarte de celle que l'on retrouve dans les études effectuées précédemment sur ces sociétés. En effet, selon la définition de l'auteur, le coût du capital pour les sociétés est lié aux rendements après impôt que produisent les créances sous forme d'obligations et d'actions des sociétés que détiennent les différents bailleurs de fonds. Deux constantes se dégagent empiriquement de cette étude: 1) le taux de rendement réel après impôt des actions et obligations calculé en tenant compte de l'inflation est toujours inférieur au taux qui est calculé à partir de données non corrigées, et 2) le taux d'imposition réel des revenus de placement, corrigé pour tenir compte de l'inflation, semble évoluer à la hausse, tout comme l'inflation, pendant la période-échantillon.

**INTRODUCTION**

It has long been recognized that when there is inflation, published financial data on wealth and income may be misleading. One particular area where this applies is in the reporting of corporate income. Under current accounting rules, which presuppose price stability, the net returns to investing in corporate debt and equity will be overstated if prices are rising. This is because investors and corporations are not allowed to completely expense the costs they must incur to maintain the real value of their wealth. Such costs will tend to appreciate with inflation, but this is not reflected in the official accounting definition of income and profitability. Corporate income is thus overstated for tax and financial disclosure purposes.

This has a number of disturbing economic implications. One of these concerns the erroneous reporting of income for tax purposes. Under present accounting rules, inflation serves to increase the real effective tax rate on investment income by driving up the taxable income -- and taxes -- of investors by more than their real income. This represents an arbitrary shift in the relative tax burden of investors that may be deemed undesirable on equity grounds.

If the increase in the tax rate is perceived, investors may demand a higher pre-tax rate of return as compensation, thus driving up the financing costs of corporations and discouraging investment in physical plant and equipment. If, however, investors are not fully cognizant of the increased tax burden because they are misled by published data, they may misjudge the relative returns to various sorts of saving and subsequently misallocate resources from a social point of view. In either case there may result an overall loss in efficiency.

In this paper we assess the scope of the accounting distortion by correcting reported corporate income data for the impact of inflation. We then use this estimate of inflation-adjusted income to calculate the real after-tax rate of return on Canadian corporate debt and equity. The objective is twofold: (1) To determine whether the real tax rate on investment income has proven sensitive to inflation, and (2) To determine

the extent to which the returns to debt and equity, based on published data, have strayed from those based on inflation-adjusted data.

This paper derives its inspiration from a number of earlier studies of the Canadian corporate sector that also address the problem of inflation accounting.[1] However, we take a different approach to defining the returns to corporate activity. Conventionally, these returns have been defined from the vantage point of the corporation, where "income" consists exclusively of corporate profits, and the tax liable on that income includes only the corporate income tax.

In this study income is defined to include all returns that accrue to investors -- dividends, interest and capital gains -- as a result of the debt and equity claims they hold on the corporate sector. Moreover, the total tax liable on investment income is defined to include not only the corporate income tax, but also the taxes levied on dividends, interest and capital gains income directly, and we derive a separate tax rate series for each. This approach reflects the view that the supply of funds to the corporate sector will be governed by the after-tax returns that accrue to individual investors, the ultimate recipients of the returns to corporate activity. In this sense we follow the lead of Feldstein et al.,[2] who undertake a similar approach for the United States.

The paper is organized as follows. In the first section the definition of income used in constructing the inflation-adjusted rate of return on debt and equity is discussed in detail. In the second section the data are reviewed. Inflation-adjusted investment income is derived in the third section, and the average tax rates applicable to dividends, interest and capital gains are derived in the fourth. These are used to calculate the total tax liable on such income at the investor level. This is later added to the corporate income tax to obtain the total tax liable on investment income. The methodology used to derive the total real tax

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1. See Basu and Hanna (1976), Jenkins (1977a,b), Bossons (1977), Bélanger and McIlveen (1980a,b) and Tarasofsky et al., (1981). We also benefited greatly from access to an early draft of a forthcoming study of the real effective tax rate on corporate profits by the Department of Finance.

2. E.g., Feldstein (1976, 1982), Feldstein and Summers (1978), Feldstein et al. (1981).

rate on investment income and the real after-tax rate of return on debt and equity is described in the fifth section. In the sixth and seventh sections the results are discussed and conclusions drawn. Alternative estimates of the real tax rate and rate of return based on a narrow definition of income similar to that employed in previous studies are presented in Appendix I.

## 1 BASIC CONCEPTS

### 1.1 Investment Income Defined

In this paper, investment income is defined to include all returns that accrue to investors as a result of the debt and equity claims they exercise against the corporate sector. This includes remuneration in the form of dividends, interest and capital gains. Dividends represent a return to equity, interest a return to debt, and capital gains a return to both. "Equity" consists of all common and preferred shares outstanding. Since the corporate sector considered here consists of all private sector corporations, including those engaged in financial intermediation, "debt" is defined in the broadest sense to include all interest-bearing financial claims. By defining income in this fashion, we thus choose to look at the rate of return on a widely diversified portfolio of corporate debt and equity. Income is defined to include the total returns to investment, and taxes include both the corporate profits tax, plus any taxes levied on dividends, interest and capital gains directly. By focusing on investors instead of the corporation, this approach treats as the main players the actual economic actors involved in the savings and investment decision, instead of a legal construct that serves in more of an accounting role.

We begin the adjustment for depreciation and depletion by calculating a separate series based on the capital maintenance definition of income. Under this approach, "income" must represent an increase in the real wealth of the income earner. Investment income is thus defined as the gross returns to debt and equity, less what must be set aside in order to preserve the real wealth of investors. The need for such a deduction occurs as a result of the depreciation and depletion of fixed capital, the consumption of inventory stocks, and the impact of inflation on the real

principal of nominally denominated financial claims. The capital maintenance approach characterizes present accounting methodology. However, it is accompanied by a presumption of price stability, so that no allowance is made for the impact of inflation on the costs of maintaining real wealth. This paper attempts to correct this by defining such costs in terms of the current price level.

The "wealth" of investors is defined as the present discounted value of the expected future returns to debt and equity. It is assumed that capital markets are efficient, so that the value of investor wealth is reflected in the current market value of debt and equity. Following Feldstein et al., we abstract from year-to-year fluctuations in assets markets, and assume that the market value of debt and equity is, on average, equal to the current replacement value of the corporate capital stock; in other words, that Tobin's q equals unity.[3] The capital maintenance notion of wealth can thus be interpreted in terms of the corporate balance sheet. Consider the following "reduced form" balance sheet of the corporate sector:

| **ASSETS** | **LIABILITIES** |
|---|---|
| Net non-interest-bearing financial assets (assets less liabilities)(12.8%) | |
| | Interest-bearing debt |
| Interest-bearing financial assets(38.5%) | |
| Inventories(11.6%) | |
| Depreciable/depletable capital(34.1%) | SHAREHOLDERS' EQUITY |
| Land(3.0%) | |

3. One might expect Tobin's q to differ from unity, occasionally if not consistently, owing to cyclical disturbances and taxes. While short-term fluctuations in the variable may indeed be quantitatively significant, we wish to determine the long-run tendencies in the real effective tax rate and rate of return, and we assume that a Tobin's q of unity is a good approximation.

The number beside each entry in the assets column is the average share of each asset in the total corporate assets for the 1966-80 period.[4]

Investor wealth is equal to the current replacement value of the capital stock, defined as the sum of all physical and financial assets owned by the corporate sector (that is, everything under "ASSETS"). It is assumed that financial markets value both kinds of capital in setting the price of debt and equity, since all assets collectively contribute to the generation of gross revenues. The funds that must be set aside each period to maintain the real value of investor wealth are necessary to replace physical capital that has been depreciated or depleted, replace inventories that have been withdrawn from stocks, and maintain the real principal of all nominally denominated financial assets. The greater the rate of inflation, ceteris paribus, the larger must be the reserve of funds set aside to maintain investor wealth. Under current accounting rules, where price stability is assumed, such compensation for inflation is not allowed, with the result that reported income flows will be overstated.

The capital maintenance approach presumes that corporations are "going concerns", which is to say they are assumed to operate indefinitely. This assumption is implicit in the published income data used in this study, and it is retained when we perform accounting adjustments for inflation. It is assumed that corporations do in fact set aside funds to maintain real investor wealth; continuing failure to do so would result in the dissipation of the capital stock, and corporations could no longer continue to operate.[5]

Besides taking the capital maintenance view of income, we define income on an accrual basis. This means that capital gains constitute

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4. Over the 1966-80 period, the share of interest-bearing financial assets rose significantly, from 27.3 per cent in 1966 to 45.8 per cent in 1980. The share of inventories and land changed only negligibly, and that of depreciable/depletable capital fell marginally from 35.8 to 32.4 per cent. The share of net non-interest-bearing financial assets fell from 22.2 per cent to only 7.7 per cent.

5. Of course individual corporations do cease to exist, voluntarily or otherwise. However, from the point of view of the corporate sector as a whole, this does not conflict with the "going concern" assumption, provided the assets of such corporations are picked up by others.

income as they accrue, regardless of whether they are actually realized. Viewed as a cash flow measure, income should be defined to include capital gains realizations. Viewed as a measure of those incentives governing the purchase of debt and equity, income should be defined to reflect the market's appraisal of uncertain future cash flow prospects as well, and the expectation of such flows will, in an efficient capital market, be reflected in the current market price of debt and equity. The conversion of capital gains accruals into realizations reflects the propensity to consume in a certain fashion; here we are concerned with what determines the propensity to save. Changes in the market value of debt and equity are thus treated as income. However, in accord with the capital maintenance view of income, any increase in nominal investor wealth that does not constitute an increase in real wealth is not considered "income".[6]

## 1.2 The Rate of Return Defined

In this study we calculate the inflation-adjusted ex post rate of return on debt and equity. Published financial data are amended to reflect the costs of maintaining real wealth that investors actually incurred over the sample period, based on rates of inflation that obtained historically. This enables us to assess the extent to which inflation has adversely affected the after-tax rate of return on debt and equity. It also furnishes a variable that is potentially useful in terms of explaining the propensity of corporations to invest in physical plant and equipment, traditionally an important part of total economic activity.[7]

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6. Most previous studies of corporate inflation accounting have instead defined income on a realization basis, although because they have defined income without specific reference to capital gains, it is not important which definition of income is adopted. A number of U.S. studies have taken an accrual view of income: Shoven and Bulow (1975, 1976), Feldstein and Summers (1978), Feldstein et al. (1981), but to our knowledge no previous Canadian study has done so.

7. To perform such an experiment, it might be necessary to adjust our calculated ex post rate of return to incorporate the impact of inflationary expectations on desired investment, since our calculations are based solely on ex post rates of inflation. We should also expect that changes in the capital stock at the margin will be primarily a function of the marginal rate of return on investment. In this paper, we calculate the average rate of return. Despite such caveats, Feldstein (1982) estimates a series of investment equations with the ex post average rate of return on capital as an argument.

We also calculate the rate of return on the grounds that both physical and financial assets generate the income flows that ultimately accrue to investors. No explicit distinction is drawn between physical and financial capital, because from the point of view of investors only their combined return matters. By holding debt and equity claims, they effectively own a "bundle" of both the physical and financial assets of the corporations in which they have invested. It is our view that financial intermediation represents an essential part of the production process, and therefore that it makes sense to define the capital stock to include both types of capital.[8]

### 1.3 The Corporate Sector Defined

The corporate sector is defined to include all private sector corporations, whether privately held or publicly traded. Government corporations are excluded, on the assumption that they face a different set of incentives than corporations in the private sector. Government corporations are generally not taxed, and the government is typically their exclusive source of financing. It is also likely that they enjoy more immediate access to the services of government as a "lender of last resort" than private sector concerns.[9]

We also define the corporate sector to include financial corporations. These, as well as all other service industries, are included because we wish to assess the rate of return on an aggregate portfolio consisting of all corporate debt and equity claims. We therefore single out the entire corporate sector as one particular

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8. This is not to suggest that the rate of return on physical capital is always an unimportant consideration. One could take the view, for example, that financial assets do not in and of themselves make society "better off", since they only involve a transfer of income between lenders and borrowers (abstracting from any of the presumed benefits of financial intermediation per se). One could further assert that the rate of return on physical capital represents the "social" rate of return to investment: that rate describing the choice available to society between present and deferred consumption. However, this is a different concern than that in this paper.

9. Federal government proprietary Crown corporations like Air Canada are, in principle, taxable at regular rates. However, we maintain that they are more properly treated as an adjunct to the government and that they are subject to political as well as profit considerations. This is not to imply that Crown corporations serve any less important a role than private sector concerns.

repository for private savings. Of course corporate instruments compete with other forms of wealth in the savings decision, for example government bonds and residential housing. The rate of return we calculate can be considered one particular argument in the macro savings function. We feel it merits special attention because in an institutional sense the corporate sector is unique, particularly with respect to the taxation of investment income. Moreover, it represents an interesting area on which to focus because much of recent public policy has been specifically directed at the corporate sector. In many ways our decision to aggregate to this particular level reflects the same considerations that apply when different levels of activity are analyzed in the National Income Accounts.

### 1.4 The Impact of Inflation on Tax Rates and Rates of Return

The question addressed in this study is whether investors are adversely affected by the interaction of inflation and the tax system. Under current accounting rules, an increase in inflation may serve to drive up the taxable income of investors by more than their inflation-adjusted income. This occurs because taxable income is calculated without fully providing for the current costs that investors must bear in order to maintain their wealth. The result may be an increase in the effective tax rate on investment income (total taxes liable divided by inflation-adjusted income). If the incentive to save by investing in corporate debt and equity is thereby diminished, the real cost of capital to corporations may increase. Ceteris paribus, real investment in plant and equipment may be discouraged. By increasing the real tax rate on investment income, inflation may therefore inflict a real loss on society. Moreover, it may introduce an arbitrary redistribution of wealth from private savers to the government that may be undesirable on welfare grounds.

Of course investors may, on balance, appear to actually benefit from an increase in inflation, if inflation-adjusted income should rise by more than total taxes. This could occur as a result of a large real appreciation of the capital stock, or because wages lag behind selling prices, for example. It may even be that special tax provisions are introduced to offset the inflation bias in current tax accounting. These

factors are all reflected in published tax and income data, and no special adjustment for them is required. The important point is that however the effective real tax rate responds to an increase in inflation, ceteris paribus it will be higher than if full inflation accounting is practised.

An additional problem concerns the possibility that investors fail to see beneath the inflationary veil, accepting published income data at face value. This may result in an inefficient allocation of savings, if the gap between published and inflation-adjusted rates of return is significant.

## 2 DATA

Data on corporate balance sheets and income statements are obtained from the two Statistics Canada publications, Corporation Financial Statistics (SC 61-207), and Corporation Taxation Statistics (SC 61-208) (hereafter referred to as CFS and CTS, respectively), or from the CANSIM base if updated data are available. The information contained in these publications is based on a comprehensive survey of annual corporate tax returns filed by Canadian corporations, and a complete annual series is available for the years 1965-80. The coverage of the CFS/CTS data is exhaustive, including the affairs of both publicly traded and government Crown corporations. The data may be judged a reasonable reflection of the information contained in the annual financial report issued to shareholders.

Government Corporations The CFS/CTS data on total corporate activity are amended to remove all government corporations. For the years 1968-80, separate data are published detailing the affairs of government Crown corporations. Data for 1965-67 were obtained directly from the Business Finance Division at Statistics Canada.[10]

Problems with CFS/CTS Data One possible problem with the CFS/CTS data concerns the fact that they are based on the calendar year, although the taxation data from which they are derived reflect each corporation's fiscal year accounting. The figures recorded in CFS/CTS for a particular year may thus partially reflect activity that occurred in the previous calendar year, making economic inferences about the corporate sector less precise. However, the fiscal year-end of most reporting corporations has tended to fall in the last quarter, and thus any distortions this creates may not be too serious.[11]

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10. I am grateful to Al Dorland of Statistics Canada for retrieving the government corporations data.

11. In 1980, for example, over two-thirds of all corporations had fiscal year-ends falling in the last quarter.

Another problem concerns the possibility of double counting that arises when corporations are aggregated. If there are intercorporate shareholdings, then income, assets and equity will all be overstated in the CFS/CTS data. This follows from the fact that dividends are paid out of profits, so that a portion of one firm's profits paid out to another as dividends will also show up on the recipient firm's books as income. By the same token, the assets (and, by virtue of the balance sheet constraint, equity) of a corporation that owns shares in another will be higher in the amount of the shareholding, although these shares are already reflected in the assets and equity of the issuing corporation. Because of data limitations, no adjustment for such double counting is made, even though calculated rates of return may be biased as a result.[12]

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12. Since both assets and income will be overstated, calculated rates of return may be biased in either direction, depending upon whether the numerator or denominator in the rate of return expression is affected in proportionately greater measure.

## 3 THE INFLATION-ADJUSTED PRE-TAX RETURN ON DEBT AND EQUITY

The after-tax income of investors is defined in the broadest sense to include all returns that accrue to debt and equity: dividends, interest and capital gains. Dividends are paid out of after-tax corporate profits. Interest payments are financed out of corporate revenues and are treated as a tax deductible operating expense. Capital gains, it will be shown shortly, reflect both additions to the capital stock financed by retained earnings (what we call "internal" capital gains) and the inflationary appreciation of the existing capital stock ("external" capital gains). Under the capital maintenance view of income, these are defined so that only net accretions of wealth are considered income.

The pre-tax income of investors is the sum of after-tax dividend, interest and capital gains income, plus all taxes for which investors are either directly or indirectly liable. These include the corporate profits tax, plus all taxes levied directly on dividends, interest and capital gains.

Both dividends and internal capital gains (equal to retained earnings) arise from after-tax corporate profits. In past studies that have concentrated on the corporation per se, the inflation-accounting exercise has been concerned with adjusting reported corporate profits alone. In this paper, additional adjustments are performed with respect to interest and external capital gains income, reflecting a broader definition of the returns to investment. Sections 3.1 to 3.3 contain a discussion of the methodology used to adjust reported income for inflation. We consider separately: 3.1 Corporate Profits; 3.2 Interest Income; 3.3 Capital Gains Income.

### 3.1 Corporate Profits

The adjustment to corporate profits involves accounting for the costs of maintaining investor wealth in terms of current prices. The total adjustment can be broken down into separate adjustments that are made for each entry in the assets column of the balance sheet presented earlier. Each of these is considered in turn.

### 3.1.1 Adjustment for Depreciable/Depletable Capital

Current balance sheet accounting of depreciable and depletable assets makes no allowance for the effect of inflation on the replacement value of capital. Under current accounting rules, depreciable assets are recorded on the books in terms of the costs incurred when they are originally acquired. Book depreciation is typically calculated as a "straight-line" writeoff of the capital stock, where the annual amount charged against each capital good is a fixed fraction of its gross book value. Depletable assets are recorded as the capitalized value of exploration, development and land acquisition costs incurred in developing natural resource properties. Book depletion will reflect the amortization of these costs, at a rate that more or less parallels the rate at which the resources themselves are exhausted. Both book depreciation and depletion represent the writeoff of capital valued in terms of historical acquisition costs. When there is inflation, such costs as declared will be inadequate to cover the full costs of replacing depreciated and depleted capital. In terms of the capital maintenance definition of income, therefore, reported book costs will fall short of actual costs incurred, and reported profits will be too high.

For a given total tax liability, ceteris paribus, this means that the actual tax rate on investment income exceeds the rate obtained when we divide taxes payable by reported income. This is, however, offset by the treatment of depreciation for tax purposes. To calculate the taxable income of a corporation, straight-line book depreciation, discussed above, is replaced by a tax depreciation allowance, which entails a more generous ("declining-balance") writeoff of capital than that allowed on the books. For tax purposes, approximately thirty different "classes" of depreciable capital are recognized, to each of which there corresponds some prescribed rate of writeoff. For each class the allowable tax depreciation is calculated by applying the writeoff rate against the net book value of capital in the class (that is, capital net of all accumulated depreciation). Over the years tax depreciation rates have grown more generous, and this may have served to offset the inflationary bias in the tax rate. However, tax depreciation is a function of the net book value

of capital, which will fall short of the current replacement value when there is inflation.[13]

The adjustment that we perform consists of replacing book depreciation and depletion expenses with an inflation-adjusted measure that reflects the current costs that must be incurred to maintain the real value of depreciable/depletable capital. Because the book values of depreciation and depletion contained in the CFS data reflect the amortization of capital goods acquired over a long period, it is not possible to deflate the series by any "one" price in order to obtain an estimate of real depreciation and depletion. Instead, the current capital stock is expressed as a cumulation of present and past investment, making it possible to "allocate" book depreciation/depletion to specific vintages of capital, to each of which there corresponds a particular price.

a) Capital Service Life

The first step in this procedure is to estimate the average service life of depreciable/depletable capital. It is assumed that book and economic depreciation/depletion rates are identical, and that both depreciation and depletion are calculated as a straight-line writeoff of gross capital.[14] The service life of capital is equal to the gross book value of depreciable/depletable assets, divided by total book depreciation/depletion expenses. The reciprocal of the estimated service life is just the straight-line rate of depreciation/depletion. The estimated service life has a mean value of about 19 years, which is the

13. Tax depletion allowances are alao designed to confer an accelerated tax benefit, although they are calculated aa a function of specified income flows, and are not directly linked to a firm's actual stock of depletable resources.

14. According to the resulta of a survey conducted by the Canadian Institute of Chartered Accountants, and reported in Financial Reporting in Canada (1981), in 1980 68 per cent of 405 firms surveyed used straight-line depreciation, 19 per cent used the "unit of production" technique (which involves a piecemeal writeoff of capital as it is physically used up), 11 per cent used "diminishing balance" techniques (which includes declining balance depreciation), and the remainder used "sinking fund" methods (largely reflecting real estate development operations). Firms have a great deal of flexibility in choosing the method of book depreciation, although straight-line methods have become less popular and are gradually being supplanted by diminishing balance techniquea.

figure we employ in subsequent calculations.[15] The service life is reasonably stable over the sample period, but there is some evidence of a downward trend.[16] This, it will be shown, would be consistent with a substitution by corporations into shorter-lived investments to reduce the real tax distortion of historical cost depreciation/depletion.

b) A Real Gross Investment Series

The second step in deriving an estimate of replacement cost depreciation/depletion is to construct a series for real gross investment by private sector corporations. A special series for real gross investment by all corporations, including government enterprises, was obtained from the Construction Division of Statistics Canada.[17] This series, hereafter referred to as IGTOT, is based on the data contained in Fixed Capital Flows and Stocks (SC 13-568). These encompass unincorporated as well as incorporated enterprise activity, and are adjusted downwards by specified percentages that reflect the importance of corporations in total industrial activity. These percentages are approximations, based on a procedure that looks at the distribution of labour income across corporate and non-corporate sectors.

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15. This may seem high, but it is also the figure employed in Bélanger and McIlveen (1980a,b) and Tarasofsky et al. (1981). It also seems more intuitively plausible than the service life implied by the Fixed Capital Flows and Stocks (SC 13-211) data, which has an average value of 25 years for 1966-80. In general, when an asset is scrapped or sold the book value of assets is reduced by the residual book value of the asset in question, and book depreciation or depletion will be correspondingly lower, ceteris paribus. If an asset should be rendered less productive for some reason but is still used in production, its book value will often be reduced to reflect this. It is unlikely, therefore, that oil price shocks have driven the "true" economic service life of capital below our service-life estimate because of an unrealistically high book valuation of capital. Of course the economic service life of an asset is never known exactly until it is retired. However, in calculating book depreciation, accountants generally try to approximate this figure, and in this regard are probably as well-informed aa most economists.

16. In 1966 the average service life ia 19.6 years; in 1980, 16.8 years. This drop occurs largely after 1975. Since the CFS data do not include the groas value of depletable assets (only net), the service life is estimated on the basis of depreciable assets only. Depletable assets are generally expensed on a "unit-of-production" basis, i.e., the book writeoff will reflect the rate of physical exhaustion. It is assumed thia also occurs on a straight-line basis. Although this asaumption ia probably leas realistic than that for depreciation, any resulting diatortions are probably small, since in current value terms depletable assets account for only 2.9 per cent of all assets on average for 1966-80.

17. I am grateful to Peter Koumanakos of Statistics Canada for thia data. To my knowledge the data have not been used elsewhere in a similar applied context.

Next, IGTOT is purged of all government enterprise activity, to obtain a series consistent with the CFS corporate universe. The IGTOT data are based directly on the Fixed Capital Flows and Stocks data, which in turn are based on investment survey information contained in Private and Public Investment in Canada (SC 61-205). The latter contains information on nominal gross investment ("capital expenditures") by government corporations. This government enterprise investment series is denoted by IGG. Then IGG, deflated by an implicit investment price index based on the IGTOT series (PI), is subtracted from IGTOT for the years 1956-80. For preceding years, it is assumed that IGG/PI, real gross investment by government corporations, equals 30 per cent of total gross investment, IGTOT.[18] We end up with a series for real gross investment by private sector corporations, IG.

The adjustment for depreciation and depletion is made in order to calculate a separate series for historical cost depreciation/depletion (DEPH), and replacement cost depreciation/ depletion (DEPR), using the gross investment series IG, and a service-life assumption of 19 years. The inflation-adjusted value of depreciation/depletion is then defined as[19]

$$\frac{DEPR}{DEPH} \cdot \text{(CFS book value of depreciation and depletion)}$$

DEPR and DEPH are calculated as follows. First, it is assumed that gross investment occurs at mid-year. At year-end, therefore, the amount of depreciation/depletion charged against capital acquired in that year will be equal to one-half the annual rate of depreciation/depletion. During all subsequent years until this capital is retired, depreciation

18. This particular percentage is chosen on the basis of the percentage observed for 1956-80, years for which data on government investment are published. The average percentage for the period is 31.8, 32.9 for 1968-80, and 30.5 for 1956-67. It is also fairly stable, tending to level off at about 30 per cent as one goes back to 1956. This approximation is, admittedly, crude, but we feel the series captures the general tendencies in private sector investment reasonably well. Given the data limitations involved, an approximation is invariably required. Bélanger and McIlveen (1980a,b) define gross investment as the difference between successive book valuations of capital, adjusted for inflation, and for years not covered by the book data, the Fixed Capital Flows and Stocks (FCFS) data on gross investment are scaled down by the ratio of "book" investment to "FCFS" investment for years when there is some overlap.

19. This is the same sort of adjustment performed in Bélanger and McIlveen (1980) and Tarasofsky et al. (1981).

and depletion will be charged at full annual rates. In the year of retirement, one-half of one year's worth of depreciation/depletion is again declared, since at mid-year the capital in question is retired from the corporate balance sheet. In the current year, however, total depreciation/ depletion declared will reflect not only capital acquired in the current year, but also capital acquired in previous years. The "memory" of previous gross investment in current depreciation/depletion will extend back in time to a point dictated by the economic service life of capital.

Under historical cost depreciation, capital acquired before the current year is valued in terms of the price that prevailed in the year of acquisition. Under replacement cost depreciation, all capital is valued in terms of the current price level. If the "historical" price of investment goods acquired in year i is $PI_i$, and the "current" price is $PI_t$, then historical cost depreciation is given by

$$DEPH = \frac{1}{19}(IG_t \cdot PI_t/2) + \sum_{i=t-18}^{i=t-1} \frac{1}{19}(IG_i \cdot PI_i) + \frac{1}{19}(IG_{t-19} \cdot PI_{t-19}/2)$$

and replacement cost depreciation by

$$DEPR = \frac{1}{19}(IG_t \cdot PI_t/2) + \sum_{i=t-18}^{i=t-1} \frac{1}{19}(IG_i \cdot PI_t) + \frac{1}{19}(IG_{t-19} \cdot PI_t/2).$$

The difference between DEPR and DEPH arises from the differing valuation of real gross investment; in DEPR, all investment is valued in terms of the current replacement price of capital, $PI_t$. The ratio DEPR/DEPH used in adjusting book depreciation/depletion thus depends positively upon the ratio of $PI_t$ to an average of historical prices, $PI_i$. It will rise

with the inflation rate. It will also be larger, the longer the service life of capital, and the lower the level of current relative to past investment, since these imply a greater contribution of "cheaper" old investment to the current capital stock valued at historical prices.

In Table 1, the value of DEPR/DEPH is shown for the years 1966-80. DEPR/DEPH has clearly increased over the sample, rising significantly in 1974 and 1975, years in which there was a marked acceleration of inflation, as measured by the change in the natural logarithm of the price of investment goods, PI (shown in Table 2 as $\pi^k$).

The ratio DEPR/DEPH is used to revalue the book value of depreciation/depletion. DEPR is not simply substituted for the book value of depreciation/depletion directly, because the two sources of data differ in certain respects. The CFS data are culled from corporate accounting statements, while the Fixed Capital Flows and Stocks data are based on value-added enterprise data. The implicit service life used in the latter is about 26 years, and investment is defined to exclude land acquisition costs, although they are included in the definition of depletable assets which appear in the CFS data.[20]

The inflation adjustment for depreciable/depletable assets thus requires that we subtract

$$DEP = \left(\frac{DEPR}{DEPH} - 1\right) \cdot (\text{CFS book value of depreciation and depletion})$$

from reported profits.[21] Some indication as to the relative magnitude of the accounting distortion is provided in Table 3, column 1, which shows the ratio of DEP to pre-tax book profits. Clearly, the size of the distortion has increased dramatically.

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20. The average ratio of DEPH to book depreciation and depletion is about 56 per cent for 1966-80. This ratio also tends to fall over the period, from about 61 per cent in 1966 to 48 per cent in 1980.

21. This adjustment is appropriate even if firms fail to continuously replace depreciated/depleted capital, so that the funds "set aside" for replacement purposes in period t are, in real terms, insufficient to fully replace the new capital purchased in period t+j. This is because these replacement funds, until used, will be "atored" either in the form of financial assets, inventories or land, for which independent adjustments are made. This is the issue of so-called "backlog depreciation".

Table 1

**RATIO OF REPLACEMENT TO HISTORICAL COST DEPRECIATION AND DEPLETION**

| | DEPR/DEPH |
|---|---|
| 1966 | 1.24 |
| 1967 | 1.22 |
| 1968 | 1.18 |
| 1969 | 1.21 |
| 1970 | 1.23 |
| 1971 | 1.26 |
| 1972 | 1.27 |
| 1973 | 1.31 |
| 1974 | 1.43 |
| 1975 | 1.54 |
| 1976 | 1.57 |
| 1977 | 1.62 |
| 1978 | 1.68 |
| 1979 | 1.73 |
| 1980 | 1.76 |

Table 2

**INFLATION RATES (%)**

| | Gross Expenditures ($\pi^a$) | Investment Goods ($\pi^k$) | Business Inventories ($\pi^l$) |
|---|---|---|---|
| 1966 | 4.2 | 4.5 | 2.5 |
| 1967 | 3.7 | 1.9 | 2.2 |
| 1968 | 3.4 | 0.5 | 1.7 |
| 1969 | 4.5 | 4.6 | 2.7 |
| 1970 | 4.4 | 4.5 | 2.0 |
| 1971 | 3.5 | 6.3 | 2.8 |
| 1972 | 4.7 | 4.4 | 3.9 |
| 1973 | 7.6 | 6.7 | 7.9 |
| 1974 | 12.6 | 13.5 | 14.0 |
| 1975 | 11.3 | 12.0 | 11.1 |
| 1976 | 8.3 | 7.7 | 5.9 |
| 1977 | 7.8 | 8.5 | 7.8 |
| 1978 | 7.4 | 8.6 | 8.8 |
| 1979 | 8.7 | 9.9 | 12.5 |
| 1980 | 10.2 | 8.9 | 13.2 |

Table 3

**INFLATION-ACCOUNTING ADJUSTMENTS**
as a percentage of pre-tax corporate profits

| | (1) Depreciation/ Depletion Adjustment | (2) Inventory Valuation Adjustment | (3) Interest Income Adjustment | (4) Liquid Capital Adjustment | (5) Net Inflation Adjustment |
|---|---|---|---|---|---|
| 1966 | 10.1 | 4.5 | 15.5 | 13.2 | 12.3 |
| 1967 | 9.7 | 4.5 | 18.8 | 13.7 | 9.2 |
| 1968 | 7.4 | 3.9 | 15.9 | 11.6 | 7.0 |
| 1969 | 8.5 | 6.0 | 21.9 | 16.0 | 8.5 |
| 1970 | 11.5 | 2.4 | 28.0 | 20.0 | 5.9 |
| 1971 | 11.9 | 7.0 | 15.9 | 9.6 | 12.6 |
| 1972 | 13.1 | 11.0 | 17.5 | 7.8 | 14.3 |
| 1973 | 11.5 | 17.1 | 22.9 | 10.3 | 16.1 |
| 1974 | 13.4 | 22.6 | 31.5 | 12.9 | 17.5 |
| 1975 | 19.4 | 17.0 | 34.9 | 12.3 | 13.9 |
| 1976 | 22.7 | 12.3 | 29.6 | 10.3 | 15.6 |
| 1977 | 26.7 | 19.6 | 30.3 | 10.9 | 26.9 |
| 1978 | 25.1 | 20.8 | 25.9 | 9.7 | 29.8 |
| 1979 | 22.2 | 22.5 | 25.1 | 9.5 | 29.1 |
| 1980 | 23.5 | 20.3 | 29.0 | 11.4 | 26.3 |

### 3.1.2 Adjustment for Inventories

For taxation purposes, corporations must employ the first-in first-out (FIFO) method of inventory accounting. This requires that goods withdrawn from inventories for production or sale be expensed in the same order that they were produced or acquired. The costs of using up inventories that may be charged against revenues must correspond to the original cost of production or acquisition incurred. If the cost of replacing goods withdrawn from inventories exceeds the historical production or acquisition cost, there results an illusory capital gain that is taxable as regular income. In terms of the capital maintenance definition of income, this difference should be excluded from the taxable income base, because it represents an expense that must be incurred if the real stock of inventories is to be replenished. Failure to treat inventory capital gains in this fashion may have inflated the real tax burden. However, since 1977 corporations have been allowed a tax credit equal to 3 per cent of the book value of beginning-of-period inventories, and this has provided some measure of tax relief.

In Canada, corporations must employ FIFO accounting for tax purposes. Although they may employ alternative accounting methods on their books, FIFO methods are the most widely practised, and in this study it is assumed that this practice is exclusive.[22]

In the National Income Accounts, illusory capital gains resulting from historical cost inventory accounting are reflected in the "Inventory Valuation Adjustment". This is defined as the annual change in the book value of inventories held by the non-farm business sector, less the physical change in inventories valued at replacement prices. This

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22. According to a survey conducted by the Canadian Institute of Chartered Accountants, published in Financial Reporting in Canada (1980), 46 per cent of 264 firms aurveyed used FIFO methods, 32 per cent used average cost methods (which approximate FIFO accounting), 6 per cent used last-in-first-out (LIFO) and 16 per cent used other methods. In Canada, firms must employ FIFO for tax purposes, but may choose other methods for book accounting. In the U.S. firms may expense inventories by either the FIFO or LIFO method for tax purposes, but must then employ the same method for book accounting. Under LIFO accounting, goods withdrawn from inventories are expensed in the order that they were most recently acquired or produced. Goods remaining in inventories are, therefore, assumed to be of an earlier vintage, and if stocks should be run down for some reason, the capital gains from selling off these "cheap" goods may be substantial. This may partly explain why conversion to LIFO in the U.S. has been less than complete.

adjustment is subtracted from business income in the National Income Accounts because inventory capital gains do not represent production of current goods and services. Because the non-farm business sector includes unincorporated businesses and government Crown corporations, it is necessary to scale down the national accounts adjustment to obtain a measure of inventory capital gains consistent with our corporate universe. These capital gains are defined as

$$IVA = IVAGNP \cdot \frac{INVC}{INVB}$$

where IVAGNP = the inventory valuation adjustment made to income in the GNP accounts
INVC = the book value of non-government corporate inventories obtained from the CFS data
INVB = the book value of non-farm business inventories used in calculating IVAGNP

and IVA is subtracted from book profits.[23] Annual data for IVAGNP and the book value of non-farm business inventories were obtained from the National Accounts division at Statistics Canada.

Some indication as to the real burden of the inventory accounting distortion is provided in Table 3, column 2, which shows the ratio of IVA to total pre-tax book profits. This ratio varies considerably over the sample, reflecting movements in the price of inventories implicit in IVAGNP, but does, in general, exhibit an upward trend (see Appendix II).

### 3.1.3 Adjustment for Interest-Bearing Financial Assets

Under present accounting rules, corporations claim total nominal interest earned on their financial assets as income, and total nominal

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23. Sometimes it is argued that no adjustment to corporate profits to account for inventory appreciation is required, since firms are already compensated by the tax deduction allowed on the interest expense they incur in financing their inventory. However, this confuses two issues that are conceptually distinct. On the one hand, firms are afforded a tax deduction with respect to their interest expenses. The corporate tax liability will be affected by this deduction, and numerous others. The deduction depends upon the level of outstanding corporate borrowings; it does not depend upon the size of inventory stocks. On the other hand, under the capital maintenance definition of income reported profits must be reduced to reflect the outlays needed to maintain the real stock of inventories. This represents an adjustment to pre-tax income that would have to be made even if inventories were completely equity financed.

interest owed on their outstanding debt as an expense. Under the capital maintenance definition of income, these gross interest flows should be adjusted to reflect the impact of inflation on the real principal of interest-bearing assets and liabilities, the nominal principal of which is fixed.

Thus, the reported interest income of corporations is reduced by $A \cdot \pi^a$, where A denotes the nominal face value of interest-bearing financial assets held by corporations as recorded on the books, and $\pi^a$ is the inflation rate. This amount must be set aside each period in order to maintain the real principal of financial assets. Similarly, the reported interest expense of corporations is too high in the amount $L \cdot \pi^a$, where L denotes the book value of interest-bearing corporate debt. The reported expense is too high because corporations gain each period by $L \cdot \pi^a$, the decline in the real principal of debt.

On balance, reported profits must be augmented by

$$(L - A) \cdot \pi^a.$$

We emphasize that this adjustment to corporate profits does not complete the story about interest flows. Investment income is defined to include the interest paid on corporate debt as well, and this requires an additional adjustment similar to those just discussed. It will be shown in section 3.2 that the overall adjustment for interest flows is consistent with the notion of balance sheet wealth discussed in section 1.1.

Corporate financial assets and liabilities are defined in terms of the CFS balance sheet data as follows:[24]

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24. The same sort of adjustment is performed in Jenkins (1977b), Bélanger and McIlveen (1980a,b) and Tarasofsky et al. (1981). "Marketable securities" and "Long-term investments" included in 'A' include intercorporate shareholdings as well as bonds and debentures, treasury bills, term deposits and the like. One would like to exclude such shareholdings from the present adjustment, not only because of the double-counting problems alluded to earlier, but also because equity does not require the same sort of adjustment as fixed-principal debt, since its price is free to fluctuate. Unfortunately, no finer breakdown of these categories is possible.

A = Marketable securities
+ Loans receivable (short-term)
+ Mortgages
+ Loans and notes receivable
+ Long-term investments
+ Advances to affiliates

L = Bank loans (short-term)
+ Short-term loans
+ Long-term debt due within a year
+ Due shareholders or affiliates
+ Mortgage debt
+ Bonds and debentures
+ Long-term bank loans.

"The" inflation rate that is appropriate in this case should reflect some general index of purchasing power, since the inflation premium in nominal interest rates serves to preserve the purchasing power of a lender's principal. The inflation rate, $\pi^a$, is thus defined as the change in the natural logarithm of the implicit GNE deflator, adjusted to include imports and exclude exports, and is shown in column 2 of Table 2 for the 1966-80 period.

For ease of exposition, the preceding discussion has assumed that corporate financial accounting occurs on a continuous basis. In fact, A and L are based on year-end balance sheet data, although recorded interest income and expenses reflect a flow cumulated over the entire year. It is therefore assumed that interest income earned in a year represents a return to the average of the beginning- and end-of-period stock of assets. Denoting the average stock of financial assets and liabilities as $\bar{A}$ and $\bar{L}$, respectively, the inflation adjustment consists of adding

$$DEBT = (\bar{L} - \bar{A}) \cdot \pi^a$$

back to book profits.

The ratio of DEBT to pre-tax book profits for the 1966-80 period is shown in Table 3, column 3. The distortion is of a substantial magnitude, and although there is no evident trend for the post-1972 period, the relative size of the distortion has increased over levels observed in earlier years.

### 3.1.4 Adjustment for Net Non-Interest-Bearing Financial Assets

Under the capital maintenance definition of income, reported income must be reduced by the funds that have to be set aside each period in order to maintain real investor wealth. This wealth is defined to include non-interest-bearing financial assets (net of liabilities), the real value of which declines with inflation. Reported profits are therefore too high in the amount

$$LIQK = (\overline{AA} - \overline{LL}) \cdot \pi^a$$

where $(\overline{AA} - \overline{LL})$ denotes the average stock of non-interest-bearing net financial assets held for the year.[25] $\overline{AA}$ denotes the average annual stock of non-interest-bearing financial assets, defined as

$\overline{AA}$ = Cash
+ Accounts receivable
+ Due from affiliates
+ Deposits and advances
+ Other current assets

and $\overline{LL}$ the total of such liabilities:

$\overline{LL}$ = Accounts payable
+ Advances and prepayments
+ Due to affiliates
+ Other current liabilities.

The ratio of LIQK to pre-tax book profits is shown in Table 3, column 4, and there appears to be no discernable trend over the sample, in contrast to what is observed of the other adjustments to reported profits. This may reflect the more efficient management of cash balances, allowing corporations to reduce their reserve of non-interest-bearing assets held for transactions purposes.

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25. This sort of adjustment has been performed in previous studies [(Jenkins (1977a,b), Bélanger and McIlveen (1980a,b) Tarasofsky et al. (1981)].

### 3.1.5 Net Inflation-Accounting Adjustment

The total adjustment to corporate book profits reflects a separate accounting of each item in the corporate balance sheet with the exception of land. No adjustment is made for land because it is not "consumed" like depreciable capital or inventories, although income arising from the real appreciation of land is considered later. The net inflation adjustment thus consists of subtracting

$$IA = DEP + IVA - DEBT + LIQK$$

from book profits, where DEP, IVA, DEBT and LIQK are as defined previously. The ratio of IA to pre-tax book profits is shown in column 5 of Table 3. Although the corporate sector has been a net debtor over the sample period, and thus DEBT has been consistently positive, on balance reported profits have conveyed an exaggerated picture of true profitability. Moreover, the reporting error has grown considerably more pronounced over the sample.

## 3.2 Interest Income

Under the capital maintenance definition of income, the nominal interest income of debt-holders must be reduced by the funds they have to set aside to maintain the real principal of the debt claims they hold, the nominal principal of which is fixed. Inflation-adjusted interest income is thus defined as total nominal interest paid out by corporations, less $L \cdot \pi^a$, where L is the book value of outstanding debt, and $\pi^a$ is the inflation rate.

The overall adjustment for interest income consists of increasing reported corporate profits by $(L - A) \cdot \pi^a$, and reducing the nominal interest income of debt-holders by $L \cdot \pi^a$. The net adjustment reduces the total unadjusted income of investors by $A \cdot \pi^a$, where A is the book value of interest-bearing financial assets held by the corporate sector.

This result is consistent with the balance sheet characterization of investor wealth introduced in section 1.1. This wealth is defined to include the book value of interest-bearing financial assets held by

corporations. Since the nominal principal of such assets is fixed, the real principal (and thus investor wealth) will fall by $A \cdot \pi^a$ each period. This amount must therefore be set aside to keep real wealth intact. The real principal of debt-holders also declines each period for the same reason, by $L \cdot \pi^a$. This does not enter the net adjustment to income, however, because it represents only a transfer of wealth to equity-holders, and does not affect the combined wealth of all investors.

The nominal interest income of debt-holders is denoted by

$$INT = \bar{L} \cdot i$$

where i is the average rate of return on debt, $INT/\bar{L}$, and $\bar{L}$ is the average value of corporate debt outstanding for the year. INT is defined as the sum of all "bond", "mortgage", and "other" interest paid by corporations. Inflation-adjusted interest income is denoted by

$$INTR = INT - \bar{L} \cdot \pi^a = \bar{L} \cdot (i - \pi^a).$$

INTR is thus the ex post real interest return on debt. In Table 4 the average nominal (i) and real ($i-\pi^a$) interest returns on corporate debt are compared. Although i grows steadily over the sample, movements in ($i-\pi^a$) are (negatively) correlated with the actual inflation rate, $\pi^a$. In general the real rate is low, exceeding 1 per cent in only three of fifteen years. Following the increase in $\pi^a$ from 3.5 per cent in 1971 to 4.6 per cent the next year, the real rate becomes negative, falling even more over the next two years as inflation reaches a high of 12.6 per cent. Evidently the average term to maturity of outstanding corporate debt during this period is sufficiently long that the real rate follows the nominal rate on new issues only with a lag, as outstanding issues are gradually retired.

Table 4

**THE AVERAGE INTEREST RETURN ON DEBT (%)**

| | Real Interest Return ($i-\pi^a$) | Nominal Interest Return ($i$) |
|---|---|---|
| 1966 | 0.1 | 4.2 |
| 1967 | 0.6 | 4.2 |
| 1968 | 1.2 | 4.6 |
| 1969 | 0.7 | 5.2 |
| 1970 | 1.4 | 5.7 |
| 1971 | 1.6 | 5.1 |
| 1972 | -0.1 | 4.6 |
| 1973 | -2.5 | 5.2 |
| 1974 | -5.5 | 7.2 |
| 1975 | -4.4 | 6.9 |
| 1976 | -1.2 | 7.1 |
| 1977 | -0.9 | 6.9 |
| 1978 | -0.2 | 7.2 |
| 1979 | 0.1 | 8.8 |
| 1980 | 0.2 | 10.4 |

### 3.3 Capital Gains

Total accrued capital gains can be broken down into two components: 1) Internal Capital Gains (KGI), which reflect the acquisition of additional capital financed through retained earnings, and 2) External Capital Gains (KGE), which reflect the nominal appreciation of the existing net capital stock as a result of general price inflation. That this is so can be seen by considering the following argument. Let PB and QB denote the price and quantity of all corporate "borrowings", defined to include both debt and equity financing. Similarly, let PK and QK denote the price and quantity of the corporate capital stock. Our assumption that the market and replacement value of capital are equal implies

$$PB \cdot QB = PK \cdot QK.$$

When the discrete differential of each side of the equality is taken, it follows that

$$\Delta PB \cdot \overline{QB} + \Delta QB \cdot \overline{PB} = \Delta PK \cdot \overline{QK} + \Delta QK \cdot \overline{PK}$$

where $\overline{QB}$ denotes the average of the beginning- and end-of-period values of QB, and similarly for PB, PK and QK. However, $\Delta PB \cdot \overline{QB}$ is just the value of total accrued capital gains, KGA.[26] Rearrangement of the expression yields

$$\begin{aligned} KGA &= \Delta QK \cdot \overline{PK} - \Delta QB \cdot \overline{PB} + \Delta PK \cdot \overline{QK} \\ &= [\Delta QK \cdot \overline{PK} - \Delta QB \cdot \overline{PB}] + \frac{\Delta PK}{\overline{PK}} \cdot \overline{PK} \cdot \overline{QK} \\ &= KGI + KGE \end{aligned}$$

where $\Delta PK/\overline{PK}$ approximates the rate of inflation of the price of capital, and $[\Delta QK \cdot \overline{PK} - \Delta QB \cdot \overline{PB}]$ approximates the value of retained earnings, since any increase in the capital stock must be financed either internally or externally, and $\Delta QB \cdot \overline{PB}$ represents the value of external borrowings. Accrued capital gains on debt and equity held in the current period thus result from any appreciation of the nominal net capital stock over and above what is financed through contemporaneous outside borrowing. Such an appreciation may reflect the purchase of new capital at currently prevailing prices, or an inflation of the price of existing capital. In either case, an increase in the replacement value of the net capital stock will cause the market value of financial claims on the stock to rise commensurately.

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26. The discrete differential as shown is exactly defined, but each of the four elements in the equation is only an approximation to the true value of the variable it represents. However, if the changes in PK, QK, PB, QB are more or less linear, the approximation will be a good one.

### 3.3.1 Calculation of Internal Capital Gains (KGI)

Internal capital gains that accrue in a given period are equal to the value of retained earnings. Because retained earnings do not appear explicitly in the CFS data, they are calculated residually, as the difference between inflation-adjusted after-tax corporate profits, and total cash dividend payouts.

After-tax profits are defined as the sum of after-tax book profits, plus "deferred taxes". Deferred taxes represent an estimate made by a firm of the additional taxes it expects to pay in the future as a result of accelerated tax depreciation, which allows capital goods to be written off at a faster rate for tax than for book purposes. Capital costs declared for tax purposes will exceed actual costs incurred in the initial stages of an asset's economic life, but the reverse will eventually be true as the asset matures. The effect is to reduce the present value of the total tax liability by shifting taxes ahead, but the level of the future tax liability will be greater than would be true in the absence of accelerated depreciation. Since deferred taxes do not represent a drain on current cash flows, they are added back to book profits.

The CFS data differentiate between current and deferred taxes for the 1971-80 period; for earlier years it is assumed that the ratio of deferred to total taxes is as observed for 1971.[27]

### 3.3.2 Calculation of External Capital Gains (KGE)

External capital gains (KGE) are derived as the product of the average net capital stock valued at current replacement prices ($\overline{PK} \cdot \overline{QK}$), times the rate of inflation of the price of capital ($\Delta PK/\overline{PK}$).

The replacement value of capital is derived as follows. "Capital" is defined to include all assets that appear on the corporate sector's books. These may in turn be arranged under four general headings: financial assets, inventories, depreciable/depletable capital, and land.

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27. The ratio observed for 1971 is 0.119. This value is chosen in preference to an average value based on later years because the introduction of more generous accelerated writeoffs after 1971 probably resulted in tax deferrals becoming quantitatively more significant than they were over the 1966-70 period.

The replacement value of financial assets is just the value of principal recorded on the books. The replacement value of inventories will, under FIFO accounting, and assuming a relatively high turnover, be approximately equal to their book value.

The replacement value of net depreciable/depletable capital is derived in much the same way as replacement cost depreciation.[28] Given the investment series IG and an assumed service life of 19 years, a series for the net capital stock valued in terms of both historical and replacement prices is calculated by the perpetual inventory method. Assuming as before that investment occurs at mid-year, and that economic depreciation is straight-line, the historical value of the net capital stock is given by

$$KNH_t = \sum_{i=t-19+1}^{i=t} IG_i \cdot PI_i \cdot (19 - t + i - 0.5)/19$$

where $PI_i$ is the price of investment goods in period i. Similarly, the replacement value of the net capital stock is given by

$$KNR_t = \sum_{i=t-19+1}^{i=t} IG_i \cdot PI_t \cdot (19 - t + i - 0.5)/19$$

where $PI_t$ is the price of investment goods in the current period, t. Thus, the net capital stock in any period serves as a cumulative record of past investment undertaken, with the "memory" of the stock extending back to a point that reflects the economic service life of capital.

The replacement value of net depreciable/depletable capital is defined as the product of (KNR/KNH) and the book value of net depreciable/depletable capital in the CFS balance sheet data. The series (KNR/KNH) is shown in Table 5. The ratio has clearly tended to rise over the sample period. By construction, KNR/KNH depends positively upon the inflation rate, and indeed $\pi^k$, the rate of inflation of PI, has risen over the

28. The same perpetual inventory formulation of the capital stock is used in Bélanger and McIlveen (1980a,b) and in Tarasofsky et al. (1981).

sample (Table 2).[29] KNR/KNH also depends positively upon the relative contribution made to the present capital stock by "old" as opposed to "new" investment. Thus, given a constant $\pi^k$, KNR/KNH is higher, the longer is the service life of capital and the lower is the rate of current investment. All these factors contribute in greater or lesser measure to observed movements in KNR/KNH.

Finally, the replacement value of land is crudely approximated by the product of (KNR/KNH) and its book value. It would be preferable to perform an exercise similar to that undertaken with respect to depreciable/depletable capital, but unfortunately no satisfactory price or investment series for land are available.[30]

Table 5

**RATIO OF REPLACEMENT VALUE TO HISTORICAL VALUE OF THE NET CAPITAL STOCK**

| | KNR/KNH |
|---|---|
| 1966 | 1.15 |
| 1967 | 1.13 |
| 1968 | 1.11 |
| 1969 | 1.13 |
| 1970 | 1.14 |
| 1971 | 1.17 |
| 1972 | 1.17 |
| 1973 | 1.20 |
| 1974 | 1.27 |
| 1975 | 1.37 |
| 1976 | 1.38 |
| 1977 | 1.41 |
| 1978 | 1.44 |
| 1979 | 1.46 |
| 1980 | 1.45 |

29. For expositional convenience we refer to all of $\pi^a$, $\pi^k$ and $\pi^i$ as "inflation" rates, although strictly speaking only $\pi^a$ represents "the" inflation rate, since the price index on which it is based is the most general in scope. $\pi^k$ and $\pi^i$ reflect relative price movements, rather than movements in the general price level. This distinction becomes important when inflation-adjusted capital gains income is defined later.

30. Although the present treatment of land is somewhat crude, any reaulting distortions may not be too severe since in current value terms land accounted for only 3 per cent of all assets. A similar approach is taken in Bélanger and McIlveen (1980a,b), where the book value of land is grossed up by the ratio of the current dollar to the historical dollar value of "structures" (building construction).

The replacement value of the total capital stock, PK·QK, is thus defined as the sum of the separate replacement values of financial assets, inventories, depreciable/depletable capital and land. In terms of calculating external capital gains, KGE, however, it is recognized that different kinds of capital may appreciate at different rates. Indeed, there will be no such appreciation of financial assets, the principal of which is fixed in nominal terms. This leaves inventories, depreciable/depletable capital and land. Inventories are assumed to appreciate at the rate $\pi^i$, defined as the difference in the natural logarithm of the price deflator for non-farm business inventories used in RDXF converted to an annual series. Depreciable/depletable capital and land are assumed to appreciate at the rate $\pi^k$, derived previously. Both $\pi^i$ and $\pi^k$ are shown in Table 2. External capital gains are thus defined as [31]

$$KGE = \overline{IR} \cdot \pi^i + \overline{KR} \cdot \pi^k$$

where $\overline{IR}$ = the average stock of inventories at current replacement prices

$\overline{KR}$ = the average stock of depreciable/depletable capital and land at current replacement prices

Under current tax rules, such gains are completely taxable. In terms of the capital maintenance view of income, however, external capital gains represent an increase in real wealth only to the extent that such capital appreciates at a faster rate than the general index of an investor's purchasing power, as reflected in $\pi^a$. If the prices of all goods inflated at the same rate, thus precluding any relative price changes, then external capital gains would not involve any increase in investor wealth, since in real terms the value of capital "owned" by investors would be

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31. Equivalently, we could have approximated the nominal appreciation of inventories by IVA, the inventory valuation adjustment derived from the National Income Accounts and discussed in section 3.1.2. We consider IVA to be the superior measure of inventory appreciation, since unlike the measure used in constructing KGE, it takes explicit account of those changes in the nominal value of inventories attributable to changes in real stocks alone. However, to calculate the "real" part of external capital gains, we must know the rate at which the price of inventories inflates, and this information is only implicitly contained in IVA. The two measures of inventory appreciation are quite similar: over 1966-80, the average ratio of IVA to the measure of inventory capital gains used in KGE is 1.1.

unchanged. Inflation-adjusted income is thus defined to include only the "real" part of external capital gains, defined as [32]

$$KGER = \overline{IR} \cdot (\pi^i - \pi^a) + \overline{KR} \cdot (\pi^k - \pi^a)$$

### 3.4 Inflation-Adjusted Corporate Income Defined

The pre-tax income of investors is defined in the broadest sense to include all returns that accrue to debt and equity: dividends, interest and capital gains (internal and external). Under the capital maintenance view of income, these are defined so that only net accretions of wealth to investors are counted as income.

Dividends and internal capital gains (equal to corporate retentions) arise out of inflation-adjusted corporate profits, once the corporate income tax has been paid. Interest income is defined as the real (ex post) interest return to debt: nominal interest flows less the loss in real principal attributable to inflation. External capital gains reflect the inflationary appreciation of depreciable/depletable capital and land, and inventories. However, only the "real" part of such gains, reflecting an increase in the relative price of capital, is considered income.

The total inflation-adjusted pre-tax income of investors is therefore equal to

$$YTOTB = (PBK + PNR - IA) + INTR + KGER$$

where
- PBK = unadjusted pre-tax book profits
- PNR = non-recurring items [33]
- IA = the total inflation adjustment made for depreciation, inventory valuation, etc.
- INTR = the ex post real interest return to debt-holders
- KGER = the "real" part of external capital gains.

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32. Of course there are also negative "real" external capital gains that accrue on fixed-principal financial assets, equal to the negative of the inflation rate, $\pi^a$. However, the deduction from gross income that this necessitates is already made in the adjustments to corporate profits, DEBT and LIQK.

33. Non-recurring items represent capital gains realized on the disposition of corporate properties. They may not represent revenues arising from the "normal" operations of firms, but they do contribute to cash flows and therefore to dividends and retentions.

Note that YTOTB represents an income flow gross of all taxes, including both the corporate income tax and those taxes levied on dividend, interest and capital gains income directly. Once inflation-adjusted corporate profits, PBK + PNR - IA, are adjusted downwards by the corporate income tax, what remains is either paid out as dividends, or reinvested, which results in internal capital gains.

## 4 AVERAGE TAX RATES ON DIVIDEND, INTEREST AND CAPITAL GAINS INCOME

A major premise of this paper is that the allocation of private savings to the corporate sector will be governed by the total after-tax rate of return to those who exercise a financial claim on the sector. Consideration must be given not only to income earned and taxes payable by the corporation as defined for tax and legal purposes, but also to the additional income and taxes earned and paid by investors that result directly from the ownership of such financial claims. The "additional" income consists of dividends, interest, and capital gains, and a separate average tax rate is calculated for each.

Each tax rate is a weighted average of separate rates for various sectors in the economy. These sectors are defined according to the breakdown of economic activity featured in the Statistics Canada financial flow accounts, and are differentiated on the basis of the particular tax treatment accorded each kind of investment income. The separate rates are weighted by the relative amounts held by each sector of those financial claims presumed to generate dividend, interest, or capital gains income. In sections 4.1 to 4.3, the details of the tax rate construction are discussed in depth.

### 4.1 The Aggregate Tax Rate on Dividends

To calculate the average tax rate for dividend income, the economy is partitioned as follows: 1) persons and unincorporated businesses, 2) corporations,[34] 3) governments, pension and social security funds, and 4)

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34. "Corporations" are defined in terms of the sector breakdown featured in Statistics Canada's Financial Flow Accounts. These include "nonfinancial private corporations", "banks and near-banks", "insurance companies", and "other private financial institutions". We also define corporations to include "nonfinancial government enterprises" and "public financial institutions". The former includes proprietary Crown corporations, which are treated like private sector corporations for tax purposes, as well as non-taxable government enterprises, but no adjustment to remove these last is possible given the available data. "Public financial institutions" consists almost exclusively of proprietary Crown corporations such as the Canada Mortgage and Housing Corporation and the Export Development Corporation, which together account for about 75 per cent of total assets owned by such institutions.

foreigners. Dividends received by corporations are non-taxable,[35] as are dividends accruing to pension and social security funds, and all levels of government. Foreigners are assumed to be taxed at the overall average rate.

For persons and unincorporated businesses we must consider the particulars of the federal-provincial tax collection arrangements that have been in force over the years. For the 1966-80 period, provincial tax levies on personal income have been collected by the federal government on behalf of all provinces except Quebec. For all other provinces, the provincial tax liability is calculated as a prescribed percentage of the "basic federal tax". This includes the taxable portion of dividend, interest and capital gains income. Over the years 1966-71, the provinces were afforded increasing leverage with regard to personal tax collections, in the form of an abatement of the basic federal tax granted to individual taxpayers. This abatement was also expressed as a fixed percentage of the basic federal tax, equal for all provinces except Quebec, where it was larger. In 1972 the abatement system was rescinded, and replaced by a lower federal marginal rate schedule, enabling the provinces to maintain total tax collections at former levels without a major revision to provincial rates.

In addition to the basic tax outlined above, there is the $1000 investment income deduction, afforded residents who earn investment income from Canadian sources, under which the first $1000 of qualifying investment income is tax exempt. Introduced in 1974 to shield Canadian interest income alone, the deduction was subsequently extended in 1975 to include Canadian dividend income (grossed up by a prescribed percentage), and again in 1977 to include one-half of realized capital gains (gross of losses) on Canadian securities.

The average tax rate on dividends for persons and unincorporated businesses is defined as the total tax liable on dividend income accruing

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35. One qualification to this concerns "term preferred shares", first issued in mid-1977 and for which the dividend payout rate is determined by a fixed formula. These dividends are tax exempt, except for shares issued after November 16, 1978, the dividend return to which is fully taxable at regular rates. These are now considerably less attractive to corporations as a source of financing, and it is unlikely that they present a major problem in terms of our treatment of intercorporate dividend income.

to persons and unincorporated businesses, divided by total dividend income earned by both taxable and non-taxable individuals. Information on the latter is obtained directly from Revenue Canada's, Taxation Statistics, which summarizes the data contained in filed tax returns by income class. From these data it is not possible to identify precisely the "total" tax liable on dividend income, since it is not possible to distinguish taxes liable on dividend income from those liable on other forms of remuneration. As a practical compromise, we assume that the "total" tax on dividends can be approximated by the product of the appropriate marginal tax rate and total dividend income.

To calculate the tax liable on dividend income we partition the sector into taxable and non-taxable individuals. No tax is paid by the latter group. The former group is divided into nine classes, based on gross pre-tax income: $1 - 4,999; $5,000 - 9,999; $10,000 - 14,999; $15,000 - 19,999; $20,000 - 24,999; $25,000 - 49,999; $50,000 - 99,999; $100,000 - 199,999; and $200,000 and over. A separate tax liability is calculated for each class. The total tax liability for the sector is defined as the sum of the taxes payable by all individuals, both taxable and non-taxable.

The tax on dividends reflects various tax provisions that have existed over the years. For the 1966-71 period, individuals were granted a flat 20 per cent deduction in respect of gross dividends earned. Since then the procedure has become more complicated. Dividend income is first grossed up by a prescribed percentage (denoted as RDGU •100). This grossed-up figure enters the taxable income base and is subject to the statutory marginal federal tax rate. The total tax liability is then reduced by a dividend tax credit, equal to the product of grossed-up dividends and the rate of dividend tax credit (RDTC). The resulting "basic federal tax" forms the base against which the provincial tax rate is applied. The values for RDGU and RDTC are the same for each taxable income class, and are shown in Table 6.

Table 6

**RATE OF DIVIDEND TAX CREDIT (RDTC) AND RATE OF DIVIDEND GROSS-UP (RDGU) (%)**

| | RDTC | RDGU |
|---|---|---|
| 1966 | 20.0 | 0.0 |
| 1967 | 20.0 | 0.0 |
| 1968 | 20.0 | 0.0 |
| 1969 | 20.0 | 0.0 |
| 1970 | 20.0 | 0.0 |
| 1971 | 20.0 | 0.0 |
| 1972 | 20.0 | 33.0 |
| 1973 | 20.0 | 33.0 |
| 1974 | 20.0 | 33.0 |
| 1975 | 20.0 | 33.0 |
| 1976 | 20.0 | 33.0 |
| 1977 | 18.75 | 33.0 |
| 1978 | 25.0 | 50.0 |
| 1979 | 25.0 | 50.0 |
| 1980 | 25.0 | 50.0 |

To account for the effect of the $1000 investment income deduction on the dividend tax rate during 1975-80, gross dividend income received by taxable income class i is scaled down by the following ratio:

$$\beta_i = \frac{INV_i - DED_i}{INV_i}$$

where $INV_i$ = total investment income earned by class i that qualifies for the $1000 investment income deduction

$DED_i$ = total qualifying investment income shielded by the $1000 investment income deduction.

Since a maximum of $1000 of qualifying investment income is shielded by the deduction, $\beta_i$ will be close to unity for individuals situated in upper income classes who traditionally receive the largest share of investment income, and less than unity for individuals in lower income

classes, for whom the effect of the deduction on average tax rates is more pronounced.[36]

Next, to each income class i we assign the federal statutory marginal tax rate appropriate for that class, $t_i$, based on average income earned and as published by the Canadian Tax Foundation in The National Finances. We take account of the provincial tax levy with the variable PROV, an average of provincial tax rates, each weighted by the provincial share of the total Canadian gross domestic product.[37] For the years 1966-71, we construct an average of the various provincial abatement rates, denoted by AB. The marginal tax on dividends earned by class i is then defined as

$$\{(\beta_i \cdot DIV_i)(1-.20) \cdot t_i\} \quad (X_i - AB + PROV) \quad \text{for 1966-71}$$

and

$$\{(\beta_i \cdot DIV)((1+RDGU) \cdot t_i - (1+RDGU) \cdot RDTC)\} \quad (X_i + PROV) \quad \text{for 1972-80}$$

where $X_i$ is a factor reflecting any federal tax surcharges or rebates that may have been in place during a particular tax year; if no such amendment to the basic federal tax existed, then $X_i$ equals unity.

The average tax rate on dividend income earned by persons and unincorporated businesses, TRDIVP, is calculated as the sum of the taxes

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36. I am indebted to John Murray and John Kuazczak for suggesting this adjustment. $INV_i$ includes, when applicable, grossed-up dividends, interest, and one-half of gross capital gains earned on Canadian securities. Because of data limitations, $INV_i$ does not represent an exact measure of investment income that qualifies for the $1000 deduction. Certain kinds of trust and annuity income that also qualify are excluded, although these are of relatively minor importance. Also, only half of all realized capital gains on Canadian securities, and gross of all losses, qualify. $INV_i$ is thus too high to the extent that it includes capital gains on property and real estate, for example, and too low to the extent that capital losses occur. It is assumed that these considerations are more or less offsetting. The $\beta_i$ adjustment also treats all individuals in a given income class identically. In fact, for most classes the average amount claimed by each person is less than the possible $1000 deduction, although the average qualifying investment income earned exceeds $1000. This implies a non-uniform distribution of income within a class. We must therefore assume that $\beta_i$ is a good approximation of the tax relief afforded by the deduction.

37. These weights are based on the data contained in Statistics Canada's Provincial Economic Accounts (SC 13-213). Since the provincial tax in Quebec reflects a different taxable income base than that recognized by the federal government and the other provinces, an effective tax rate for Quebec was estimated. The estimate for 1971-73 was obtained directly from The National Finances. For other years it was assumed that this rate moved in the same proportion as the average rate calculated for all other provinces.

liable on individuals in all nine income classes, divided by the total dividend income of both taxable and non-taxable individuals.[38]

The average tax rate on dividend income for the whole economy, TRDIV, is calculated as a weighted average of TRDIVP and the tax rates for the other sectors, the weights being the proportion of all outstanding corporate stocks held by each sector, as determined from the Statistics Canada financial flows data on year-end outstanding balances.[39] The calculated values for TRDIVP and TRDIV are shown in Table 7, columns 1 and 2.

Movements in TRDIV over the sample largely reflect similar movements in TRDIVP. Except for the last few years, there is a general upward trend in TRDIVP. For the years preceding the introduction of inflation-indexation in 1974, this may in part reflect inflationary drift in the tax schedule. Particularly notable is the large increase in TRDIVP observed in 1972, coinciding with an overhaul of federal-provincial financing arrangements, as a result of which there was a significant broadening of the taxable income base. As well, the 1972 tax changes made realized capital gains taxable for the first time. This may have induced investors situated in relatively high marginal tax brackets, typically the main recipients of capital gains income, to take more income in the form of dividends at the expense of capital gains. Given the construction of TRDIVP, such a substitution would be consistent with an increase in the average tax rate. A series of progressively more generous federal tax rebates, initiated since 1972, may account for the decrease in TRDIVP after 1976, and the decline in TRDIVP in 1975 in part reflects the extension of the $1000 investment income deduction to include grossed-up dividend income. The substantial drop in TRDIVP in 1978 coincides with an increase in both the rate of dividend gross-up (RDGU) and the dividend tax credit (RDTC) (Table 5). Since the marginal tax rate on dividends earned by class i, $(1+RDGU)(t_i-RDTC)-(X_i+PROV)$, will have the same sign as

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38. The Taxation Statistics data do not include information on investment income earned by individuals who did not file a return. Total dividend income may therefore exceed the income declared on filed returns, and the calculated tax rate on dividend income may be too high. The same consideration applies to interest and capital gains income.

39. In the financial flows data, "stocks" are defined to include both common and preferred shares issued by Canadian corporations.

Table 7

**AVERAGE TAX RATES ON INVESTMENT INCOME (%)**
Dividends, Interest and Accrued Capital Gains

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | DIVIDENDS | | INTEREST | | | ACCRUED CAPITAL GAINS | |
| | Persons and Unincorporated Businesses (TRDIVP) | Whole Economy (TRDIV) | Persons and Unincorporated Businesses (TRINTP) | Corporations (RTCA) | Whole Economy (TRINT) | Persons and Unincorporated Businesses (TRKGAP) | Whole Economy (TRKGA) |
| 1966 | 17.5 | 14.1 | 22.2 | 45.5 | 33.0 | 0.0 | 0.0 |
| 1967 | 18.0 | 14.4 | 24.5 | 44.6 | 33.2 | 0.0 | 0.0 |
| 1968 | 18.5 | 14.6 | 27.3 | 46.0 | 35.0 | 0.0 | 0.0 |
| 1969 | 19.0 | 14.7 | 29.1 | 46.3 | 35.9 | 0.0 | 0.0 |
| 1970 | 18.9 | 14.5 | 30.0 | 46.2 | 36.2 | 0.0 | 0.0 |
| 1971 | 17.2 | 12.9 | 26.5 | 44.3 | 33.6 | 0.0 | 0.0 |
| 1972 | 22.5 | 16.7 | 29.8 | 44.4 | 35.2 | 5.6 | 4.4 |
| 1973 | 24.5 | 18.2 | 31.4 | 43.7 | 35.4 | 5.7 | 4.4 |
| 1974 | 24.6 | 18.8 | 20.2 | 42.7 | 30.1 | 5.5 | 4.4 |
| 1975 | 21.0 | 16.1 | 19.9 | 41.4 | 28.9 | 5.2 | 4.1 |
| 1976 | 22.8 | 17.2 | 21.5 | 41.4 | 29.5 | 5.4 | 4.1 |
| 1977 | 21.6 | 16.9 | 22.2 | 41.5 | 29.9 | 4.1 | 3.5 |
| 1978 | 15.4 | 11.5 | 22.7 | 41.9 | 30.4 | 4.7 | 3.9 |
| 1979 | 15.5 | 12.2 | 23.1 | 41.9 | 30.8 | 5.0 | 4.3 |
| 1980 | 15.7 | 12.4 | 25.2 | 43.4 | 32.5 | 5.2 | 4.4 |

($t_i$-RDTC), then the increase in RDTC means that more individuals, on average, faced a negative marginal dividend tax rate than previously, an effect magnified by the increase in RDGU. This would have been consistent with a decline in TRDIVP, a weighted average of marginal tax rates across all classes.

It is interesting to note that TRDIVP has been strictly positive over the sample period. The principal rationale for a dividend tax credit is that it affords an offset to the double taxation of income that occurs when dividends, paid out of after-tax profits, are taxed when received by shareholders. Given the present dividend tax credit, equal to 33 per cent of grossed-up dividends, the marginal tax rate on dividend income received by persons and unincorporated businesses will be zero only if the federal statutory marginal rate, $t_i$, is 33 per cent. Since most dividend income is received by individuals in higher tax brackets, most dividend income does not escape the double tax, even when account is taken of others who face a negative marginal tax rate on dividends.

### 4.2 The Aggregate Tax Rate on Interest

To calculate the average tax rate for interest income, we consider four sectors: 1) persons and unincorporated businesses, 2) corporations, 3) governments, pension and social security funds, and 4) foreigners.

Interest received by governments, pension and social security funds is assumed to be non-taxable, and foreigners are assumed to be taxed on their Canadian investment income at the average rate calculated for the whole economy. Corporations as well as persons and unincorporated businesses are taxed at regular statutory rates. The average tax rate on interest income faced by corporations is defined as an annualized transform of the quarterly RDXF variable RTCA. This variable takes into account the special small business tax rate, and the variation in rates across provinces and industries.[40] The tax rate on interest income

40. Prior to 1972, credit unions and caiasea populaires were non-taxable. Subsequently, they were effectively taxed at the small buainess rate, which ia reflected in the corporate tax rate variable we use. The weighta applied againat the separate aector tax rates in calculating the overall tax rate are adjusted to reflect thia.

earned by persons and unincorporated businesses is constructed along the same lines as the dividend tax rate. As before, the sector is divided into nine income classes, and for each the tax liability is defined as

$$\beta_i \cdot INT \cdot t_i \cdot (X_i - AB + PROV) \quad \text{for 1966-71}$$

and

$$\beta_i \cdot INT_i \cdot t_i \cdot (X_i + PROV) \quad \text{for 1972-80}$$

where $INT_i$ denotes the total of bond, bank and mortgage interest earned by persons and unincorporated businesses, and all other variables are as defined previously.[41] The average tax rate for the sector, TRINTP, is defined as the sum of the taxes liable on interest income earned by all nine income classes, divided by the total of bond, bank and mortgage interest earned by both taxable and non-taxable individuals.

The average tax rate on interest income for the whole economy, TRINT, is calculated as a weighted average of TRINTP and the other sector rates, the weights being the proportion of outstanding interest-bearing corporate claims held by each sector, as determined from the financial flows data. Because the corporate sector is defined in the broadest sense to include financial institutions, interest-bearing claims are defined to include corporate bonds, deposits, loans, mortgages, finance and other short-term paper, and like claims.[42] The weight applied to TRINTP is reduced by an amount reflecting the outstanding value of RRSPs and RHOSPs, the interest return to which is non-taxable.[43] The calculated values for TRINTP, the average corporate tax rate, and TRINT are shown in Table 7, columns 3 through 5.

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41. Bond, bank and mortgage interest income account for the bulk of interest income earned by persons and unincorporated businesses, but there are also certain kinds of trust and annuity income that the Taxation Statiatica data do not allow us to identify exactly.

42. "Deposits" in the financial flows data are defined to include currency, but this accounts for a relatively minor fraction of the total. Bonds are defined as the total of "other Canadian bonds" in the Financial Flow Accounts, consisting of all corporate bonds, plus bonds issued by hospitals and universities, which are relatively insignificant. It is assumed that all corporate loans, mortgages and finance and other short-term paper are issued to other corporations.

43. Data on the total funds invested in RRSPs and RHOSPs were obtained from the General Information Bulletin of the Trust Companies Association of Canada.

Movements in TRINTP over the sample reflect the same factors addressed in our discussion of the dividend tax rate. In 1972, the increase in TRINT reflects an expanded federal tax base. In 1974 TRINT falls dramatically in response to the introduction of the $1000 investment income deduction. That the impact of the deduction appears stronger for interest than either dividend or, as will be seen shortly, capital gains income, reflects the fact that most interest income accrues to individuals situated in relatively low income classes, whereas dividends and capital gains are earned primarily by wealthier classes. Since the impact of the deduction as reflected in the scale variable $\beta_i$ is more pronounced for lower income groups, there is a greater weight given to low values of $\beta_i$ in the case of interest income than for dividend or capital gains income. It appears that there has been some upward drift in TRINTP since 1974. This may partly reflect the impact of inflation on the real value of the tax protection afforded by the fixed $1000 deduction.

### 4.3 The Aggregate Tax Rate on Accrued Capital Gains

We calculate the average tax rate on realized capital gains using the same methodology employed for dividends and interest. However, we must convert this into a tax rate on accrued capital gains, since investment income is defined to include accruals. One can think of the total tax liable on accrued capital gains as the current discounted value of all future taxes that will eventually be incurred once these accruals are converted into realized capital gains. The simplifying assumption is made that an amount $\gamma \cdot 100$ per cent of all outstanding capital gains accruals is "consumed" (converted into capital gains realizations) each year. Thus, if capital gains accruals earned in the present year are equal to $KGA_t$, then $\gamma \cdot KGA_t$ is realized in the year of accrual, $\gamma(1-\gamma)KGA_t$ is realized in the next year, $\gamma(1-\gamma)^2$ KGA is realized in the year after that, and so forth. It is assumed that individuals expect capital gains realized in future years to be taxed at the current rate on realizations, $\theta^R$, and that future taxes liable on such realizations are discounted at the

constant nominal rate, r. The total tax liable on accrued capital gains, $TKGA_t$, is thus defined as[44]

$$TKGA_t = \theta^R \cdot \gamma \cdot KGA_t + \frac{\theta^R \cdot \gamma(1-\gamma)KGA_t}{(1+r)} + \frac{\theta^R \cdot \gamma(1-\gamma)^2 KGA_t}{(1+r)^2} + \ldots$$

$$= \theta^R \cdot \gamma \cdot KGA_t \left(1 + \frac{(1-\gamma)}{(1+r)} + \frac{(1-\gamma)^2}{(1+r)^2} + \ldots\right).$$

However, since $\gamma$ and r are, by assumption, both positive and less than one, so is the expression $(1-\gamma)/(1+r)$, and thus the series inside the brackets can be simplified, yielding:

$$TKGA_t = \theta^R \frac{\gamma+\gamma r}{\gamma+r} \cdot KGA.$$

The tax rate on capital gains <u>accruals</u>, $\theta^A$, is obtained by differentiating the above expression for $TKGA_t$ with respect to $KGA_t$:

$$\theta^A = \frac{\gamma+\gamma r}{\gamma+r}\theta^R.$$

Since $\theta^R$ is known, it is thus possible to determine $\theta^A$, once a value for $(\gamma+\gamma r)/(\gamma+r)$ has been specified. It is assumed that the coefficient on $\theta^R$ can be reasonably set at 25 per cent.[45] Although the calculated level of $\theta^A$ may only be an uncertain approximation to the true value, <u>changes</u> in $\theta^A$, reflecting underlying changes in $\theta^R$, may yield some useful insights.[46]

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44. Of course as these accrued capital gains are realized over time, the proceeds may be reinvested in income-earning assets. This does not mean, however, that the additional returns thus generated should be netted out of gross taxes payable in order to obtain some "net" deduction from capital gains income. This ia because any returns to reinvesting capital gains realizations in corporate debt and equity should already be reflected in the income variables DIV, INT and KGA. Any returns to reinveating in other assets are not relevant to assessing the return on <u>corporate</u> debt and equity.

45. A coefficient of 25 per cent might seem high. However, assuming an r of 10 per cent, this implies that the rate at which accruals are converted into realizations, $\gamma$, is only about 3 per cent. If the coefficient were any lower than 25 per cent, $\gamma$ would be even smaller.

46. Although the coefficient on $\theta^R$ is, by assumption, conatant over time, it is conceivable that it would prove relatively stable even if r and $\theta$ were variable. This is because r is in fact the opportunity coat of holding "unrealized" capital gains (accruals). Thua, if r should rise, so might $\theta$, since it becomes relatively more expensive to postpone the conversion of accruals into realizations which can be invested at rate r.

The average tax rate on realized capital gains, $\Theta^R$, is calculated in the same manner as the other tax rates. The economy is divided into four sectors: 1) persons and unincorporated businesses, 2) all corporations except life insurance companies, 3) governments, pension and social security funds, and life insurance companies, and 4) foreigners. As before, foreigners are assumed to be taxed at the overall average tax rate, and governments, pension and social security funds are assumed to be non-taxable. Life insurance companies, too, are treated as non-taxable, since they can effectively allocate capital gains to their policyholders and circumvent the capital gains tax. Other corporations are taxed like persons and unincorporated businesses: realized net capital gains are taxed at one-half of normal statutory rates. For corporations other than life insurance companies the same tax rate is used as that embodied in TRINT.

For persons and unincorporated businesses, the average tax rate on capital gains realizations is defined in the same fashion as TRDIVP and TRINTP. The sector is partitioned into nine income classes, and for each the tax liable on capital gains is defined as

$$\beta_i \cdot KGR_i \cdot \tfrac{1}{2}t_i \cdot (X_i - AB + PROV) \qquad \text{for 1966-71}$$

$$\beta_i \cdot KGR_i \cdot \tfrac{1}{2}t_i \cdot (X_i + PROV) \qquad \text{for 1972-80}$$

where $KGR_i$ denotes total capital gains realizations for class i.

The average tax rate for the sector is then defined as the total tax paid by all classes, divided by total capital gains realized by both taxable and non-taxable individuals.

The average tax rate on realizations for the whole economy is a weighted average of the four sector tax rates, the weights being the proportion of all outstanding corporate stocks and bonds held by each sector.[47] The aggregate tax rate on accrued capital gains is set at one-quarter the rate calculated for realizations. In Table 7, the average tax rates on accruals for persons and unincorporated businesses (TRKGAP) and the economy (TRKGA) are shown in columns 6 and 7, respectively.

47. "Stocks" and "bonds" are defined in the same manner as the weights used in calculating the tax rate on dividends and interest.

Both rates exhibit a similar pattern over the sample period. For the years 1966-71, during which capital gains were not taxed, both rates are zero. Over 1972-76, both rates are reasonably stable, but fall in 1977 when gross capital gains on Canadian securities held by persons and unincorporated businesses first became eligible for the $1000 investment income deduction. Following this, TRKGAP and TRKGA both drift upwards, until by the end of the sample they return to the level observed over 1972-76.[48]

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48. The average tax rate on accrued capital gains has been consistently lower than the rate calculated for dividend income. Since accrued capital gains result partly from the retention of corporate profita, this raises the queation of why corporations should pay dividends at all, since it would seem that investors could reduce their overall tax liability by electing to take all income resulting from the use of corporate profits in the form of capital gains. This apparent paradox has received much currency in the corporate finance literature, but no definitive explanation has emerged.

## 5 CALCULATING TAX RATES AND RATES OF RETURN

### 5.1 Effective Tax Rate on Broadly Defined Corporate Income

The total tax liable on corporate income is defined to include corporate income tax, plus any additional taxes levied directly on dividends, interest and capital gains. The total tax on broadly defined income is thus equal to

$$TAXB = DIV * TRDIV + INT * TRINT + KGI * TRKGA + KGE * TRKGA + TAXBUS$$

where DIV = total cash dividends paid out by the corporate sector
INT = total interest paid out by the corporate sector
KGI = internal capital gains
KGE = external capital gains
TAXBUS = the statutory corporate income tax liability

and TRDIV, TRINT and TRKGA are the average tax rates on dividend, interest and capital gains income.

The effective real tax rate on investment income is defined as the total tax liability, TAXB, divided by inflation-adjusted pre-tax income, YTOTB:[49]

$$RTAXB = \frac{TAXB}{YTOTB+TLOSS}.$$

The term TLOSS denotes "current-year losses for tax purposes", obtained from the CTS data, and is added back to YTOTB so that RTAXB represents a measure of the relative tax burden on positive corporate income. Under present tax rules, non-capital losses may be carried back one year, or carried forward up to five years, in order to reduce taxable income. In the current tax year, corporations reporting a loss pay no income tax. Thus, an increase in the proportion of all corporations reporting an operating loss would, in lieu of an adjustment, be manifested

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49. We note that both the numerator and denominator of RTAXB reflect some double counting of taxes and income, both of which will be overstated to the extent that some of interest income, INT, shows up in corporate profits due to intercorporate debt holdings. As with the other double-counting problems, the data do not enable us to completely correct for this, even were we to exclude the financial sector from our corporate universe altogether and thus rather arbitrarily narrow the scope of the analysis to one particular set of corporations. In any event, we attach considerably more importance to movements in our tax rate and rate of return variables than to their actual levels and counsel the reader to be mindful of such limitations of the data.

as an increase in RTAXB, even though the real tax burden on corporations earning positive profits may not have changed.[50]

The unadjusted tax rate differs from RTAXB in that no adjustment for inflation is made to total investment income. The unadjusted rate is defined as

$$RTAXBU = \frac{TAXB}{YTOTBU + TLOSS}$$

where YTOTBU, unadjusted income, is equal to

$$YTOTBU = PBK + PNR + INT + KGE.$$

The expression PBK + PNR denotes book profits, INT the nominal interest income to debt-holders, and KGE nominal external capital gains.

## 5.2 Rates of Return for Broadly Defined Corporate Income

Since we are defining income as the total return to debt-holders and shareholders, the relevant rate of return is that which measures their pecuniary return on invested funds. These funds should, strictly, be valued in terms of the opportunity cost incurred by having them tied up in corporate debt and equity. At any time, the true opportunity cost may reflect the value of corporate debt and equity as determined in secondary securities markets, or, under differing circumstances, the potential proceeds associated with winding up the affairs of existing corporations and retiring outstanding debt and equity claims.

In this paper we have defined rates of return in terms of the market value of corporate debt and equity. No data on market values are available directly, but, by virtue of the assumption that Tobin's q equals unity, the market value may be proxied by the replacement value of the capital stock. This replacement value, it will be recalled, is defined as

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50. This is the same adjustment made in a forthcoming study by the Department of Finance that examines the real effective tax rate on corporate profits. It is imperfect, however, inasmuch as TLOSS is based on data drawn from accounting statements that have not been corrected for inflation distortions. Since, on balance, these distortiona result in actual profits falling short of reported profita, then reported loases, TLOSS, will fall short of actual losses, and RTAXB will be biased upwards. It is felt, however, that some correction is better than none. Over the 1966-80 period, TLOSS was, on average, about 13 per cent of reported book profita.

the inflation-adjusted value of depreciable/depletable capital and land, plus the book value of all other assets.[51]

Because income flows cumulate over the whole year, but stocks are measured at year-end, rates of return are defined as a return to the average market value of debt and equity outstanding over the year, denoted by $\overline{B}$.

The real pre-tax rate of return on debt and equity is thus given by

$$RPREB = YTOTB/\overline{B}$$

and the after-tax rate of return is defined by

$$RNETB = (YTOTB-TAXB)/\overline{B}.$$

These represent real rates of return, because the numerator and denominator of both RPREB and RNETB are nominal magnitudes. The pre- and after-tax rates of return calculated with no adjustment for inflation are derived in the same fashion as RPREB and RNETB, except that YTOTBU is substituted for YTOTB.[52]

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51. The rate of return was also calculated in terms of the "aurrender value" of debt and equity: the potential proceeds associated with winding up the corporate aector and cashing in all outstanding debt and equity claima. The surrender value of debt is its par book value, and the surrender value of equity is inflation-adjuated assets leas the aurrender value of debt. The opportunity coat of debt and equity, defined aa the best foregone alternative, might well be this aurrender value if the market value should prove lower. In fact, this is never the case with our data. Also, although ratea of return based on the surrender value were uniformly higher than those based on market value, movementa in both seriea were similar. Most of the movement in the rates of return may thus be attributed to changes in adjusted income rather than meaaured wealth. This is reassuring, because we have much more confidence in our estimates of the former. In interpreting the reaulta, we give greater emphasia to movements than to absolute levels.

52. More rigorously, the real inflation-adjusted pre-tax rate of return, RPREB, is defined as the proportional change in real wealth, W/P:

$$\frac{d(W/P)}{(W/P)} = \frac{dW - W\cdot\pi^a}{W} = \frac{dW}{W} - \pi^a$$

where W denotes inflation-adjusted nominal inveator wealth, P is the general price level, and $\pi^a = dP/P$ is the general inflation rate. The numerator, $dW - W\cdot\pi^a$, is adjusted income, YTOTB, where $W\cdot\pi^a$ repreaents external capital gaina from general price inflation. Equivalently, the real rate equals the nominal rate, dW/W, leas the inflation rate, $\pi^a$. RPREBU, the unadjusted rate of return, is defined aa $dW^U/W$, where $dW^U$ denotes unadjusted investment income, YTOTBU. Thus, RPREBU represents neither the true nominal rate of return (dW/W), nor a "real" rate (aince we don't subtract the inflation rate, $\pi^a$), but rather a benchmark against which RPREB can be compared to assess the size of our adjuatments to reported income flows. RPREBU thus doea not rule out a certain amount of money illusion in terms of how investora regard external capital gains.

### 5.3 Tax Distortions

When tax rates and rates of return are calculated in this way, the resulting series will be subject to the influence of four principal distortions present in the tax system. These are: 1) the failure of the corporate income tax to allow for the impact of inflation on the gap between actual and reported book profits, 2) the double taxation of dividends and internal capital gains, both of which arise out of after-tax corporate profits and are taxable once received by investors, 3) the taxation of external capital gains resulting from the nominal appreciation of the capital stock, and 4) the taxation of total nominal interest income received by corporations and their creditors, and the ability of corporations to claim total nominal debt-servicing costs as an operating expense.[53]

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53. These problems have not gone unrecognized by policymakers. The June 1982 federal budget contained a proposal to create a new class of indexed deposits and loans in which only real interest income would be taxable, and only real interest expenses tax deductible. As well, a "Registered Shareholders' Investment Plan" (RSIP) was proposed, under which external capital gains were to be afforded some measure of tax relief. The former proposal was never implemented, but the latter appeared in the April 1983 budget as the "Indexed Security Investment Plan" (ISIP).

# 6 RESULTS

## 6.1 The Real Pre-Tax Rate of Return

The real pre-tax rate of return on debt and equity, fully adjusted for inflation (RPREB), is shown as the solid line in Figure 1. The pre-tax rate of return calculated using unadjusted data (RPREBU), appears in the same figure as the dashed line.

Two general observations can be made. First, the inflation-adjusted rate of return consistently falls short of the unadjusted rate, reflecting the gap between adjusted and unadjusted income (Table 8). Second, the difference between the two series becomes more pronounced over the sample. Over the 1966-72 period, during which relatively mild rates of inflation were experienced, movements in both the adjusted and unadjusted series are reasonably alike. After the acceleration of inflation in 1973, however, the unadjusted rate of return increases sharply, while the adjusted rate declines.

Although the unadjusted rate falls during the next two years, the level difference between the two series remains higher than that observed before 1973 (the average gap between the two rates for 1966-72 was 4.5 percentage points; for 1973-80 it was fully 10.9 percentage points). As a general observation, it appears that the adjusted pre-tax rate of return is inversely related to the inflation rate, and the unadjusted rate, positively related.[54]

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54. For 1966-80 the correlation coefficient between RPREB and $\pi^a$ is -0.607; between RPREBU and $\pi^a$, 0.939. Similar signs and magnitudes are obtained for the correlations between these variables, and $\pi^k$ and $\pi^i$.

**Figure 1**
**THE REAL PRE-TAX RATE OF RETURN**

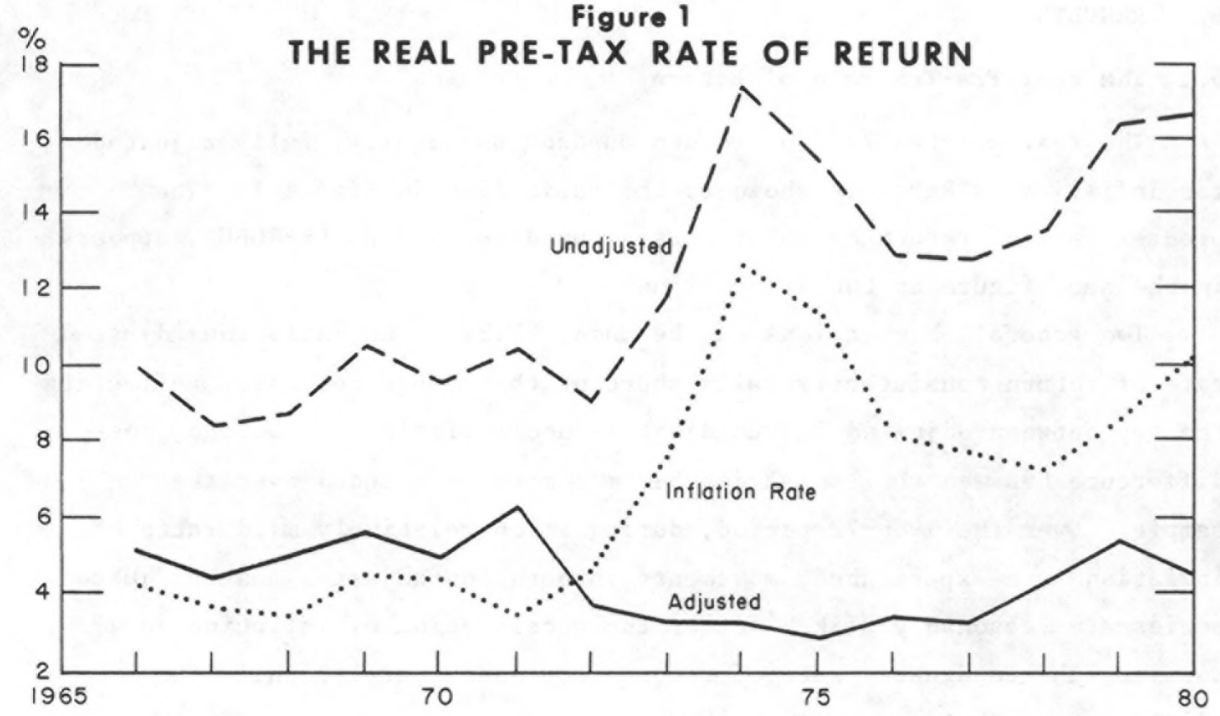


**Figure 2**
**THE REAL EFFECTIVE TAX RATE**

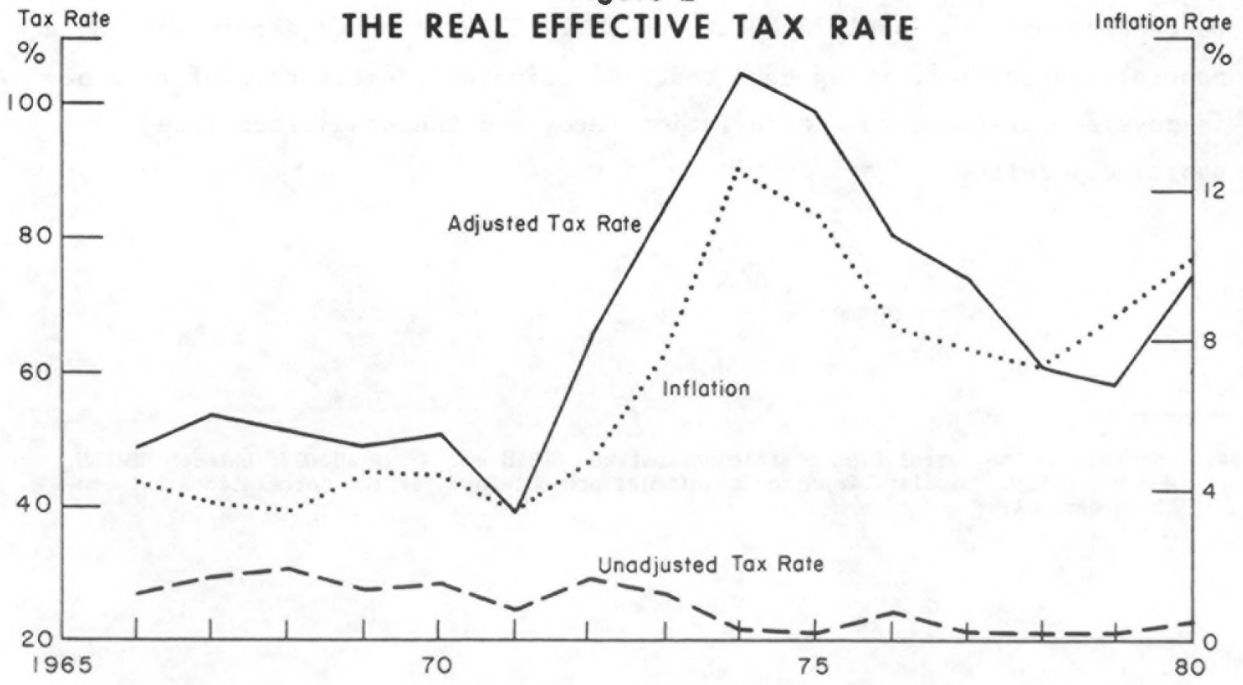

Table 8

**THE RATIO OF INFLATION-ADJUSTED INCOME TO UNADJUSTED INCOME (PRE-TAX) (%)**

| | YTOTB/YTOTBU' |
|---|---|
| 1966 | 51.9 |
| 1967 | 51.6 |
| 1968 | 56.8 |
| 1969 | 53.4 |
| 1970 | 51.8 |
| 1971 | 59.8 |
| 1972 | 40.9 |
| 1973 | 27.6 |
| 1974 | 18.7 |
| 1975 | 18.4 |
| 1976 | 26.3 |
| 1977 | 26.0 |
| 1978 | 31.8 |
| 1979 | 33.6 |
| 1980 | 27.8 |

A detailed breakdown of the pre-tax rate of return appears in Table 9. The inflation-adjusted investment income, YTOTB, is defined as the sum of inflation-adjusted pre-tax book profits and non-recurring items, real interest income and real external capital gains. The total adjusted rate of return, shown in column 6, can be expressed in terms of these separate components of YTOTB, shown in columns 1 through 5. The share of pre-tax book profits and non-recurring items in the total return does not change significantly over the sample (columns 1 and 2), although the relative size of the inflation adjustment, IA, does increase (column 3). The share of real interest income falls sharply in response to the acceleration of inflation in 1973-74, but recovers gradually thereafter as inflation comes down. The share of real external capital gains is minor in absolute terms, but volatile, reflecting divergent movements in the rates $\pi^a$, $\pi^k$ and $\pi^i$. Overall, the adjusted pre-tax rate of return exhibits no particular trend over the sample, despite the observed trough spanning 1972-77.

Table 9

**THE REAL PRE-TAX RATE OF RETURN ON DEBT AND EQUITY (%)**
Total Return and its Components

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | | | | | | Total Income | |
| | Pre-tax Book Profits | Non-Recurring Items | Total Inflation Adjustment | Real Interest Income | External Capital Gains | Adjusted for Inflation | Unadjusted for Inflation |
| 1966 | 5.9 | 0.0 | -0.7 | 0.1 | -0.1 | 5.2 | 10.0 |
| 1967 | 5.3 | 0.0 | -0.5 | 0.3 | -0.8 | 4.4 | 8.5 |
| 1968 | 5.4 | 0.6 | -0.4 | 0.7 | -1.2 | 5.0 | 8.8 |
| 1969 | 5.2 | 0.7 | -0.5 | 0.4 | -0.1 | 5.6 | 10.5 |
| 1970 | 4.4 | 0.3 | -0.3 | 0.8 | -0.2 | 5.0 | 9.6 |
| 1971 | 4.6 | 0.5 | -0.6 | 0.9 | 0.9 | 6.2 | 10.4 |
| 1972 | 4.3 | 0.3 | -0.7 | -0.1 | -0.2 | 3.7 | 9.0 |
| 1973 | 5.7 | 0.3 | -1.0 | -1.4 | -0.3 | 3.3 | 11.9 |
| 1974 | 6.8 | 0.5 | -1.3 | -3.2 | 0.5 | 3.3 | 17.5 |
| 1975 | 5.6 | 0.5 | -0.8 | -2.6 | 0.2 | 2.9 | 15.5 |
| 1976 | 4.9 | 0.5 | -0.9 | -0.7 | -0.5 | 3.4 | 13.0 |
| 1977 | 4.5 | 0.5 | -1.3 | -0.5 | 0.2 | 3.4 | 12.9 |
| 1978 | 5.1 | 0.5 | -1.7 | -0.1 | 0.6 | 4.4 | 13.7 |
| 1979 | 5.7 | 0.8 | -1.9 | 0.1 | 0.8 | 5.6 | 16.5 |
| 1980 | 5.5 | 0.8 | -1.7 | 0.1 | -0.1 | 4.7 | 16.8 |

## 6.2 The Real Effective Tax Rate

The real effective tax rate on total inflation-adjusted investment income, YTOTB, (RTAXB) is shown as the solid line in Figure 2. The real effective tax rate, calculated using unadjusted income, (RTAXBU) appears as the dashed line.

The adjusted tax rate exceeds the unadjusted rate over the whole sample, reflecting the gap between adjusted and unadjusted income. Over 1971-74, the adjusted rate increases dramatically, rising above 100 per cent in 1974. This is followed by a large decline, reversed in 1980 as inflation ($\pi^a$) re-accelerates. On balance, there appears to be a large level increase in the adjusted rate following 1971. (For the 1966-72 period, the average rate is 51.2 per cent, but this increases to fully 80.1 per cent for 1973-80).[55] There are three likely explanations for the shift. First, capital gains became taxable for the first time in 1972, and the distortive taxation of full external capital gains would have grown more pronounced as inflation accelerated. Second, real interest income fell after 1972 (Table 4), but taxable nominal interest income rose. Finally, the inflation adjustment to corporate profits, IA, grew in relative magnitude, further widening the gap between adjusted and unadjusted income. In general, the adjusted tax rate appears to be positively correlated with the rate of inflation.[56]

The unadjusted tax rate displays little volatility over the sample period, and, in marked contrast to the adjusted rate, actually falls slightly over the latter half. (For 1966-72, the average of the unadjusted rate is 27.9 per cent; for 1973-80 it is 23.0 per cent.) The gap between the adjusted and unadjusted tax rate thus grows more

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55. Despite the substantial increase in RTAXB over 1972-74, the pre-tax rate of return, RPREB, actually declinea over the same period. This appears inconaistent with the hypotheais that investors demanded a higher pre-tax rate of return to compensate for the increased tax rate. However, the large relative price changes experienced in thia period as a result of oil and commodity price shocks may have reduced pre-tax profitability enough to offset the tax effect. To disentangle the two effects a more sophisticated analysis is required.

56. For 1966-80 the correlation coefficient between RTAXB and $\pi^a$ ia 0.889; between RTAXBU and $\pi^a$, -0.761. Similar signa and magnitudes are obtained for the correlations between the tax rate variablea and $\pi^k$ and $\pi^l$.

pronounced over the sample, increasing from 23.2 percentage points for 1966-72, to 57.1 percentage points for 1973-80.[57]

The total tax rate is broken down into separate components reflecting the different taxes liable on investment income. In Table 10, the "share" of each tax in the total tax is shown in columns 1 through 5, which sum to the total adjusted rate in column 6. The unadjusted tax rate appears in column 7.

Clearly much of the growth in the total tax rate reflects a sizable increase in the tax liable on interest income (column 2). Indeed, in 1980 one-half of all taxes result from the taxation of interest. In contrast, the share of the corporate profits tax declines over the sample (column 5), although it represents the most substantial component of the total tax in all but the last two years. The taxes on dividends and internal capital gains are relatively lower, and decline as a share of total taxes (columns 1 and 3). The same can be said of the tax on external capital gains, although it increases sharply during 1972-74 as the inflation of the price of capital, $\pi^k$, accelerates. Individually the taxes on dividends and capital gains are of relatively minor significance. Taken together, however, they do represent an important part of the total tax.

### 6.3 The Real After-Tax Rate of Return

The inflation-adjusted real after-tax rate of return on corporate debt and equity (RNETB) is shown graphically in Figure 3 as the solid line. The after-tax rate of return, calculated without incorporating any adjustments for inflation (RNETBU), appears as the dashed line.

The inflation-adjusted after-tax rate of return, it will be recalled, is defined as the difference between inflation-adjusted income, YTOTB, and the total tax liable on that income, TAXB, divided by the market value of

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57. Since 1980, the last year covered in this study, a number of tax provisions have been introduced that may have lowered the average tax rate on investment income. E.g., the November 1981 federal budget reduced the maximum marginal tax rates faced by peraons and unincorporated businesses, and the April 1983 budget contained proposala regarding corporate loss-carry provisions that were ostensibly designed to reduce the average tax rate on corporate profits. This does not weaken the central conclusion of this paper, however, that increases in inflation may increase the effective real tax rate on investment income. The level of the tax rate is of less concern here than the fact that inflation may reduce the real benefit of tax policies such as those above.

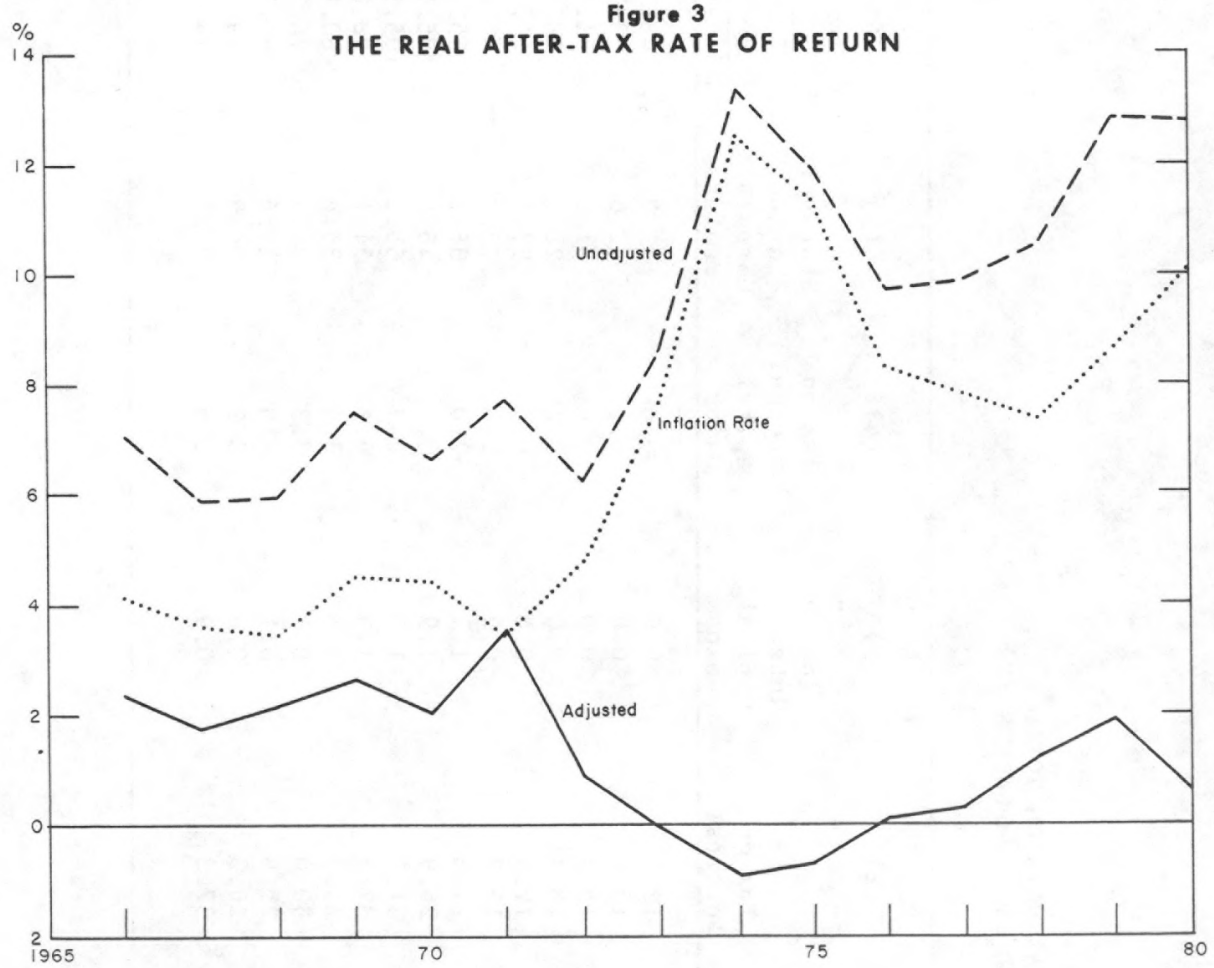
Table 10

**THE REAL EFFECTIVE TAX RATE ON TOTAL INVESTMENT INCOME AND ITS COMPONENTS (%)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Tax on Dividends | Tax on Interest | Tax on Internal Capital Gains | Tax on External Capital Gains | Statutory Tax on Corporate Profits | Total Effective Tax Rate | |
| | | | | | | Adjusted | Unadjusted |
| 1966 | 5.0 | 12.5 | 0.0 | 0.0 | 31.3 | 48.8 | 26.7 |
| 1967 | 5.7 | 15.0 | 0.0 | 0.0 | 32.6 | 53.3 | 29.1 |
| 1968 | 4.9 | 15.7 | 0.0 | 0.0 | 31.0 | 51.5 | 30.6 |
| 1969 | 4.0 | 16.3 | 0.0 | 0.0 | 28.2 | 48.5 | 27.1 |
| 1970 | 4.3 | 19.9 | 0.0 | 0.0 | 27.1 | 51.2 | 28.4 |
| 1971 | 3.1 | 13.7 | 0.0 | 0.0 | 22.2 | 39.0 | 24.4 |
| 1972 | 5.4 | 21.3 | 1.1 | 2.0 | 36.1 | 65.8 | 29.1 |
| 1973 | 7.0 | 26.9 | 1.9 | 3.4 | 46.5 | 85.7 | 26.7 |
| 1974 | 10.0 | 31.9 | 1.9 | 6.7 | 55.1 | 105.5 | 22.9 |
| 1975 | 7.3 | 32.2 | 1.9 | 6.1 | 51.1 | 98.8 | 21.9 |
| 1976 | 6.3 | 30.3 | 1.5 | 3.5 | 39.4 | 80.9 | 24.1 |
| 1977 | 6.0 | 30.0 | 0.7 | 3.3 | 34.4 | 74.3 | 22.2 |
| 1978 | 5.3 | 25.9 | 0.1 | 3.0 | 27.6 | 61.9 | 21.7 |
| 1979 | 4.3 | 26.3 | 0.6 | 3.2 | 24.9 | 59.2 | 21.5 |
| 1980 | 4.4 | 37.3 | 0.9 | 3.5 | 28.0 | 74.1 | 23.0 |

debt and equity. The evolution of RNETB over time depends upon the evolution of both the pre-tax rate of return, reflecting the behaviour of YTOTB, and the real effective tax rate, reflecting the proportion of YTOTB claimed by various taxes.

**Figure 3**
**THE REAL AFTER-TAX RATE OF RETURN**




Several observations can be made about the behaviour of RNETB and RNETBU. First, both rates move in a roughly parallel fashion over 1966-72. This reflects similar underlying movements in the adjusted and unadjusted tax rate and pre-tax rate of return. Second, the adjusted rate

of return declines significantly following the transition to a more inflationary regime in 1973. During 1973-75 the adjusted rate is actually negative,[58] and the average rate for 1973-80 only 0.3 per cent, as opposed to 2.2 per cent for 1966-72. In part this reflects a decline in the pre-tax rate of return. In larger measure, however, it reflects an increase in the adjusted tax rate, which more than doubles over the course of 1971-74.

A breakdown of the after-tax rate of return into its constituent parts appears in Table 11. The inflation-adjusted rate, RNETB, is defined as

$$RNETB = \frac{YTOTB - TAXB}{\overline{B}}$$

where $\overline{B}$ denotes the market value of debt and equity. Given the definition of YTOTB and TAXB the numerator of this expression equals

$$(PBK + PNR - IA) + INTR + KGER$$

$$- (DIV \cdot TRDIV + INT \cdot TRINT + KGI \cdot TRKGA + KGE \cdot TRKGA + TAXBUS)$$

where all variables are as defined previously. Inflation-adjusted after-tax profits, PBK + PNR - IA - TAXBUS, can be decomposed into dividends, DIV, and retained earnings, which equal internal capital gains, KGI. The above expression thus simplifies to

$$DIV \cdot (1-TRDIV) + INTR - INT \cdot TRINT + KGI \cdot (1-TRKGA)$$

$$+ KGER - KGE \cdot TRKGA$$

The share of dividend income in the total after-tax return does not change substantially over the sample (column 1). However, the share of

58. Although RTAXB exceeds 100 per cent in only one year, RNETB is negative in three years because RTAXB reflects the inclusion of TLOSS -- current-year losses for tax purposes -- in the denominator. No such adjustment to pre-tax income is made in defining RNETB.

Table 11

**THE REAL AFTER-TAX RATE OF RETURN ON DEBT AND EQUITY (%)**
Total Return and its Components

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | | | | | Total Income | |
| | Dividend Income | Real Interest Income | Internal Capital Gains | External Capital Gains | Adjusted for Inflation | Unadjusted for Inflation |
| 1966 | 1.8 | -0.7 | 1.3 | -0.1 | 2.3 | 7.1 |
| 1967 | 1.7 | -0.5 | 1.3 | -0.8 | 1.7 | 5.8 |
| 1968 | 1.6 | -0.2 | 2.0 | -1.2 | 2.1 | 5.9 |
| 1969 | 1.4 | -0.6 | 1.9 | -0.1 | 2.6 | 7.5 |
| 1970 | 1.5 | -0.4 | 1.2 | -0.2 | 2.0 | 6.6 |
| 1971 | 1.5 | -0.1 | 1.3 | 0.9 | 3.5 | 7.7 |
| 1972 | 1.1 | -1.0 | 1.0 | -0.2 | 0.9 | 6.2 |
| 1973 | 1.2 | -2.5 | 1.6 | -0.4 | -0.1 | 8.6 |
| 1974 | 1.7 | -4.4 | 1.6 | 0.2 | -0.9 | 13.3 |
| 1975 | 1.4 | -3.7 | 1.6 | 0.0 | -0.7 | 11.9 |
| 1976 | 1.2 | -1.9 | 1.5 | -0.6 | 0.1 | 9.7 |
| 1977 | 1.2 | -1.7 | 0.8 | 0.1 | 0.3 | 9.9 |
| 1978 | 2.1 | -1.4 | 0.2 | 0.4 | 1.2 | 10.6 |
| 1979 | 1.9 | -1.6 | 0.9 | 0.6 | 1.9 | 12.8 |
| 1980 | 1.7 | -1.9 | 1.1 | -0.3 | 0.6 | 12.8 |

internal capital gains (column 3) tends to fall, reflecting in part the introduction of the capital gains tax in 1972. This is also a factor in the evolution of real external capital gains (column 4), although as a proportion of the total return they grow more significant over the sample, reflecting movements in the relative price of capital. The share of after-tax real interest income is negative for all years, reflecting the combination of a generally low pre-tax return and a real tax burden that increases substantially during the 1973-75 period of higher inflation (column 2). Together, dividend and internal capital gains income account for the largest share of total income. This reflects the total return arising from corporate profits, net of both the corporate income tax and the taxes levied on dividends and capital gains directly. Once allowance is made for real interest and capital gains income, however, a substantially different picture of profitability emerges.[59]

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59. In this paper the definition of income and the associated tax liability are based on the approach used in Feldstein, et al. (1981). Although their reaults and oura are not strictly comparable because of inatitutional and, in some instances, methodological anomalies, it ia interesting to note that generally the Canadian and U.S. results are similar. They find that the real pre-tax rate of return averages 12.7 per cent for the 1960s and only 9.8 per cent for the 1970s. The real effective tax rate averages 59.6 per cent for the 1960s, and 68.7 per cent for the 1970s. This rate also moves in a very similar fashion to ours over the 1966-79 period where both studies overlap, although their tax rate never rises above 100 per cent. In part this may reflect the fact that their corporate universe excludes financial institutions so that the distortionary taxation of nominal intereat income is less important in the total tax rate.

## 7 CONCLUSIONS

When there is inflation, published financial data on wealth and income are misleading. Our adjustment of reported data on the returns to investment in Canadian corporations uncovers two empirical regularities: 1) the real after-tax rate of return on debt and equity calculated under full inflation accounting consistently falls below the rate based on unadjusted reported data, and 2) the inflation-adjusted real tax rate on investment income appears to be positively associated with the inflation rate.

The existence of a gap between adjusted and unadjusted rates of return raises the possibility that investors may only partially adjust for inflation-related accounting distortions in assessing the relative returns to alternative investments. They may therefore base their savings decisions on information that is partly erroneous, and resources will be allocated inefficiently. A similar sort of informational dilemma confronts policymakers and others who use reported income data in forming policies and judgements directed at the corporate sector.

The observed correlation between inflation and the real tax rate raises two disturbing possibilities. First, an increase in inflation may arbitrarily redistribute income by raising the taxable income of investors by more than their real income. This constitutes a hidden tax that may be difficult to justify on equity grounds. Second, an increase in inflation may raise the cost of capital to corporations by causing investors to demand a higher pre-tax rate of return to compensate for the higher tax rate, ceteris paribus. Real investment in physical capital could therefore be discouraged during periods when inflation is accelerating.

Through the current system of financial accounting, inflation may thus bring certain potentially serious costs to bear on society. Given the evidence advanced in this paper, there are grounds for believing that the scope of the problem may be very large indeed.

APPENDIX I - **An Alternative View of Corporate Income**

APPENDIX II - **A Derivation of the Inventory Valuation Adjustment**

Appendix I

**An Alternative View of Corporate Income**

A more conventional definition of the returns to investment than that used in this paper defines income in terms of inflation-adjusted corporate profits exclusively, and considers only the corporate income tax. No account is taken of either interest or external capital gains income, and the tax liability excludes the taxes levied directly on dividends, interest and capital gains. In terms of this "narrow" approach, income and taxes are defined on the premise that the corporation, considered as a legal fiction, is the relevant unit of account. However, when income and taxes are "broadly" defined the debtors and shareholders of a corporation, the ultimate recipients of taxable corporate income, are the main players.

We take the view that the broadly defined tax rate and rate of return are more interesting from an economic standpoint. If one wishes to calculate the cost of capital, the combined return to both equity and debt is relevant, since corporations finance their investment expenditures through both kinds of issues. If one is interested in assessing the real tax burden on investment income -- even on equity income exclusively -- account should be taken of all taxes, including those levied on investors directly.

To put this broad notion of income in perspective, the inflation-adjusted rates of return and real effective tax rate for narrowly defined income are derived. The following is a discussion of the methodology used in constructing these alternative series, and comparisons are drawn between these and the broadly defined series derived in the body of our report.

## 1. Effective Tax Rate on Narrowly Defined Corporate Income

In terms of the mnemonics used in our study, the total tax payable on narrowly defined income, TAXN, consists exclusively of the statutory corporate income tax, TAXBUS. Thus, although income is defined as a return to equity, no account is taken of the additional tax incurred by shareholders once dividends and internal capital gains are realized out of after-tax profits. The inflation adjustments performed on corporate

profits are those described previously for broadly defined income; that is, reported profits are reduced by IA = DEP + IVA + LIQK - DEBT. However, inflation-adjusted profits are not supplemented by interest and external capital gains income and no special provision is made for the taxes liable on such income.

Total inflation-adjusted income, narrowly defined, is equal to

$$YTOTN = PBK + PNR - IA$$

where all variables are as defined previously for YTOTB. The real effective tax rate is thus equal to

$$RTAXN = \frac{TAXN}{YTOTN+TLOSS} .$$

## 2. Rates of Return for Narrowly Defined Corporate Income

In this report we follow earlier practice* and define the narrow rate of return as a return to the current replacement value of shareholders' equity, equal to

$$N = EQBK + KR - KBK + RFT$$

where EQBK = the book value of shareholders' equity
KR = the current replacement value of the capital stock
KBK = the book value of the capital stock, and
RFT = reserve for future income taxes.

The "reserve for future income taxes" appears in the CFS balance sheet data under "liabilities". It represents the cumulation of all

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* Our "narrow" rate of return corresponds most closely to that derived in Bélanger and McIlveen (1980a,b), who define the replacement value of shareholders' equity in an identical fashion. Differences between our results and theirs largely reflect differences in data. Their estimates are based on data in Industrial Corporations: Financial Statistics (61-003). These are taken from the quarterly financial statements of non-financial industrial corporations. Basu and Hanna (1976) and Boasons (1977) also concentrate on the returns to shareholders, looking at the rate of return on common equity. However, these studies differ from ours and Bélanger and McIlveen's in the particular manner in which the adjustments to reported profits are implemented. By contrast, Jenkins (1977a) and Tarasofsky et al. (1981) look at the "social" rate of return on capital employed, where capital is defined as the current replacement value of all physical and financial assets. These are closer in spirit to this study, although to our knowledge no explicit provision is made for the taxes directly liable on dividend, interest and capital gains income.

current and previous-period deferred taxes. Deferred taxes, it will be recalled, are those additional taxes a firm expects to pay in the future once the tax advantage of accelerated depreciation has been exhausted. In practice, as long as the firm continues to remain a going concern, and can continue to avail itself of accelerated tax writeoffs, these deferred taxes tend never to be paid, since newly acquired capital confers an additional tax advantage sufficient to more than offset deferred taxes that come due. This reserve is thus more appropriately treated as equity.

The pre-tax real rate of return on equity is given by

$$RPREN = YTOTN/\overline{N}$$

and the real after-tax rate of return is equal to

$$RNETN = (YTOTN-TAXN)/\overline{N}$$

where $\overline{N}$ denotes the average of the beginning- and end-of-period values of N.

The unadjusted rates of return and real tax rate are defined like RPREN, RNETN and RTAXN, except that YTOTN is replaced by unadjusted pre-tax corporate profits, PBK + PNR.

## 3. Results

### The Real Pre-Tax Rate of Return

The real pre-tax rates of return on equity, adjusted and unadjusted for inflation, are shown in Table 1A. For all years the adjusted rate falls short of the unadjusted rate, and, as when income is broadly defined, the gap widens with the onset of higher inflation in 1973-75 (for 1966-72 the average gap is 1.1 percentage points; this increases for the 1973-80 period to 3.2 percentage points). The adjusted rate exhibits no particular trend over the sample.

In Figure 1A, the inflation-adjusted pre-tax rates of return for narrowly defined (RPREN) and broadly defined (RPREB) income are shown together. In all years RPREN exceeds RPREB, and both series evolve quite differently over time. Particularly notable is the peak in RPREN in 1974,

Table 1A

THE REAL PRE-TAX RATE OF RETURN ON EQUITY FOR NARROWLY DEFINED INCOME (%)

| | Adjusted for Inflation | Unadjusted for Inflation |
|---|---|---|
| 1966 | 10.7 | 12.1 |
| 1967 | 10.3 | 11.4 |
| 1968 | 12.1 | 13.0 |
| 1969 | 12.0 | 13.1 |
| 1970 | 9.9 | 10.5 |
| 1971 | 10.2 | 11.6 |
| 1972 | 9.0 | 10.5 |
| 1973 | 11.8 | 14.1 |
| 1974 | 14.3 | 17.3 |
| 1975 | 12.4 | 14.4 |
| 1976 | 11.0 | 13.0 |
| 1977 | 8.9 | 12.2 |
| 1978 | 9.7 | 13.8 |
| 1979 | 11.7 | 16.5 |
| 1980 | 11.6 | 15.7 |

Table 2A

THE REAL EFFECTIVE TAX RATE ON NARROWLY DEFINED INCOME (%)

| | Adjusted for Inflation | Unadjusted for Inflation |
|---|---|---|
| 1966 | 31.3 | 27.8 |
| 1967 | 29.7 | 27.3 |
| 1968 | 28.2 | 26.4 |
| 1969 | 29.4 | 27.1 |
| 1970 | 30.0 | 28.5 |
| 1971 | 29.7 | 26.4 |
| 1972 | 34.3 | 29.9 |
| 1973 | 32.4 | 27.7 |
| 1974 | 32.6 | 27.4 |
| 1975 | 31.0 | 27.2 |
| 1976 | 30.6 | 26.3 |
| 1977 | 32.1 | 24.5 |
| 1978 | 30.5 | 22.4 |
| 1979 | 29.1 | 21.4 |
| 1980 | 28.2 | 21.6 |

Table 3A

THE REAL AFTER-TAX RATE OF RETURN ON EQUITY FOR NARROWLY DEFINED INCOME (%)

| | Adjusted for Inflation | Unadjusted for Inflation |
|---|---|---|
| 1966 | 6.9 | 8.4 |
| 1967 | 6.9 | 7.9 |
| 1968 | 8.3 | 9.2 |
| 1969 | 8.1 | 9.2 |
| 1970 | 6.4 | 7.0 |
| 1971 | 6.7 | 8.1 |
| 1972 | 5.5 | 7.0 |
| 1973 | 7.5 | 9.8 |
| 1974 | 9.1 | 12.1 |
| 1975 | 8.0 | 10.0 |
| 1976 | 7.2 | 9.2 |
| 1977 | 5.5 | 8.8 |
| 1978 | 6.2 | 10.3 |
| 1979 | 7.8 | 12.6 |
| 1980 | 7.8 | 11.9 |

**Figure 1A**
**REAL PRE-TAX RATES OF RETURN**

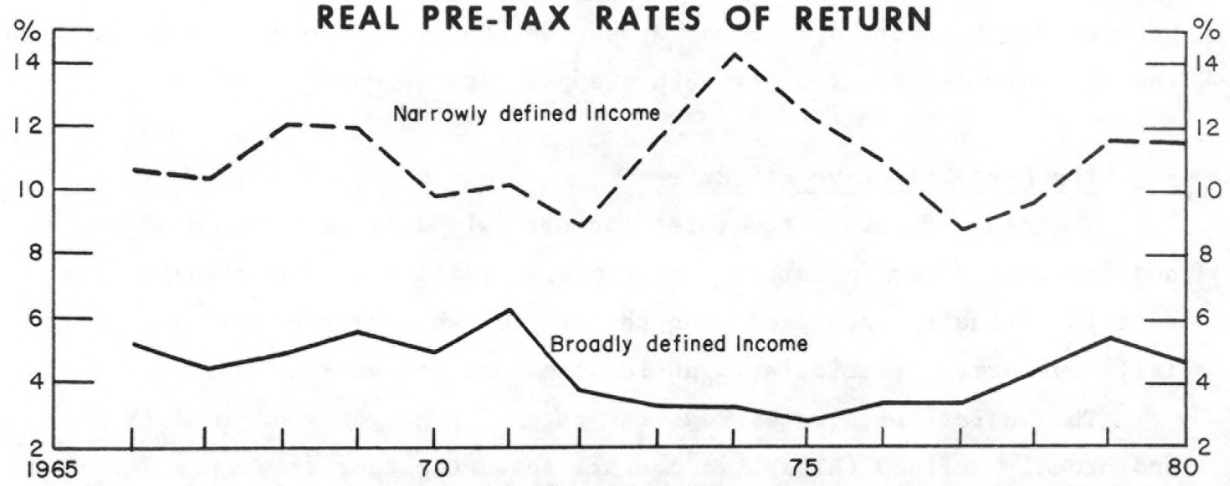



**Figure 2A**
**REAL EFFECTIVE TAX RATES**

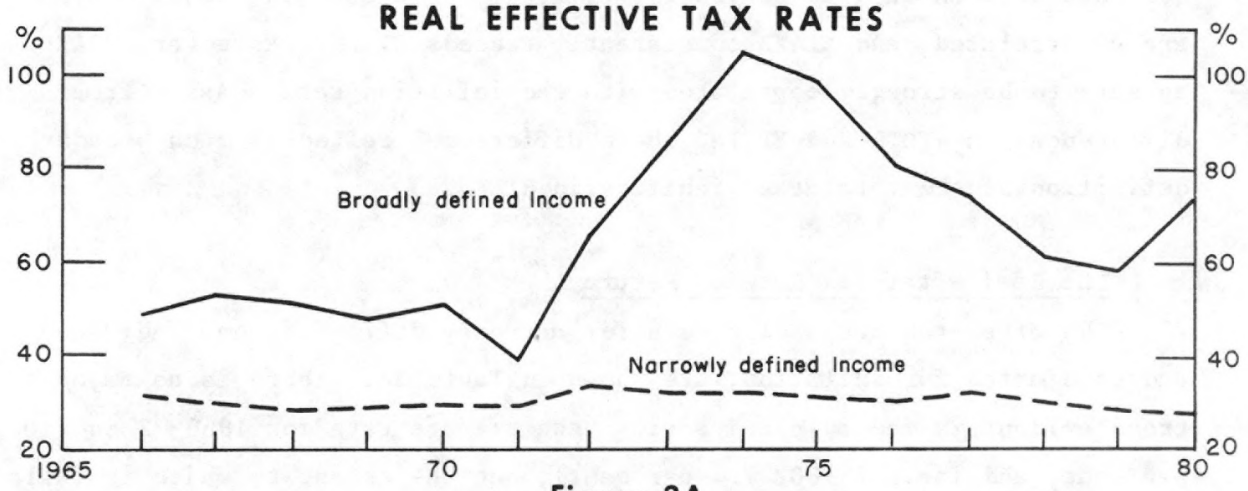
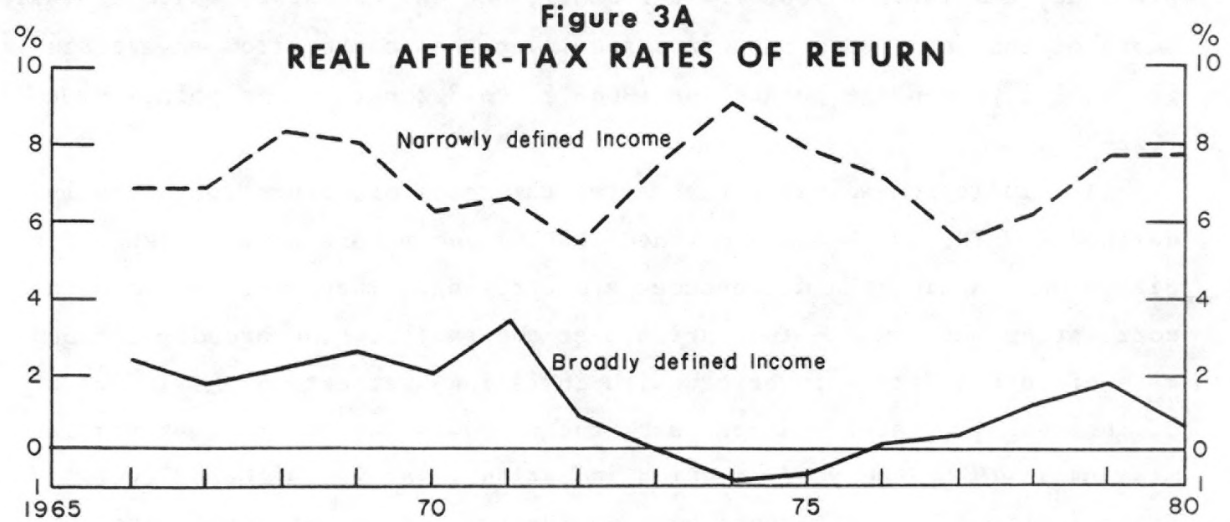



**Figure 3A**
**REAL AFTER-TAX RATES OF RETURN**



the year RPREB falls to its second lowest level historically. The gap between the two series does not appear to change much over the sample, but the narrowly defined rate of return appears to be more volatile.

The Real Effective Tax Rate

The real effective tax rates for narrowly defined income, adjusted and unadjusted for inflation, are shown in Table 2A. The adjusted tax rate is virtually unchanged over the sample, whereas the unadjusted rate falls over time, particularly during the last few years.

The inflation-adjusted real tax rates for narrowly defined (RTAXN) and broadly defined (RTAXB) income are shown together in Figure 2A. The contrast between the two series is striking. Movements in the two rates are uncorrelated, and RTAXB consistently exceeds RTAXN. Moreover, RTAXB appears to be strongly correlated with the inflation rate. Aside from differences in YTOTB and YTOTN, these differences reflect a much broader definition of the total tax liability in RTAXB.

The Real After-Tax Rate of Return

The after-tax rates of return for narrowly defined income, adjusted and unadjusted for inflation, are shown in Table 3A. There is no major trend evident in the adjusted series (the average rate for 1966-72 is 7.0 per cent, and for 1973-80, 7.4 per cent), but the extent to which it falls short of the unadjusted rate increases over the sample (from an average gap of 1.1 percentage points for 1966-72, to 3.2 percentage points over 1972-80).

The inflation-adjusted real after-tax rates of return for narrowly defined (RNETN) and broadly defined (RNETB) income are shown together in Figure 3A. Again, the differences are striking. There appears to be no correlation between the two series over the sample. The broadly defined rate of return varies inversely with inflation, reflecting the influence of the real tax rate. In contrast, the narrowly defined rate attains a maximum in 1974, the year in which inflation is at its highest level historically. The difference between the two series reflects quite divergent movements in both the underlying real tax rates and the pre-tax rates of return.

## 4. Conclusions

It is apparent that inflation-related accounting distortions have the same general implications under each definition of income: unadjusted tax rates are too low, and unadjusted rates of return too high. However, the manner in which tax rates and rates of return respond to changes in inflation depends critically upon how income and the associated tax liability are defined. Under the broad definition, it appears that the real tax rate on investment income is extremely sensitive to inflation. Quite the opposite impression is given by the narrowly defined tax rate. This clearly has important implications in terms of how current tax policy should be interpreted. In particular, it might be inferred by looking at just the narrowly defined tax rate that no special amendment to existing tax legislation to incorporate full inflation accounting is required. The evidence presented by the broadly defined tax rate, however, suggests that the real effects of inflation have been very substantial indeed.

Appendix II

**A Derivation of the Inventory Valuation Adjustment**

That the inventory accounting distortion should be of the same magnitude as the depreciation/depletion distortion might strike one as peculiar, given the fact that inventories turn over so rapidly (about 5.7 times a year — a figure obtained by dividing annual sales by average stocks). If little time elapses between the point of acquisition and the point of sale, there would seem to be less time for the price of inventories to rise, and therefore less of a tax distortion under FIFO accounting. Depreciable/depletable capital, on the other hand, is held for a considerably longer time (about 19 years).

This apparent paradox is easily resolved by considering the analogy of a pipe through which water is continuously flowing. The water represents inventories that "flow through" a firm's stocks. The price that prevails when water enters the pipe is what firms are allowed to declare as a cost under FIFO. The price that prevails when the same water leaves the pipe is what firms must pay to replace inventories withdrawn from stocks. When there is inflation, the latter price exceeds the former, and reported profits are too high. At any point in time the volume of water in the pipe corresponds to the stock of inventories, and the rate at which water leaves the pipe represents sales. The average length of time that inventories stay in the pipeline is approximated by the ratio of average stocks to sales,

$$L = K(t)/Q(t)$$

(this is just the inverse of the turnover rate). The tax distortion under FIFO equals the difference between actual costs (AC) and reported costs (RC), times the corporate tax rate ($\tau$):

$$D(t) = \{AC(t) - RC(t)\} \cdot \tau$$

$$= \{Q(t)P(t) - Q(t)P(t-L)\} \cdot \tau$$

where P(t) is the price that obtains as inventories leave the pipeline, and P(t-L) the price that obtains when they first enter. (We assume that the price of inventories can be approximated by the step function, P(s).) If we take the limit of D(t) as L approaches zero, then it appears that the tax distortion disappears. However, if we recall the definition of L, this in fact assumes that inventory stocks K(t), shrink to a negligible fraction of sales, Q(t). In terms of the pipeline analogy, this implies that the pipeline completely collapses. Instead, if we substitute K(t)/L for Q(t) in the expression for D(t), and then take the limit, we obtain

$$\lim_{L\to 0} D(t) = \lim_{L\to 0} \left\{ \frac{K(t)P(t) - K(t)P(t-L)}{L} \right\} \cdot \tau$$

which, by successive application of L'hopital's rule, reduces to

$$-K(t) \lim_{L\to 0} \left\{ \frac{dP(t-L)}{dL} \right\} \cdot \tau$$

where 'd' is the differential operator. Now, assuming that $P(s)=\exp(\pi \cdot s)$, this expression becomes

$$\{\pi \cdot K(t)P(t)\} \cdot \tau$$

This is the form of the adjustment made in Bossons (1977) and Tarasofsky et al. (1981), where the replacement value of inventories, K(t)P(t), is approximated by their book value; this approximation will be a good one under FIFO accounting provided that the turnover rate of inventories is high (that is, L is close to zero). The alternative approach based on the GNP inventory valuation adjustment also measures inflationary capital gains on inventories, as a residual: the difference between the total change in book value of inventories, less new acquisitions. This adjustment is considered superior, because it takes account of changes in real stocks that occur during the year, which the other approach is forced to approximate in some fashion. The approach we favour is also used in Jenkins (1977a,b) and Bélanger and McIlveen (1980a,b).

## REFERENCES


Basu, S. and J.R. Hanna (1976). "Accounting for Changes in the General Purchasing Power of Money: The Impact on Financial Statements of Canadian Corporations for the Period 1967-74." Cost and Management 50, 4-16.

Bélanger, G. and N. McIlveen (1980a). Rate of Return and Investment Profitability, Ottawa: Department of Finance.

Bélanger, G. and N. McIlveen (1980b). "Eatimation of the Real Rate of Return on Equity: Methodology and Sourcea." mimeograph, Ottawa: Department of Finance.

Boadway, R. (1980). "Corporate Taxation and Investment: a Synthesis of the Neoclassical Theory." Canadian Journal of Economics 13, 250-267.

Boadway, R.W. and N. Bruce (1979). "Depreciation and Interest Deductions and the Effect of the Corporation Income Tax on Inveatment." Journal of Public Economica 11, 93-105.

Boadway, R.W. and H. Kitchen (1980). Canadian Tax Policy, Toronto: Canadian Tax Foundation.

Boadway, R.W., N. Bruce and J. Mintz (1982). "Corporate Taxation and the Cost of Holding Inventoriea." Canadian Journal of Economics 15, 278-293.

Bossons, J. (1977). The Impact of Inflation on Income and Financing of Large Non-Financial Corporations Supplementary Paper 5 (Ontario Committee on Inflation Accounting), Toronto.

Brealey, R. and S. Myers (1981). Principlea of Corporate Finance, New York: McGraw-Hill, Inc.

Canadian Institute of Chartered Accountanta. Financial Reporting in Canada, Toronto (various issues).

Canadian Tax Foundation. The National Finances, Toronto (various issues).

Chant, J.F. and D.G. McFetridge (1979). The Allocative Effects of Inflation: Interaction Between the Tax System and Anticipated Inflation Rates, Ottawa: Anti-inflation Board.

Courchene, T.J. and D.C. Smith (1982). "Inflation, Indexation, and Capital Income: What's Left of the White Paper." Queen's Discussion Paper 504. Kingston, Ontario: Queen's University Institute for Economic Research.

Davidson, S. and R.L. Weil (1976). "Inflation Accounting: Implications of the FASB Proposal," in Inflation and the Income Tax Henry J. Aaron (ed.), Washington, D.C.: The Brookings Institution.

Economic Council of Canada (1979). Two Cheers for the Eighties (Sixteenth Annual Review), Ottawa.

Feldstein, M. (1976). "Inflation, Income Taxes, and the Rate of Interest: A Theoretical Analysia." American Economic Review 66, 809-820.

Feldstein, M. (1982). "Inflation, Tax Rules and Investment: Some Econometric Evidence." Econometrica 50, 825-862.

Feldstein, M. and L. Summers (1978). "Inflation, Tax Rules, and the Long-Term Interest Rate." Brookings Papera on Economic Activity 1, 61-99.

Feldstein, M. and L. Summera (1979). "Inflation and the Taxation of Capital Income in the Corporate Sector." National Tax Journal 32, 445-470.

Feldstein, M., J. Poterba and L. Dicks-Mireaux (1981). "The Effective Tax Rate and the Pretax Rate of Return." NBER Working Paper 740. Cambridge, Mass: National Bureau of Economic Research.

von Furstenberg, G.M. (1976). "Corporate Taxes and Financing under Continuing Inflation", in AEI Studies Contemporary Economic Problems W. Fellner (ed.), Washington, D.C.: The American Enterprise Institute for Public Policy Research.

von Furstenberg, G.M. (1977). "Corporate Investment: Does Market Valuation Matter in the Aggregate?" Brookinga Papera on Economic Activity 2, 347-97.

Jenkins, G.P. (1977a). Capital in Canada: Its Social and Private Performance, 1965-74 Discussion Paper 98, Ottawa: Economic Council of Canada.

Jenkins, G.P. (1977b). Inflation: Its Financial Impact on Business in Canada, Ottawa: Economic Council of Canada.

Lusztig, P. and B. Schwab (1973). Managerial Finance in a Canadian Setting, Toronto: Holt, Rinehart and Winston Ltd. (Canada).

Modigliani, F. and R.A. Cohn (1979). "Inflation and the Stock Market." Financial Analysts Journal March/April, 24-44.

Palash, C.J. (1978). "Tax Policy: Its Impact on Investment Incentives." Federal Reserve Bank of New York Quarterly Review 3, 30-36.

Pesando, J.E. (1977). The Impact of Inflation on Financial Markets in Canada, Montreal: C.D. Howe Research Institute.

Revenue Canada, Taxation. Taxation Statistics, Ottawa (various issues).

Shoven, J.B. and J.I. Bulow (1975). "Inflation Accounting and Non-financial Corporate Profits: Physical Asaets." Brookings Papers on Economic Activity 3, 557-611.

Shoven, J.B. and J.I. Bulow (1976). "Inflation Accounting and Non-financial Corporate Profits: Financial Assets and Liabilities."Brookings Papers on Economic Activity 1, 15-66.

Statistics Canada. Corporation Financial Statistics 61-207, Ottawa (various issues).

Statistics Canada. Corporation Taxation Statistics 61-208, Ottawa (various issues).

Statiatics Canada. Fixed Capital Flows and Stocks 13-568, Ottawa (various issues).

Statistics Canada. Financial Flow Accounts 13-563, Ottawa (various issues).

Statiatica Canada. Provincial Economic Accounts 13-213, Ottawa (various issues).

Summers, L.H. (1980). "Inflation, Taxation and Corporate Investment." NBER Working Paper 604. Cambridge, Mass.: National Bureau of Economic Research.

Tarasofsky, A., T.G. Roseman and H.E. Waslander (1981). Ex post Aggregate Real Rates of Return in Canada: 1947-76, Ottawa: The Economic Council of Canada.

Tatom, J.A. and J.F. Turley (1978). "Inflation and Taxes: Disincentives for Capital Formation." Federal Reserve Bank of St. Louis Review January, 2-8.

Tideman, T. N. and D.P. Tucker (1976). "The Tax Treatment of Business Profits under Inflationary Conditions." in Inflation and the Income Tax Henry J. Aaron (ed.), Washington, D.C.: The Brookings Institution.

Trust Companies Association of Canada. General Information Bulletin, Toronto (various issues).

Vancil, R.F. and R.L. Weil (1976). "Current Replacement Cost Accounting, Depreciable Assets, and Distributable Income." Financial Analysts Journal July/August, 38-45.

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