A paper prepared for the

Economic Council of Canada

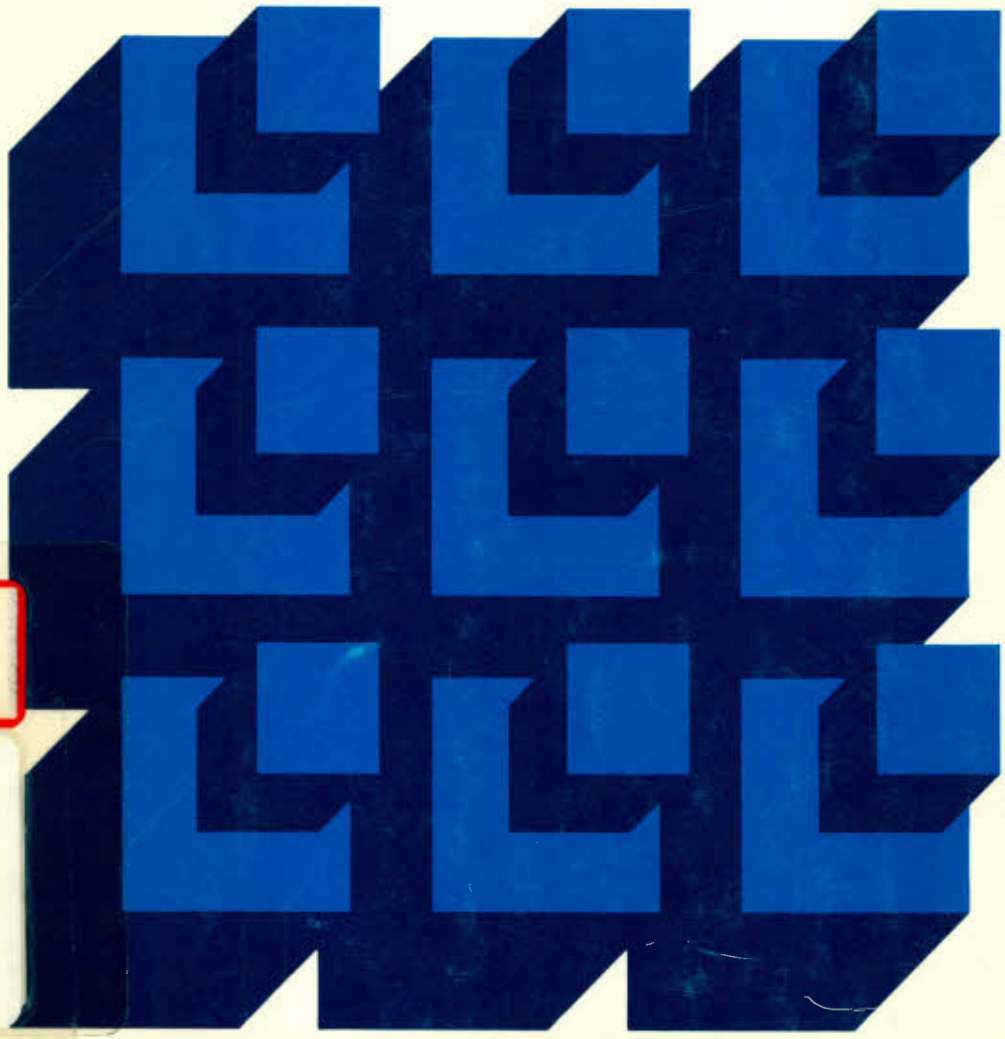
P.O. Box 527
Ottawa, Ontario
K1P 5V6

Un document préparé pour le

Conseil économique du Canada

C.P. 527
Ottawa (Ontario)
K1P 5V6

[redacted]



The **Economic Council of Canada** was established in 1963 by Act of Parliament. The Council is a crown corporation consisting of a Chairman, two Directors and not more than twenty-five Members appointed by the Governor in Council.

The Council is an independent advisory body with broad terms of reference to study, advise and report on a very wide range of matters relating to Canada's economic development. The Council is empowered to conduct studies and inquiries on its own initiative, or if directed to do so by the Minister, and to report on these activities. The Council is required to publish annually a review of medium- and long-term economic prospects and problems. In addition it may publish such other studies and reports as it sees fit.

The Chairman is the Chief Executive Officer of the Council and has supervision over and direction of the work and staff of the Council. The expenses of the Council are paid out of money appropriated by Parliament for the purpose.

The Council as a corporate body bears final responsibility for the *Annual Review*, and for certain other reports which are clearly designated as *Council Reports*. The Council also publishes *Research Studies, Discussion Papers* and *Conference Proceedings* which are clearly attributed to individual authors rather than the Council as a whole. While the Council establishes general policy regarding such studies, it is the Chairman of the Council who bears final responsibility for the decision to publish authored research studies, discussion papers and conference proceedings under the imprint of the Council. The Chairman, in reaching a judgment on the competence and relevance of each author-attributed study or paper, is advised by the two Directors. In addition, for *authored Research Studies* the Chairman and the two Directors weigh the views of expert outside readers who report in confidence on the quality of the work. Publication of an author-attributed study or paper signifies that it is deemed a competent treatment worthy of public consideration, but does not imply endorsement of conclusions or recommendations by either the Chairman or Council members.

Établi en 1963 par une Loi du Parlement, le **Conseil économique du Canada** est une corporation de la Couronne composée d'un président, de deux directeurs et d'au plus vingt-cinq autres membres, qui sont nommés par le gouverneur en conseil.

Le Conseil est un organisme consultatif indépendant dont le mandat lui enjoint de faire des études, donner des avis et dresser des rapports concernant une grande variété de questions rattachées au développement économique du Canada. Le Conseil est autorisé à entreprendre des études et des enquêtes, de sa propre initiative ou à la demande du Ministre, et à faire rapport de ses activités. Chaque année, il doit préparer et faire publier un exposé sur les perspectives et les problèmes économiques à long et à moyen termes. Il peut aussi faire publier les études et les rapports dont la publication lui semble opportune.

Le président est le directeur général du Conseil; il en surveille les travaux et en dirige le personnel. Les montants requis pour acquitter les dépenses du Conseil sont prélevés sur les crédits que le Parlement vote à cette fin.

En tant que personne morale, le Conseil assume l'entière responsabilité des *Exposés annuels*, ainsi que de certains autres rapports qui sont clairement désignés comme étant des *Rapports du Conseil*. Figurent également au nombre des publications du Conseil, les *Études*, *Documents* et *Comptes rendus de colloques*, qui sont explicitement *attribués à des auteurs particuliers* plutôt qu'au Conseil lui-même. Celui-ci établit une politique générale touchant ces textes, mais c'est au président qu'il incombe de prendre la décision finale de faire publier, sous les auspices du Conseil économique du Canada, les ouvrages à nom d'auteur tels que les études, documents et rapports de colloques. Pour se prononcer sur la qualité, l'exactitude et l'objectivité d'une étude ou d'un document attribué à son auteur, le président est conseillé par les deux directeurs. De plus, dans le cas des *études à nom d'auteur*, le président et les deux directeurs sollicitent l'avis de lecteurs extérieurs spécialisés, qui font un rapport confidentiel sur la qualité de ces ouvrages. Le fait de publier une étude ou un document à nom d'auteur ne signifie pas que le président ou les membres du Conseil souscrivent aux conclusions ou recommandations contenues dans l'ouvrage, mais plutôt que l'analyse est jugée d'une qualité suffisante pour être portée à l'attention du public.

DISCUSSION PAPER NO. 293

A Comparison of Effective Marginal Tax Rates in Canadian Manufacturing

by Michael Daly
Jack Jung
Pierre Mercier
Thomas Schweitzer

The findings of this Discussion Paper are the personal responsibility of the authors and, as such, have not been endorsed by members of the Economic Council of Canada.

Discussion Papers are working documents made available by the Council, in limited number and in the language of preparation, to interested individuals for the benefit of their professional comments.

Requests for permission to reproduce or excerpt this material should be addressed to:

Council Secretary
Economic Council of Canada
Post Office Box 527
Ottawa, Ontario
K1P 5V6

ISSN-0225-8013

November 1985

ACKNOWLEDGMENT

The authors are especially indebted to Alan Macnaughton for his advice and suggestions. They are also extremely grateful to Richard Bird, Sylvester Damus, Don Fullerton, Glenn Jenkins, John Joisce, Mervyn King, and David Sewell for their many helpful comments, and to Guy Camirē, for his excellent computer programming assistance. The usual disclaimer applies.

RÉSUMÉ

Les auteurs examinent la structure des taux d'impôt effectifs applicables au rendement des nouveaux investissements effectués dans 20 industries manufacturières, en tenant compte de l'impôt sur les sociétés, sur la propriété (impôt foncier) et sur les particuliers. Les taux effectifs marginaux d'impôt sur le rendement du capital varient considérablement, selon le type d'investissement (machines, immeubles ou inventaires), le mode de financement (emprunts, nouvelles émissions d'actions ou bénéfices non distribués), le status fiscal de l'investisseur qui fournit les fonds (ménages, institutions exonérées d'impôt ou compagnies d'assurance), ainsi que l'industrie où les capitaux sont investis. Non seulement cette situation est-elle injuste, mais elle risque de créer éventuellement de graves distorsions dans les décisions d'investir et d'épargner.

D'après nos simulations, le régime fiscal touchant les sociétés n'influe que faiblement sur le taux effectif marginal global puisque, dans près de la moitié des industries examinées et dans l'ensemble du secteur manufacturier - si on l'examine isolément -, il subventionne les entreprises et, par conséquent, réduit en fait

le taux global. Il est néanmoins la cause principale des écarts interindustriels des taux effectifs marginaux. Par contre, le régime de l'impôt sur les particuliers exerce une influence considérable sur le taux effectif marginal global applicable au rendement du capital, mais il n'explique que faiblement les écarts de taux entre industries. L'impôt sur les propriétés commerciales contribue, lui, de façon importante à ces écarts.

La grande variation des taux effectifs marginaux d'impôt sur les sociétés suivant le genre d'actif, les formes de financement et, par conséquent, les industries, est en grande partie attribuable aux provisions pour amortissement accéléré des machines et au crédit d'impôt à l'investissement. Les dispositions fiscales mentionnées ci-dessus, conjuguées au niveau élevé des taux statutaires d'impôt sur les sociétés, favorisent les entreprises et les industries dont le coefficient d'emprunt est très élevé et qui investissent beaucoup plus dans les machines que dans les immeubles ou les inventaires. C'est donc dire qu'on pourrait éliminer en grande partie les écarts interindustriels et intraindustriels des taux d'impôt en réduisant ou en supprimant le crédit d'impôt à l'investissement et en fondant l'amortissement fiscal sur une véritable dépréciation économique au coût de remplacement des machines, tout en ajustant à la baisse le taux d'impôt statutaire sur les sociétés afin de maintenir à un niveau constant les recettes totales provenant de l'impôt sur les sociétés.

ABSTRACT

This paper examines the pattern of effective tax rates on income from new investments undertaken by corporations in 20 Canadian manufacturing industries, taking into account corporate, property, and personal taxes. We find that effective marginal tax rates on capital income vary enormously, depending on the type of investment (machinery, buildings, or inventories), method of finance (debt, new share issues, or retained earnings), the tax status of the investor supplying the funds for the investment (household, tax-exempt institutions, or insurance companies), and the industry in which the investment takes place. Such a situation is not only unfair, it also constitutes a potentially serious distortion in investment and savings decisions.

According to our simulations, although the corporate tax system contributes little to the overall effective marginal tax rate - indeed, in almost half of the industries examined as well as in the manufacturing sector as a whole the corporate tax system alone provides a subsidy and thus actually reduces the total marginal tax rate - it bears primary responsibility for the variation in effective marginal tax rates among industries. By contrast, the personal tax system accounts for a large proportion of the total

effective marginal tax rate on capital income but little of the inter-industry variation. Business property taxes are also an important source of variation in marginal tax rates between industries.

The wide dispersion in effective marginal corporate tax rates across assets, forms of finance and therefore between industries can be largely attributed to accelerated depreciation allowances for machinery and the investment tax credit. The foregoing tax provisions in conjunction with high statutory corporate tax rates favour those firms and industries which are highly levered and which invest relatively heavily in machinery as opposed to buildings or inventories. If follows that much of the inter- and intra-industry dispersion in tax rates could be eliminated by reducing or abolishing the investment tax credit and basing capital cost allowances on true economic depreciation at replacement cost, while at the same time adjusting the statutory corporate tax rate downwards in order to keep total corporate tax revenue constant.

CONTENTS

1 INTRODUCTION

One of the most worrisome aspects of Canada's recent economic performance has been the dramatic slump in the rate of productivity improvement since 1973. The obvious importance of capital as a factor contributing to output and labour productivity growth has led some observers to place much of the blame for the productivity slowdown on a lack of investment, thus prompting demands for drastic cuts in the taxation of capital income and the provision of more generous investment incentives. However, given that the rate of capital formation actually accelerated during the 1974-80 period compared to 1967-73[1] and investment spending in Canada as a proportion of Gross Domestic Product has been high by international standards, it would appear that Canada's disappointing economic performance since 1973 in relation to Japan and most Western European countries cannot be attributed to any great shortfall in investment. Instead, greater attention might be focused on the inefficient use of the nation's capital stock.

Much of the blame for the misallocation of capital resources both in Canada and abroad has been directed at governments, with the structure of capital income taxation and associated investment incentives frequently cited as among the main culprits. Lack of uniformity in the tax treatment of different investments is reflected in a wide variation of the tax rates on capital

income across assets and types of finance, and therefore between industries. Major reports published during the late 1970s in Sweden, the U.S. and the U.K. all identified the haphazard tax treatment of income from capital as a potential cause of distortions in investment and saving decisions,[2] a view that has been confirmed by King and Fullerton in their recent comparative study of the same three countries together with West Germany.[3]

King and Fullerton also examined the importance of inflation through its interaction with the tax system as a potential source of capital misallocation. In all four countries they examined, inflation appears to increase the dispersion in tax rates. Judging from evidence reported by Boadway, Bruce and Mintz[4], using an approach similar to that of King and Fullerton, this phenomenon exists in Canada too where inflation appears to have accentuated the dispersion in effective tax rates on capital income from different types of assets (buildings, machinery, land, and inventories).

As a result of the foregoing types of studies, far-reaching tax changes are now being implemented or explored by governments in two major economies (the U.S. and the U.K.). These changes are designed to decrease the dispersion in tax rates by broadening the tax base, through the elimination or reduction of incentives and deductions, and at the same time cutting statutory tax rates on both corporate and personal income. Major revisions to the corporate tax structure are already being introduced in the U.K.

following the 1984 budget, while substantial changes in the U.S. tax system are being proposed by President Reagan. Similar changes are under consideration in Canada where a recent discussion paper accompanying the 1985 Federal Budget argues that reducing the degree of variation in the current pattern of tax rates among sectors of the economy could lead to a more efficient allocation of investments and thereby enhance the prospects for economic growth.[5]

Interestingly enough, whereas the reports of the late 1970s published in Sweden, the U.S., and the U.K. tended to favour a shift towards an expenditure-based tax (and thus the elimination of taxes on capital income) as the best means of removing the variance in tax rates, the reforms under way in the U.K. or being proposed in the U.S. and Canada are aimed more at the mitigation of non-neutralities inherent in what are ostensibly income-based tax systems, especially at the corporate level.[6]

This study is part of a broader project whose intent is to examine the pattern of effective tax rates on new investments undertaken in the corporate sector along the lines suggested by King and Fullerton[7], taking into account not only corporate taxes but also personal and property taxes. As in King and Fullerton, tax rates are computed for three types of assets (machinery, buildings, and inventories), three methods of finance (debt, new share issues, and retained earnings), and three kinds of savers (households, tax-exempt institutions, and insurance companies).

However, whereas King and Fullerton grouped industries into three broadly defined sectors (manufacturing, commerce, and other) in order to arrive at aggregate effective tax rates for each of the four countries, which were then used to make international comparisons, this particular paper adopts a more disaggregative approach and focuses its attention primarily on inter-industry differences by comparing effective marginal tax rates across twenty manufacturing industries. Discrepancies in effective marginal tax rates on different types of capital and across industries are indicative of the potential distortion in investment decisions due to the corporate and personal tax systems.

Our primary objective is to point out those features of the present tax system that contribute most to the variation in marginal effective tax rates between investments. We measure the dispersion of effective marginal tax rates and use it as an efficiency criterion to evaluate proposed reforms of the existing corporate tax structure. In other words, tax changes will be considered desirable insofar as they reduce the variation in effective marginal tax rates between industries and across investment projects. At the same time, we will examine the extent to which inflation affects both tax rates and their dispersion among assets and industries. Finally, the sensitivity of our estimates of tax rates to different assumptions will be investigated paying special attention to alternative arbitrage

mechanisms, that is, the manner in which capital market equilibrium is achieved.

The next section of the paper outlines the approach used to compute effective marginal tax rates for different types of investment, but can be omitted by readers who are either familiar with or not interested in the King and Fullerton methodology.[8] Section 3 provides a brief description of the Canadian corporate and personal tax systems together with the tax parameters used. Estimates concerning effective marginal tax rates among investments in Canadian manufacturing as well as some proposals for reducing the dispersion in tax rates among assets and industries are discussed in section 4. Section 5 contains a summary of our main findings together with some concluding comments. Calculations of effective marginal tax rates under alternative capital market equilibrium assumptions are reported in the Appendix.

2 THE MEASUREMENT OF EFFECTIVE TAX RATES

Most discussion regarding effective tax rates on capital income and their impact on investment have tended to focus on total taxes paid out of corporate profits, that is, the effective average corporate tax rate.[9] While this may be an appropriate measure of the burden of taxes on corporate profits, it can nevertheless be extremely misleading as a measure of the incentive to undertake new investments. Furthermore, it ignores the interaction between

the corporate and personal tax systems. The incentive to invest depends on effective marginal tax rates which combine corporate and personal taxes. Effective tax rates can diverge markedly from statutory rates due to various tax credits and deductions, while marginal tax rates are concerned with new investment rather than the observed tax on past or average investment.[10]

In order to calculate effective marginal tax rates on capital income in Canadian manufacturing industries, we follow the approach taken by King and Fullerton as well as by Boadway, Bruce and Mintz and the Department of Finance.[11] We shall consider hypothetical marginal investment projects and compute directly the tax wedge between the rate of return on an investment and the rate of return on savings used to finance the project. The size of the tax wedge depends upon the corporate tax system (including depreciation allowances, investment tax credits, and other deductions), the personal tax system and how it treats interest, dividend and capital gains income, as well as upon business property taxes. The effective marginal tax rate on an investment project is related to the type of asset purchased (machinery, buildings, or inventories), the manner in which the investment is financed (debt, new share issues or retained earnings), the identity of the investor supplying the funds (households, tax-exempt institutions, or insurance companies), and the industry in which the investment is made. For each different combination of the foregoing characteristics, we calculate a corresponding estimate of the effective marginal tax rate of which there are 540 in all

(3 assets x 3 methods of finance x 3 categories of owner x 20 industries).

Although these estimates will be separated into components related to the corporate tax and the personal tax, an overall measure is also be derived in order to capture the interaction between the two tax systems. For example, as far as households are concerned, interest payments that are deductible from income for tax purposes at the corporate level are taxed upon receipt at the personal level once the $1,000 deduction for interest, dividends, and capital gains is exhausted. Moreover, the corporate and personal tax systems are to some extent integrated by means of the dividend tax credit.

The total tax wedge, w, is the difference between the real rate of return on investment (net of depreciation), p, and the after-tax real rate of return on the savings used to finance the investment, s. The effective marginal tax rate is defined as,

$$t = w/p = (p-s)/p. \qquad (1)$$

The total tax wedge can be separated into two components, the corporate tax wedge (which includes property taxes levied on companies), cw, and the personal tax wedge, pw. These measure the contribution to the total wedge of the corporate and property tax systems combined and of the personal tax system, respectively, and are defined as cw = p-x and pw = x-s, where x may be regarded as

the real cost of funds to the corporation. The effective marginal corporate tax rate (inclusive of property taxes), t_c, and the effective marginal personal tax rate, t_p, are defined as

$$t_c = cw/p = (p-x)/p \tag{2}$$

and $$t_p = pw/x = (x-s)/x. \tag{3}$$[12]

Since interest payments on corporate debt are tax-deductible, the real cost of funds in the case of debt-financed investments is

$$x = \rho/(1-\tau) - \pi, \tag{4}$$

while for investments financed by new share issues or retained earnings,

$$x = \rho-\pi, \tag{5}$$

where τ is the statutory corporate tax rate, π is the expected inflation rate, and ρ denotes the rate of return on an investment project net of corporate and business property taxes. The latter can also be interpreted as the rate at which the company discounts nominal profits.

The value of the discount rate, ρ, depends on the real interest rate, r, and the expected inflation rate as well as on the manner in which the investment is financed and the tax status of the

saver providing the funds. As nominal interest payments are tax-deductible at the corporate level, for debt finance

$$\rho = i(1-\tau), \tag{6}$$

where i denotes the nominal rate of interest. In the case of new shares sold to households, potential investors would require a rate of return equal to $i(1-m)$, where m is the investor's marginal personal tax rate on interest income. If the project yields a return net of corporate and property taxes of ρ, then the latter must be such as to equate the dividend net of personal taxes $\rho\theta(1-m)$ with the investor's opportunity cost rate of return $i(1-m)$. It follows that

$$\rho = i/\theta \tag{7}$$

where θ equals the additional dividends shareholders would receive if one unit of post-corporate tax earnings were distributed. Similarly, where retained earnings are the source of finance so that the rate of return ρ is subject to capital gains tax instead of income tax, the household investor would require a yield such that $\rho(1-z) = i(1-m)$, where z is the effective tax rate on accrued capital gains. Hence, the discount rate associated with retained earnings is

$$\rho = i(1-m)/(1-z). \qquad (8)$$

Where the investor is a tax-exempt institution, the firm's discount rate for new share issues and retained earnings is, of course, the nominal interest rate, i. For reasons explained in section 3, the appropriate firm discount rate for new shares sold to life insurance companies is $\rho = i(1-\tau_I)$, while for retained earnings the discount rate is $\rho = i(1-\tau_I)/(1-z_I)$, where τ_I is the corporate tax rate on life insurance business and z_I is the effective accrued tax rate on capital gains realized by life insurance companies. The discount rates corresponding to each type of saver and method of finance are summarized in Table 1.

The rate of return paid by the company on the saver's financial claims is the crucial link between the company carrying out the investment and the saver providing the funds. If, for example, the saver lends money to the company in the form of a fixed interest loan, then the company must pay the market interest rate on the loan. We denote the real rate of interest on such corporate debt by r and the corresponding nominal interest rate by i, so that $r = i-\pi$. For any given investment project, we may ask the following question. What is the minimum rate of return it must yield before taxes in order to provide the saver with the same net of tax return he would receive from lending at the market rate of interest? This minimum pretax rate of return is called the cost of capital.

The relation between the cost of capital and the real rate of interest may be expressed as

$$p = c(r), \tag{9}$$

where the cost of capital function, $c(r)$, depends upon the industry in which the investment is undertaken, the type of capital purchased, the method of finance used, and the saver supplying the funds. The cost of capital function $c(r)$ also depends on the tax structure.[13]

Condition (9) can be interpreted in two ways. On the one hand, it may be considered as an expression of capital market equilibrium determining the minimum rate of return on various types of investments financed in different ways that must be earned by profit maximizing firms operating in an economy with a given real interest rate. In this case, p is determined by r. Alternatively, condition (9) may be viewed as indicating the maximum interest rate such that savers would be indifferent between lending at this rate and receiving the after-tax proceeds on a given investment financed in a particular way yielding a given pre-tax return of p. Here r is determined by p. The latter interpretation is the basis for what King and Fullerton refer to as their <u>fixed-p</u> tax computations whereas the former interpretation is used in their <u>fixed-r</u> calculations.[14]

The relation between the market interest rate and the net return to the saver, s, is determined by the personal tax system. Since taxes are levied on nominal interest income, the post-tax real rate of return received by the saver is

$$s = (1-m)\, i - \pi. \qquad (10)$$

The relationship between i and ρ, as summarized in Table 1, implies that the value of s depends upon the manner in which the investment is financed and the identity of the saver providing the funds (see Table 2). The tax wedges and thus the effective marginal tax rates for each investment project can then be computed using equations (1) to (10).

Remark that if the tax credits and deductions on marginal investments are sufficiently generous to ensure that not only are no taxes paid on income from the marginal investment, but that in addition less taxes are paid on the corporation's income from other non-marginal investments, then the marginal investment is, in effect, subsidized through the tax system.

Our main set of calculations of effective marginal tax rates involves the assumption that all projects earn the same pre-tax rate of return net of depreciation, irrespective of the industry, asset, method of finance, and the tax status of the investor providing the funds for the project. This is what King and Fullerton refer to as the <u>fixed-p case</u>.[15] The fixed-p

calculations reflect the schedule of tax rates faced by different combinations, and computation of the tax wedges or tax rates corresponding to a common value of p permits us to compare the incentives the tax system provides for different kinds of investment projects. Our subsequent fixed-p calculations of marginal tax rates assume a pre-tax real rate of return of 10 per cent.

Needless to say, one would expect capital investment to be encouraged in low-taxed projects relative to more highly taxed ones. Unfortunately, there is very little agreement among economists as to what constitutes an appropriate capital market equilibrium. Hence, we focus our attention on the fixed-p calculations of effective marginal tax rates which are independent of any assumptions regarding capital market equilibrium. Alternative estimates of effective tax rates under various capital market equilibrium assumptions are, however, reported in the Appendix to show that our principal conclusions hold no matter what assumption is made.

For each hypothetical project we compute an effective marginal tax rate. As mentioned earlier, the effective tax rate on an investment project in a given industry depends on the particular combination of characteristics (of which there are three categories): (1) the asset in which the funds are invested (machinery, buildings, and inventories), (2) the method by which the project is financed (debt, new share issues, and retained

earnings), and (3) the way in which savings are channelled to corporations (from households directly, or via tax-exempt institutions and life insurance companies). Thus for each of the 20 industries we have 27 distinct tax rates associated with each of the three foregoing categories of characteristics. We can then compute an overall effective marginal tax rate for every industry by weighting each combination of asset, source of finance, and category of owner by the appropriate capital stock weight associated with that combination.

In order to examine the impact of inflation on effective marginal tax rates through its interaction with the tax system, we calculate tax rates for three different rates of inflation. The estimates with zero inflation also attempt to describe the impact of a fully indexed tax system on tax rates. In addition, we incorporate the 1984 inflation rate of 4.4 per cent as well as 10 per cent.

To conclude this section, a few remarks are warranted regarding the King and Fullerton methodology which provides the basis for our computations of effective marginal tax rates. First and foremost, our calculations assume that the marginal investment is financed by domestic savers.[16] This assumption is justified by the apparently strong positive correlation between domestic saving and investment rates among OECD countries as reported in Feldstein and Horioka, Feldstein, and Summers,[17] which suggests that capital

is not perfectly mobile internationally. Needless to say, with perfect international capital mobility there would be no systematic relationship between domestic saving and investment rates and only corporate (including property) taxes, not personal taxes, would be relevant for investment decisions.

Our calculations also assume perfect certainty and thus make no explicit allowance for risk. As argued by King and Fullerton,[18] this in itself is not a significant assumption because the effect of risk is primarily to change the required rate of return on an investment project. In general, the greater the risk associated with the project, the higher the required rate of return. The resulting differences in the required rate of return mean that the value of r chosen in the fixed-r calculations reported in the Appendix might differ for projects with varying degrees of risk. However, our objective is to evaluate the incentives provided by the tax system and therefore it seems sensible to use a common value of r (or p) for all projects. Even if risk differs from one industry or asset to another, that does not alter the fact that in the fixed-p case the tax system imposes a wedge between a given rate of return on a project and the rate of return that can be paid out to the supplier of finance.

Finally, it is assumed that all relevant tax allowances can be claimed by the firm. This requires that firms undertaking the marginal investment have positive taxable profits or, equivalently, that the tax system is symmetric in that it makes

refunds of losses at the same rate at which it taxes profits. In practice, there are firms with negative taxable profits that are unable to claim allowances. Still, tax losses can be carried forward and backward so that the fact that taxable income is currently negative does not necessarily mean that the tax allowances are lost forever.[19]

3 THE TAXATION OF CAPITAL INCOME IN CANADA

Since the Second World War, Canada's income tax system has undergone a large number of changes, many of them affecting the taxation of income from capital. To encourage investment, a variety of tax concessions have been embodied in the tax system, particularly at the corporate level, with the manufacturing sector receiving especially favourable treatment. Among the most important of these concessions are the accelerated write-off for tax purposes of certain capital expenditures and the investment tax credit. Such concessions help to explain the marked decline in the contribution of the corporate tax to total tax receipts.[20] Whereas in 1951, the corporate tax yielded almost one-quarter of total tax revenue, by 1982 its share had dropped to only 6.5 per cent. By contrast, despite measures to encourage personal saving, the personal tax has grown to such an extent that it is now the main source of revenue for federal and provincial governments combined, accounting for over 30 per cent of total tax receipts in 1982.

The Corporate Tax System

Although the basic statutory federal corporate tax rate is 46 per cent, this rate is reduced by 10 percentage points to allow room for provinces to levy their own corporate taxes at different rates. Reductions in both federal and provincial corporate tax rates are then permitted for firms engaged in manufacturing and processing as well as for small businesses. Not surprisingly, as shown in Table 3, the resulting statutory corporate tax rate (τ) varies considerably among industries.

Effective corporate tax rates on new investments are, however, well below these statutory rates for a number of reasons. First, accelerated depreciation allowances enable firms to write-off their investments for tax purposes long before the end of their useful lives. Manufacturing and processing machinery (CCA class 29), for example, can be written off in only three years. Second, investment tax credits (ITCs) are available for new investments of specific types at rates that vary by region. Third, interest payments on corporate debt are treated as a business expense and are therefore tax-deductible, whereas dividends on equity capital are not.

The foregoing tax credits and deductions together with the tax treatment of inventories lead to wide variation in effective marginal corporate tax rates among different types of capital and sources of finance. The discrepancies result from the fact that

effective ITC rates ($\bar{g}$) differ by asset and by industry (see Table 4). Moreover, accelerated capital cost allowances result in machinery being taxed much less than either buildings, whose tax lives correspond more closely with economic lives, or inventories. Investments in buildings are further penalized compared to other types of assets because they tend to bear a disproportionate burden of property taxes (w_c) which again vary between industries (see Table 3). As regards inventories, FIFO accounting methods mean that when an item is taken out of a firm's inventory the deduction allowed is equal only to the cost of acquiring the oldest item held in the inventory. Hence, during inflationary periods, the deduction for use of inventories falls short of their replacement cost so that taxable income is overstated. Consequently, the effective corporate tax rate associated with investment in inventories rises with inflation. In order to partly compensate for this, firms have been permitted a 3 per cent inventory allowance since 1977. Nevertheless, to the extent that the rate of inflation exceeds 3 per cent, corporate taxes on inventories increase. Inflation also tends to reduce the value of capital cost allowances. They too are based on historical rather than current replacement cost.

The tax deduction accorded to corporations on their interest payments (and the non-deductibility of dividend payments) means that investments financed by debt are taxed much less at the corporate level than those financed by new share issues or retained earnings. This discrepancy widens with inflation because

nominal interest rates rise in order to compensate lenders for the decline in the purchasing power of the funds loaned. In effect, under inflationary conditions, the corporate tax system permits borrowers to deduct part of the loan principal outstanding as well as real interest expenses.

As a result of these tax deductions and credits accorded to corporations, firms and industries with different capital and financial structures can be expected to face vastly different effective marginal corporate tax rates, both within the manufacturing sector and in the economy as a whole. Firms and industries investing relatively heavily in machinery and using debt finance receive more favourable tax treatment than those investing in buildings or inventories and using equity finance.

The Personal Tax System

Saving and investment decisions can also be affected by the treatment of capital income under the personal tax system. In our model, investments can be financed by savings from three categories of owner: (1) households, (2) tax-exempt institutions, and (3) insurance companies. The first category includes saving through intermediaries such as banks or mutual funds that are subject to tax. The second category includes savings held indirectly by households in the form of pension funds and registered retirement savings plans together with the pension business of life insurance companies. The third category involves

mostly funds invested as part of contractual savings made by households through life insurance policies. As we shall see below, the tax treatment of income from each category of savings is quite different.

(a) Households

While nominal interest paid on corporate debt is tax-deductible, it is taxable when received as income by households at a rate m_d. Shareholders typically face a marginal personal tax rate on their interest income of m_e which is higher than m_d because dividends are concentrated more heavily among persons in high income brackets than is interest income. In order to provide relief from double taxation, part of the corporation's tax bill is, in effect, imputed to shareholders. Each dollar of dividends received by Canadian taxpayers from taxable Canadian corporations is regarded as having paid personal tax at the rate c and is therefore equivalent to a gross dividend of $\$1/(1-c)$. In other words, the dividend is "grossed up" at the rate c, the imputation rate, which is approximately one-third. As this gross dividend is deemed to have paid tax at the rate c, shareholders are entitled to a credit against their personal tax liability of $c/(1-c)$ per unit of dividends received,[21] which, in effect, reduces the marginal personal tax rate on dividend income from m_e to $\hat{m}_e$. The dividend tax credit is reflected in our model by the parameter θ, the opportunity cost of retained earnings in terms of gross dividends foregone, which can be defined as

$$\theta = 1/(1-c) = (1-\hat{m}_e)/(1-m_e). \qquad (11)$$

The personal tax parameters m_d, m_e and $\hat{m}_e$ were obtained from the Department of Finance's tax simulation model using 1981 data on a sample of taxfilers and the 1984 tax structure. In order to calculate the effective marginal tax rate on a particular type of income, the simulation model raises all taxfilers' receipts of that income by 1 per cent, recalculates their tax liabilities, sums the additional taxes that would be paid, and then divides by the total increase in all filers' income. The effective marginal tax rate is therefore a weighted average, where the weights are the taxfilers' shares of the type of income under consideration.

The simulation model shows that if a marginal dollar of interest income were distributed proportionately among taxfilers according to their share of total interest income, the additional taxes would be 32 cents. In the case of an additional dollar of dividend income, not taking into account the dividend tax credit, 42 cents would be paid in taxes. Hence, m_d=0.32 and m_e=0.42. However, the dividend tax credit reduces the amount of taxes paid on dividend income to 13 cents, so that $\hat{m}_e$ = 0.13.[22]

Retained earnings are subject to personal income tax only in so far as they result in increased share prices, and then only upon realization. The advantage from tax deferral depends on the proportion of gains realized in each year. The marginal statutory tax rate on capital gains, z_s, was estimated to be 21 per cent.

To account for the deferral of taxes, the latter was converted into an effective accrued tax (EAT) rate, using the simple model of investor behaviour discussed in King.[23] The EAT rate, z, is given by

$$z = \frac{\lambda\, z_s\, (1+s+\pi)}{(\lambda+s+\pi)}, \qquad (12)$$

where λ, the proportion of accumulated accrued capital gains realized by investors in each period, is assumed to be 10 per cent.[24]

(b) Tax-exempt institutions (pension funds and RRSPs)

By definition, tax-exempt institutions administering pension funds and RRSPs pay no tax on interest income, dividends or capital gains. Implicit in our model is the assumption that the personal income tax rate against which contributions to pension schemes and RRSPs are deducted is the same as the rate at which retirement benefits are taxed when paid out. In practice, however, most individuals are likely to face higher tax rates while making contributions to pension schemes and RRSPs during their working lives than when they receive retirement income. To the extent that tax rates fall after retirement, the effective tax rate on capital income from pension and RRSP funds is negative rather than zero. Consequently, our calculations tend to

overstate the actual marginal tax rate on capital income for this particular category of ownership.[25]

(c) The taxation of life insurance[26]

As regards the tax treatment of income from savings through life insurance policies, the taxation of both the life insurance company and the policyholder needs to be taken into account. Life insurance policyholders are not taxed on income earned through "exempt" life insurance policies unless and until the policy is surrendered or matures as an endowment.[27] In such a situation personal taxes are postponed for perhaps 10 to 20 years and even then probably paid at low post-retirement rates so that the discounted value of tax payments is sufficiently small to be ignored. Hence our calculations assume a zero personal tax rate for the policyholder. Needless to say, if any personal taxes are paid on income received upon maturity or surrender of an exempt policy, our calculations will tend to underestimate effective marginal tax rates on investment income received by households indirectly via life insurance companies. Unfortunately, more precise estimates of these personal tax rates require information concerning life insurance business that is not readily available. Our calculations also ignore taxes on premiums which are levied by some provinces.

Life insurance companies are allowed policy reserve deductions which ensure that any interest income earned on policyholders'

funds is not taxable if it is used to fund future payments to policyholders. Our model assumes that no excess profits are earned by life insurance companies so that all income earned on policyholders' funds is required to fund these future payments. It follows that if a life insurance company invests in corporate debt, its tax rate is zero. If, instead, the insurance company invests in shares, the policy reserve deduction is still permitted even though investment income may be taxed at a very low rate or not at all owing to the fact that intercorporate dividends are tax deductible upon receipt to avoid double taxation. By contrast, realized capital gains[28] are taxed at half the insurance company's statutory rate, τ_I, which was estimated to be 49.09 per cent.[29] The net effect, therefore, of using policyholders' funds to invest in equity can be to reduce the corporate tax paid by the life insurance company on its income from other activities. The latter together with the assumed zero personal tax rate applying to the policyholder means that income from equity held by life insurance companies is subsidized under the existing tax system.

Given the preferential tax treatment accorded to income from savings deposited with life insurance companies, it might seem surprising that much more savings are not channelled through such institutions. As shown in Table 7, only a small proportion of corporate debt and equity is held by life insurance companies. This is partly due to the fact that payment of life insurance premiums involves the purchase of protection against the

improbable event of death as well as saving, and the latter can only be increased if a greater amount of insurance is bought. Moreover, income accruing on an insurance policy is tax-exempt only if the policy's accumulating fund is sufficiently small relative to the death benefit. In other words, the saving element of a life insurance policy must be small relative to the insurance element. No doubt, the joint nature of the insurance product considerably limits its attractiveness as a savings vehicle.

4 ESTIMATES OF EFFECTIVE MARGINAL TAX RATES

Principal Results

Given the tax parameters in the previous section, effective marginal tax rates on capital income can be computed for each of the 27 combinations of characteristics outlined earlier across 20 manufacturing industries. Using the capital stock, financing and ownership weights summarized in Tables 5, 6 and 7, the tax rates associated with each of the 27 hypothetical investment projects can then be aggregated within each industry. The resulting tax rates are shown in Table 8 based on the fixed-p case in which each hypothetical investment project is assumed to earn a pre-tax real rate of return of 10 per cent per annum and the expected inflation rate is 4.4 per cent (the rate prevailing in 1984). The column under machinery, for example, gives the weighted average marginal tax rates over the nine combinations containing machinery within

each industry, while the last column gives the weighted average tax rate for each industry covering 27 combinations.

The most striking feature of Table 8 is the wide dispersion in tax rates among investments according to the type of capital, method of finance, category of owner, and industry. Rates range from a 72.51 per cent tax on building investments in Knitting Mills to a subsidy of 77.41 per cent on investment by insurance companies in Paper and Allied Industries.[30] As a result of this variation in tax rates among broad categories of investments, a 28 percentage point gap exists between the highest and the lowest taxed industries.[31]

As regards differences in tax rates among types of capital, source of finance, and category of owner, the following general conclusions can be drawn. First, the tax rate on machinery is much lower than that on either buildings or inventories because of accelerated depreciation allowances. While buildings are taxed slightly less than inventories under the combined personal and corporate systems, when property taxes are taken into account, buildings tend to be taxed more than inventories. Second, the tax deduction accorded to interest paid on debt by corporations means that investments financed by debt are taxed much less than those financed by new share issues or retained earnings. In some industries, debt financed investments even receive a subsidy. Similar tax rates apply to retained earnings and new share issues within each industry by virtue of the dividend tax credit. Third,

investments financed by savings channelled directly from households to corporations are taxed a great deal more than those financed by savings channelled indirectly to corporations through tax-exempt institutions or insurance companies. Investments financed by savings channelled through tax-exempt institutions are taxed at very low rates and in some instances receive a small subsidy compared to households, while investments financed by savings channelled through insurance companies benefit from a substantial subsidy. Finally, even for a particular type of asset, source of finance, or category of owner, wide differences in tax rates can be observed across industries.

Sources of Variation in Effective Marginal Tax Rates

Although the corporate tax system (including accelerated depreciation allowances and investment tax credits) contributes little to the overall tax rate - indeed in almost half of the manufacturing industries examined as well as in the manufacturing sector as a whole, the corporate tax system alone constitutes a subsidy and thus actually reduces the total tax rate - it is responsible for much of the variation in effective marginal tax rates among assets and sources of finance, as well as between industries. As indicated in Table 9, whereas Miscellaneous Manufacturing faces a corporate tax rate of 5.91 per cent, Paper and Allied industries are subsidized at a rate of 13.87 per cent; a range of nearly 20 percentage points. By contrast, the personal tax system accounts for a large proportion of the overall tax rate but little

of the inter-industry (or inter-asset) variation. The highest effective personal tax rate is 26.62 per cent while the lowest rate is 21.97, a range of less than five percentage points. The property tax is also a major source of inter-industry tax rate variation. The effective marginal corporate tax rate including property taxes varies between 22.68 per cent and -10.32 per cent. It would appear, therefore, that corporation and property taxes combined rather than personal taxes are responsible for most of the distortion in the pattern of total effective marginal tax rates within and between manufacturing industries. Note, however, that data limitations prevented us from determining the extent to which households, tax-exempt institutions and insurance companies have different investment patterns concerning industries. If such differences exist, our estimates tend to underestimate the impact of the personal tax system on the inter-industry dispersion in effective marginal tax rates.

Judging from the results of our simulations, the wide inter-industry dispersion in effective marginal corporate tax rates can be largely attributed to three features of the corporate tax system: the investment tax credit and accelerated write-offs for machinery combined with high statutory corporate tax rates. Comparing columns (2) and (1) of Table 10, for example, we can see that if the investment tax credit were abolished, the variation in effective marginal corporate tax rates across industries would be reduced dramatically. Needless to say, withdrawal of the investment tax credit would lead to higher effective tax rates and this

would leave room for a substantial lowering of the statutory corporate tax rate. Column (3) of Table 10 shows that if a 10 percentage point cut in statutory corporate tax rates accompanied the abolition of the investment tax credit, there would be a further decline in the dispersion of tax rates owing to the reduced value of interest deductions and depreciation allowances. As indicated by column (4), a considerable reduction in the dispersion in effective tax rates would also be achieved if capital cost allowances for tax purposes were based on economic depreciation rather than some accelerated rate. The overall effect of abolishing the investment tax credit and accelerated capital cost allowances and cutting statutory corporate tax rates by 10 percentage points is shown in column (5). Finally, column (6) is similar to column (5) except that the statutory corporate tax rate is reduced by 20 instead of 10 percentage points.[32] Precisely the same conclusions are reached with regard to the dispersion in effective marginal corporate tax rates across types of capital (see Table A5 of the Appendix). It follows that a corporate tax system involving less incentives in the form of investment tax credits and accelerated depreciation allowances combined with lower statutory corporate tax rates would eliminate most of the dispersion in effective marginal tax rates on investments between industries and types of capital. Such changes would also considerably reduce the tax-induced bias in favour of debt finance.

The Problem of Tax Exhaustion

Hitherto, our estimates of effective marginal tax rates have been based on the assumption that all tax allowances may be claimed by the company. Recently, however, Canadian companies have encountered increased difficulty in taking advantage of all their tax allowances - the problem of so-called "tax exhaustion." By 1982, over half of all corporations had no corporate tax liability whatsoever, while during the period 1977 to 1982, almost half of all investment was undertaken by corporations which were rarely able to use their capital cost allowances, investment tax credits, and other deductions.[33] Although unused tax losses can, of course, be carried forward (and backward), the period over which losses can be spread is limited. Moreover, the postponement of tax reductions to future years in which taxable income is positive results in interest being foregone. Consequently, loss offsets for tax purposes are far from complete. The marginal investment incentives faced by many companies could therefore be quite different from those described so far.

In column (1) of Table 11, we report the estimated effective marginal tax rates under the assumption that the company never pays corporate tax and therefore cannot claim the investment tax credit, the interest deduction, or any capital cost allowances. Column (5) reflects the weighted average calculation of tax rates using the weights displayed in columns (2) and (4) concerning the proportion of corporations that were taxpaying or not in 1982. A

comparison of column (5) with column (3) suggests that by restricting firms' ability to use investment tax credits, capital cost allowances and other deductions, the absence of full loss offsets in the tax system decreases the inter-industry dispersion in effective marginal corporate tax rates.

Unfortunately, imperfect loss offsetting in the tax system is a inequitable way of reducing the inter-industry dispersion in effective tax rates because it results in firms that are new and fast growing or that face highly fluctuating income streams being treated less favourably than those with steady income streams. The former are more likely than the latter to be in a loss position in some years, and therefore unable to claim all their tax allowances.

The Impact of Inflation on Tax Rates

The impact of inflation on effective marginal tax rates cannot be determined *a priori*. On the one hand, capital cost allowances for tax purposes are based on historical cost. As inflation erodes the real value of these fixed nominal deductions, it tends to increase effective marginal corporate tax rates. Inflation also tends to increase the nominal value of inventories. With FIFO inventory accounting, taxable profits are measured by the difference between nominal sales price and nominal costs. Thus, for given real magnitudes, inflation has a tendency to increase taxable nominal profits and consequently the effective corporate tax rate.

On the other hand, inflation increases nominal interest rates and thus interest payments on corporate debt. As the latter are deductible from corporate taxable income, inflation increases these deductions and therefore decreases corporate taxes paid. At the same time, however, insofar as nominal interest receipts are subject to personal tax, the tendency of inflation to increase such receipts results in higher personal taxes. In combination, as the marginal personal tax rate on interest averaged over all investors is 26 per cent while statutory corporate tax rates in manufacturing range between 33.32 and 45.41 per cent, inflation tends to reduce the overall effective tax rate. Remark also that there have been a number of ad hoc adjustments to the tax system, such as the 3 per cent inventory allowance, designed to offset the impact of inflation on the tax system.

Our simulations reported in Table 12, again for the fixed-p case, show that effective corporate tax rates are lower and the subsidies higher with an expected annual inflation rate of 4.4 per cent than would be the case if zero inflation were expected or, equivalently, if the existing tax system were fully indexed.[34] But as the expected rate of inflation reaches 10 per cent, some tax rates continue to drop while others increase. By contrast, effective personal tax rates rise with inflation (see Table 13). Taking the corporate and personal tax systems together, we find that inflation increases total effective tax rates in all industries (see Table 14).

Surprisingly enough, the impact of inflation on the dispersion in effective marginal tax rates among manufacturing industries is rather mixed, depending on the rates of inflation that are compared and the measure of dispersion used. Hence, full indexation of the tax system will not necessarily reduce the inter-industry variation in tax rates. It follows that the contribution of inflation to the inter-industry dispersion in tax rates is unlikely to be as great as that of the investment tax credit or accelerated capital cost allowances in conjunction with current statutory corporate tax rates. One ought to keep in mind, however, that the tendency of inflation to substantially increase the taxable income of corporations in the 1970s and early 1980s was a factor behind the liberalization of capital cost allowances and the enhancement of the investment tax credit.[35] Consequently, ad hoc tax policies in response to inflation rather than inflation per se were likely the main cause of the increased dispersion in tax rates among industries (and assets).

Table 15 shows the impact of inflation on the taxation of income from various types of capital. It appears that inflation increases effective marginal tax rates on all three types of capital with inventories being affected most. Consequently, as shown by the coefficient of variation, inflation tends to accentuate the dispersion in effective marginal tax rates among types of capital. These conclusions are consistent with the results of similar experiments conducted by Boadway, Bruce and Mintz for the economy as a whole.[36]

5 SUMMARY AND CONCLUSIONS

The estimates presented in this paper reveal a surprisingly wide variation in effective marginal tax rates among types of asset, sources of finance, as well as category of investor, and therefore between industries, even within the manufacturing sector. Similar differences are likely to arise among non-manufacturing industries.[37] No doubt, tax rates on capital income also vary widely among firms to the extent that their capital and financial structures differ. Not only is such a situation a potentially serious source of misallocation in capital resources, it is also inequitable.

Judging from our simulations, the variation in effective marginal tax rates appears to be largely due to the corporation tax system, despite the fact that at the margin the latter (which includes investment tax credits and accelerated depreciation allowances) constitutes a subsidy rather than a tax on capital income in the manufacturing sector as a whole.[38] More specifically, existing statutory corporate tax rates in conjunction with accelerated capital cost allowances and investment tax credits favour those firms and industries that are highly levered and which invest relatively heavily in machinery and equipment as opposed to buildings or inventories. Consequently, much of the inter- and intra-industry dispersion in tax rates could be eliminated by reducing or abolishing the investment tax credit and basing capital cost allowances on true economic depreciation at

replacement cost, and then adjusting the statutory corporate tax rate downwards in order to keep total corporate tax revenue constant.

A discussion paper accompanying the 1985 Federal Budget contains a number of proposals for reforming the taxation of capital income in Canada notable among which are, a corporate tax rate reduction, elimination of the investment tax credit (except for scientific research expenditures), and reduced accelerated capital cost allowances. Our simulations suggest that such a combination of measures would dramatically reduce the dispersion in effective marginal tax rates among assets and industries.[39]

APPENDIX[40]

As pointed out in section 2, the foregoing fixed-p calculations of effective marginal tax rates describe the tax schedules faced by different investment projects. In response, capital investment would likely be encouraged in low-taxed projects relative to more highly taxed ones, and in actual equilibrium one would not expect to observe the same before-tax rate of return on all projects. Such an equilibrium could take many different forms.

One possibility would be to assume that investment would be allocated in such a way as to attain an equilibrium where each project earned the same rate of return after corporate, property, and personal taxes. However, a sizable proportion of capital income is now derived from tax-exempt pension funds and RRSPs. Complete tax arbitrage would eliminate any differences in personal tax rates on capital income, so that the only possible equilibrium would be one in which the effective personal tax rate on capital income would be zero. Such an assumption is not plausible given that the opportunities for arbitrage in the capital market are circumscribed due to restrictions imposed by the government on the flow of savings from households to tax-exempt institutions. Hence, instead of considering a situation in which all savers receive the same rate of return after personal and corporate taxes (fixed-s), King and Fullerton consider a scenario where arbitrage leads to an outcome in which all savers receive the same real

return after corporate tax on each project as on a bond having a prespecified real interest rate of 5 per cent per annum. This is what King and Fullerton refer to as their fixed-r case.[41]

Alternatively, one might assume a situation in which arbitrage takes place at the firm level, that is, firms arbitrage between real capital and debt in order to equalize the net-of-tax return to the corporation. As the nominal interest rate net of corporate tax $i(1-m)$ would be saved by retiring a unit of debt, the same return must be earned by a new investment in any asset, whatever the source of finance. Hence, this rate is always the firm's discount rate, ρ, which is therefore independent of the personal tax system. We refer to this case as that of fixed-r(f), where the f denotes arbitrage at the firm level. Remark that the different personal tax treatment accorded to capital income depending on whether it is paid out in interest, distributed as dividends, or retained by the firm (thus creating capital gains) implies that net returns to different investments, s, must differ according to their method of finance. Consequently, when risk is ignored, one can assume either that individuals arbitrage away differences in s or that firms arbitrage away differences in source of finance, but not both.[42]

Another possibility involves a situation where arbitrage occurs in the international bond market in order to ensure that the real rate of return to U.S. investors before personal taxes, r^*, is

5 per cent on both U.S. and Canadian corporate bonds. This we refer to as the fixed-r* case. Following Boadway, Bruce and Mintz, it assumes that changes in the value of the Canadian dollar relative to its U.S. counterpart are determined by differences in expected inflation rates between the two countries.[43] Denoting U.S. variables with an asterisk, we assume that any appreciation in the exchange rate, x (the Canadian dollar in terms of U.S. currency), are treated as capital gains for tax purposes and that $\dot{x}/x = \pi - \pi^*$. With complete arbitrage in the international bond market, the real after tax rate of return to U.S. investors must be the same on both U.S. and Canadian debt. Consequently, the rate of return on Canadian bonds must be such that

$$i(1-m^*) - (1-z^*)\dot{x}/x = i^*(1-m^*).$$

Assuming a strict Fisher relationship between inflation and nominal interest rate in the U.S., that is, $i^* = r^* + \pi^*$,

$$i = r^* + \pi^* + (\pi-\pi^*)(1-z^*)/(1-m^*).$$

We assume an expected U.S. inflation rate, $\pi^* = 3.95$ per cent (the actual rate for 1984) and take the values $m^* = 0.284$ and $z^* = 0.075$ from King and Fullerton.

As regards the relationship between nominal interest rates and inflation, for the fixed-r case, we follow King and Fullerton and assume a modified Fisher's law such that a one percentage point

increase in the inflation rate causes the nominal interest rate to rise by $1/(1-\bar{m})$ percentage points, where $\bar{m}$ is the weighted average of different owners' personal tax rates. By contrast, for the fixed-r(f) case in which corporations arbitrage between bonds and real capital, we assume that a one percentage point increase in the inflation rate results in a $1/(1-\bar{\tau})$ percentage point rise in the nominal interest rate, where $\bar{\tau}$ is the weighted average of statutory corporate tax rates.[44]

The foregoing arbitrage mechanisms are, of course, only a few among a wide range of possibilities. As pointed out earlier, the reason for basing our main calculations of effective marginal tax rates on the fixed-p case is that they are independent of any assumptions regarding capital market equilibrium. In order to check the robustness of our results, however, estimates of marginal tax rates were computed under different arbitrage assumptions, which can then be compared with the fixed-p calculations.

Interestingly enough, as revealed by the rankings given in Table A1, relative differences in effective marginal tax rates between industries are similar, irrespective of the arbitrage assumptions used. Moreover, the tax rate estimates based on fixed-r and fixed-r(f) are remarkably close to each other despite fact that the latter assumes firm arbitrage while the former assumes a limited form of arbitrage on the part of households. Tax rates are lower in the fixed-p case than in either the

fixed-r, fixed-r(f), or fixed-r* cases because the latter give much greater weight to investments subject to high tax rates and which therefore require a higher pre-tax rate of return in order to pay the given market rate of return.[45] The tax rates in the fixed-r* case are higher than those for the fixed-r and fixed-r(f) cases mainly because the former assumes a strict Fisher relationship between nominal interest rates and inflation whereas the latter do not.

With regard to the sources of variation in effective marginal tax rates between industries, by comparing Tables A2, A3 and A4 with Table 10 it can be observed that the fixed-r, fixed-r(f) and fixed-r* cases give results similar to those of the fixed-p case. The same conclusions can be drawn with respect to the dispersion in effective marginal corporate tax rates across types of capital and methods of finance (see Table A5). Consequently, our conclusions regarding policy measures to reduce the dispersion in effective marginal tax rates do not depend on the arbitrage assumptions used.

Table 1

Firm's Discount Rate, ρ

METHOD OF FINANCE	TYPE OF SAVER		
	Household	Tax-Exempt Institution	Life Insurance Company
Debt	$i(1-\tau)$	$i(1-\tau)$	$i(1-\tau)$
New Shares	i/θ	i	$i(1-\tau_I)$
Retained Earnings	$i(1-m)/(1-z)$	i	$i(1-\tau_I)/(1-z_I)$

Table 2

Real After-Tax Return to Savers, s

METHOD OF FINANCE	TYPE OF SAVER		
	Household	Tax-Exempt Institution	Life Insurance Company
Debt	$(1-m)i-\pi$	$i-\pi$	$i-\pi$
New Shares	$\rho\theta(1-m)-\pi$	$\rho-\pi$	$\rho/(1-\tau_I)-\pi$
Retained Earnings	$\rho(1-z)-\pi$	$\rho-\pi$	$\rho(1-z_I)/(1-\tau_I)-\pi$

Table 3

Statutory Corporate and Property Tax Rates for Canadian Manufacturing Industries, 1980 (per cent)

Industry	Corporate Tax Rate (τ)			Property Tax Rate (w_c)
	Total	Federal	Provincial	
Food & Beverage	40.62	29.90	10.72	2.13
Tobacco Products	42.01	30.67	11.34	2.36
Rubber Products	42.43	31.11	11.32	2.42
Leather Products	36.39	26.74	9.65	3.19
Textiles Mills	40.11	29.34	10.77	2.67
Knitting Mills	36.01	26.36	9.65	4.85
Clothing Industries	33.53	24.67	8.86	4.64
Wood Industries	37.38	27.47	9.91	2.48
Furniture Industries	33.32	24.60	8.72	4.46
Paper & Allied Industries	41.85	30.59	11.26	1.63
Printing, Publishing & Allied Industries	36.02	26.73	9.29	1.91
Primary Metals	45.41	34.19	11.22	1.65
Metal Fabrication	36.70	27.04	9.66	2.38
Machinery	40.10	29.53	10.57	2.53
Transport Equipment	40.53	29.62	10.91	2.04
Electrical Products	41.24	30.27	10.97	3.13
Non-metallic Mineral Products	39.85	29.30	10.55	2.06
Petroleum & Coal Products	43.68	32.34	11.34	0.68
Chemical & Chemical Products	42.93	31.73	11.20	1.18
Miscellaneous Manufacturing	36.84	27.24	9.60	3.53
Total Manufacturing	41.10	30.34	10.76	1.85

Notes: Property tax rates (w_c) were calculated as described in M. Daly et. al.. The Taxation of Capital Income in Canada: A Comparison with Sweden, the U.K., the U.S.A. and West Germany, Economic Council of Canada, Discussion Paper No. 289 (Ottawa: Economic Council of Canada, 1985), pp. 12-13. Statutory corporate tax rates take into account small business and manufacturing and processing deductions.

Table 4

Investment Tax Credit Rates ($\bar{g}$), 1981

Industry	Machinery CCA Class					Buildings CCA Class				
	8	10	12	22	29	1	3	6	13	28
	(per cent)									
Food & Beverage	1.58	1.49	-	-	7.38	-	5.85	6.31	-	-
Tobacco Products	0.00	0.06	-	-	7.03	-	6.91	-	0.00	-
Rubber & Plastics	0.07	-	0.01	-	3.50	-	0.88	-	-	-
Leather	1.25	0.04	-	-	6.86	-	3.82	-	0.00	-
Textiles	0.12	-	-	-	6.62	-	6.33	-	0.04	-
Knitting Mills	-	0.00	-	-	6.81	-	3.73	-	0.00	-
Clothing	0.24	0.07	-	-	7.25	-	3.96	-	0.05	-
Wood	0.69	1.56	-	-	5.35	-	2.64	1.67	-	-
Furniture & Fixtures	0.11	0.50	-	-	6.42	-	5.86	-	0.43	-
Paper & Allied	-	4.38	-	-	8.79	-	5.82	-	-	-
Printing & Publishing	1.36	-	-	-	5.86	-	5.66	-	0.30	-
Primary Metals	-	5.55	0.00	-	6.78	-	5.61	-	-	7.65
Metal Fabricating	0.94	0.59	-	-	5.58	-	3.60	-	0.00	-
Machinery	1.02	1.22	0.46	-	6.70	-	5.09	-	0.26	-
Transport Equipment	0.09	0.20	0.06	-	5.63	-	4.00	-	-	-
Electrical Products	0.36	0.16	-	-	6.71	-	4.99	-	0.01	-
Non-metallic Mineral Products	1.52	0.67	0.89	1.82	6.72	-	2.89	-	-	-
Petroleum & Coal Products	0.64	5.71	-	-	5.68	-	1.16	1.03	0.00	-
Chemical & Chemical Products	0.62	2.25	-	-	4.14	0.03	2.94	2.50	-	-
Miscellaneous Manufacturing	0.63	1.24	2.01	-	7.17	-	5.00	0.17	-	-
Total Manufacturing	0.79	3.68	-	-	6.35	-	4.33	-	0.18	-

Source: Department of Finance, Government of Canada.

Notes: As investment tax credits (ITCs) are only available for new assets of specific types and the rates vary by region, statutory rates cannot be used to compute $\bar{g}$, the average effective ITC rates for each asset by industry. Average effective ITC rates were computed by taking the ITC earned on the main CCA classes in 1981 and dividing by the amounts of additions (i.e., gross investment) in the same year. The main CCA classes for buildings and machinery in each industry were defined as those which together account for at least 90 per cent of additions of assets of that type. Our model then aggregates the resulting ITC rates for machinery and buildings in each industry.

Table 5

Corporate Capital Stock Weights for Canadian Manufacturing, 1981

Industry	Machinery	Buildings	Inventories
Food and Beverages	0.05208	0.03320	0.02583
Tobacco Products	0.00160	0.00118	0.00367
Rubber Products	0.01044	0.00578	0.00559
Leather Products	0.00089	0.00097	0.00181
Textile Mills	0.01411	0.00609	0.00676
Knitting Mills	0.00168	0.00245	0.00151
Clothing Industries	0.00192	0.00088	0.00606
Wood Industries	0.02764	0.01029	0.01079
Furniture Industries	0.00257	0.00166	0.00349
Paper and Allied Industries	0.08246	0.03524	0.01325
Printing, Publishing and Allied Industries	0.01392	0.00551	0.00374
Primary Metals	0.07389	0.03132	0.02126
Metal Fabricating	0.02145	0.01124	0.01717
Machinery Industries	0.01140	0.00766	0.01679
Transportation Equipment	0.04409	0.01876	0.02000
Electrical Products	0.01516	0.00718	0.01522
Non-metallic Mineral Products	0.02787	0.01005	0.00516
Petroleum and Coal Products	0.03500	0.02394	0.02407
Chemical and Chemical Products	0.06969	0.04825	0.01553
Miscellaneous Manufacturing	0.00313	0.00301	0.00665
Total Manufacturing	0.51099	0.26466	0.22435

Source: Statistics Canada, Fixed Capital Flows and Stocks, 1981 (Catalogue 13-211) and Inventories Shipments and Orders in Manufacturing Industries, June 1981 (Catalogue 31-001).

Table 6

Source of Finance by Industry, 1973-1981, Proportion

Industry	Debt	New Shares	Retained Earnings	Total
Food and Beverages	.3356	.0893	.5751	1.0000
Tobacco Products	.3900	.0820	.5280	1.0000
Rubber Products	.3600	.0860	.5540	1.0000
Leather Products	.4598	.0726	.4676	1.0000
Textile Mills	.3101	.0972	.5972	1.0000
Knitting Mills	.3652	.0853	.5495	1.0000
Clothing Industries	.4570	.0730	.4700	1.0000
Wood Industries	.4134	.0788	.5078	1.0000
Furniture Industries	.4407	.0752	.4841	1.0000
Paper and Allied Industries	.3199	.0914	.5887	1.0000
Printing, Publishing and Allied Industries	.3453	.0880	.5667	1.0000
Primary Metals	.2846	.0961	.6193	1.0000
Metal Fabricating	.3559	.0866	.5575	1.0000
Machinery Industries	.3728	.0843	.5429	1.0000
Transportation Equipment	.3214	.0912	.5874	1.0000
Electrical Products	.3399	.0887	.5714	1.0000
Non-Metallic Mineral Products	.3250	.0907	.5843	1.0000
Petroleum and Coal Products	.4194	.0780	.5026	1.0000
Chemical & Chemical Products	.3373	.0891	.5734	1.0000
Miscellaneous Manufacturing	.4379	.0755	.4866	1.0000
Total Manufacturing	.3470	.0880	.5650	1.0000

Source: Calculations made using the same methodology and data sources as described in M. Daly et. al.. The Taxation of Capital Income in Canada: A Comparison with Sweden, the U.K., the U.S.A. and West Germany, Economic Council of Canada, Discussion Paper No. 289 (Ottawa: Economic Council of Canada, 1985). More precise details are available from the authors upon request.

Table 7

Ownership of Non-Financial Corporate Debt and Equity

	Debt	Equity
	per cent	
Households	81.3	86.0
Tax-Exempt Institutions	14.2	11.7
Insurance Companies	4.5	2.3
Total	100.0	100.0

Source: Calculations made using the same methodology and data sources as described in M. Daly et. al.. The Taxation of Capital Income in Canada: A Comparison with Sweden, the U.K., the U.S.A. and West Germany, Economic Council of Canada, Discussion Paper No. 289 (Ottawa: Economic Council of Canada, 1985).

Table 8

Total Effective Marginal Tax Rates in Manufacturing Industries (Fixed-p)

	ASSET			MODE OF FINANCE			OWNER				
	Machinery	Building	Inventory	Debt	New Shares	Retained Earnings	House-hold	Owner Tax Exempt	Insurance Cos.	Overall	Rank
Food and Beverages	4.16	49.29	43.83	1.79	40.75	39.35	33.68	0.65	-54.24	26.87	11
Tobacco Products	0.53	46.77	42.60	9.64	48.71	47.68	39.78	5.67	-40.33	32.93	6
Rubber and Plastics	6.75	55.68	43.85	3.19	44.85	43.72	36.16	1.96	-48.81	29.23	9
Leather	10.68	51.84	38.45	21.03	48.31	47.22	42.06	7.82	-30.61	35.25	3
Textiles	0.72	54.05	44.43	- 2.34	36.82	35.14	30.52	- 1.92	-61.67	23.73	16
Knitting Mills	0.76	72.51	40.70	27.09	52.46	51.41	48.53	19.67	-24.57	42.62	1
Clothing	6.47	67.72	37.53	21.99	44.81	43.57	40.56	6.74	-32.54	33.80	4
Wood	7.49	55.92	40.04	6.82	38.96	37.48	32.14	- 3.63	-50.78	24.93	13
Furniture and Fixtures	8.28	64.26	37.80	21.69	44.24	42.92	40.34	7.12	-33.79	33.66	5
Paper and Allied Industries	- 4.90	47.21	44.99	-16.12	30.13	28.16	21.66	-14.39	-77.41	14.17	20
Printing and Publishing	3.78	44.99	41.20	0.27	31.61	29.55	26.67	- 7.19	-64.56	19.62	19
Primary Metals	9.42	50.95	48.24	- 9.43	41.58	40.23	33.01	0.47	-60.62	26.23	12
Metal Fabricating	6.08	51.41	41.28	9.69	40.09	38.57	35.09	2.76	-49.15	28.42	10
Machinery	3.30	51.45	42.38	10.04	45.87	44.73	38.62	5.48	-42.85	31.89	8
Transportation Equipment	1.81	53.53	44.25	- 2.36	37.74	35.89	30.66	- 2.53	-60.62	23.77	15
Electrical Products	8.88	58.77	43.99	7.99	46.25	45.20	39.22	7.10	-44.24	32.65	7
Non-metallic Mineral Products	5.69	56.07	43.77	- 3.32	35.65	33.97	28.98	- 4.56	-63.15	22.00	18
Petroleum and Coal Products	- 2.17	42.45	42.44	- 3.42	44.16	43.02	31.35	- 7.53	-54.29	23.64	17
Chemical and Chemical Products	4.52	45.70	44.90	- 4.91	40.06	38.70	31.22	- 3.55	-59.35	24.11	14
Miscellaneous Manufacturing	7.16	61.98	39.17	21.48	49.41	48.44	43.36	10.01	-29.76	36.70	2
Total Manufacturing	3.32	49.84	43.29	- 1.30	39.41	37.93	31.62	- 2.58	-57.60	24.60	

Notes: Expected annual inflation rate of 4.4 per cent assumed.

Table 9

Effective Marginal Tax Rates in Manufacturing Industries
(Fixed-p)

Industry	(1) Corporate plus property	(2) Corporate	(3) Personal	(4) Total
Food and Beverages	4.09(12)	-1.16(12)	23.29 (2)	26.87(11)
Tobacco Products	9.30 (7)	5.54 (3)	25.65 (3)	32.93 (6)
Rubber and Plastics	5.81 (9)	0.78(11)	24.39 (9)	29.23 (9)
Leather	10.70 (3)	3.01 (7)	26.62 (4)	35.25 (3)
Textiles	1.44(13)	-3.51(15)	22.22(17)	23.73(16)
Knitting Mills	22.28 (1)	4.51 (5)	24.12 (7)	42.62 (1)
Clothing	9.42 (6)	5.27 (4)	26.47 (2)	33.80 (4)
Wood	-0.32(16)	-4.72(16)	24.79(15)	24.93(13)
Furniture and Fixtures	9.75 (5)	0.96(10)	25.58 (8)	33.66 (5)
Paper and Allied	-10.32(20)	-13.87(20)	21.97(20)	14.17(20)
Printing and Publishing	-4.08(19)	-8.00(19)	22.48(19)	19.62(19)
Primary Metals	4.50(11)	1.31 (8)	22.48(11)	26.23(12)
Metal Fabricating	5.76(10)	1.24 (9)	23.63(10)	28.42(10)
Machinery	8.86 (8)	4.28 (6)	24.82 (6)	31.89 (8)
Transport Equipment	0.97(14)	-2.70(13)	22.72(16)	23.77(15)
Electrical Products	10.65 (4)	5.75 (2)	24.13 (5)	32.65 (7)
Non-metallic Minerals	-1.10(17)	-4.88(18)	22.56(18)	22.00(18)
Petroleum and Coal Products	-3.13(18)	-4.78(17)	25.81(13)	23.64(17)
Chemicals	0.46(15)	-2.90(14)	23.47(14)	24.11(14)
Miscellaneous Manufacturing	13.09 (2)	5.91 (1)	26.39 (1)	36.70 (2)
Total Manufacturing	1.12	-2.86	23.41	24.60
Variance (20 Industries)	35.50	27.96	1.63	27.68
Coefficient of Variation (20 Industries)	5.33	-1.85	0.05	0.4

Note: Rank given in brackets. Expected annual inflation rate of 4.4 per cent is assumed.

Table 10

Effective Marginal Corporate Tax Rates Under Various Tax Rules
(Fixed-p)

Industry	(1)	(2)	(3)	(4)	(5)	(6)
Food and Beverages	-1.16	5.99	5.37	18.56	18.93	12.84
Tobacco Products	5.54	10.83	9.21	17.58	17.27	12.25
Rubber and Plastics	0.78	4.49	4.39	22.43	19.59	13.80
Leather	3.01	6.55	5.46	12.12	11.56	7.45
Textiles	-3.51	4.74	4.39	20.04	20.29	13.64
Knitting Mills	4.51	10.55	8.17	16.31	15.74	9.79
Clothing	5.27	8.00	6.26	12.11	10.68	6.37
Wood	-4.72	0.39	1.15	14.58	14.21	9.13
Furniture and Fixtures	0.96	4.92	4.10	11.98	11.20	6.53
Paper and Allied Industries	-13.87	0.15	1.13	16.42	20.94	14.48
Printing and Publishing	-8.00	-0.49	0.48	15.44	15.85	9.85
Primary Metals	1.31	9.99	8.44	25.22	25.29	18.30
Metal Fabricating	1.24	6.45	5.38	17.45	16.22	10.28
Machinery	4.28	8.87	7.55	18.38	17.12	11.69
Transportation Equipment	-2.70	2.73	3.13	21.44	19.67	13.33
Electrical Products	5.75	10.48	8.66	21.29	19.54	13.51
Non-metallic Mineral Products	-4.88	1.93	2.26	20.41	19.65	13.09
Petroleum and Coal Products	-4.78	0.16	1.67	17.47	17.11	12.55
Chemical and Chemical Products	-2.90	2.62	3.03	21.93	20.46	14.43
Miscellaneous Manufacturing	5.91	10.59	8.34	13.13	13.10	8.46
Total Manufacturing	-2.86	4.29	4.18	19.48	19.45	13.43
Variance (20 Industries)	27.96	13.76	7.13	10.80	9.66	6.52
Coefficient of Variation (20 Industries)	-1.85	0.87	0.64	0.17	0.16	0.19
Variance (540 projects)	2100.12	1654.79	865.15	1142.74	557.71	247.50
Coefficient of Variation (540 projects)	-16.03	9.78	7.04	1.74	1.21	1.17

Notes: Column (1) describes the current pattern of corporate tax rates (excluding property taxes) with a 4.4 per cent expected inflation rate.
Column (2) involves the abolition of the investment tax credit.
Column (3) combines the abolition of the investment tax credit with a 10 percentage point cut in statutory corporate tax rates.
Column (4) involves capital cost allowance based on economic rather than accelerated depreciation.
Column (5) combines capital cost allowances based on economic depreciation with the abolition of the investment tax credit and a 10 percentage point cut in statutory corporate tax rates.
Column (6) is the same as column (5) except that the statutory corporate tax rate is reduced by 20 percentage points.

Table 11

Effective Marginal Corporate Plus Property Tax Rates: The Case of Tax Exhaustion (Fixed-p)

Industry	Non-Taxpaying Corporation		Taxpaying Corporation		Weighted Average	
	Tax Rate (1)	Proportion (2)	Tax Rate (3)	Proportion (4)	Tax Rate (5)	Rank (6)
Food and Beverages	6.46	0.220	4.09	0.780	4.61	12
Tobacco Products	4.41	0.000	9.30	1.000	9.30	6
Rubber & Plastics	6.51	0.566	5.81	0.434	6.21	9
Leather	8.51	0.254	10.70	0.746	10.14	3
Textiles	6.13	0.722	1.44	0.278	4.83	11
Knitting Mills	21.14	0.302	22.28	0.698	21.94	1
Clothing	4.69	0.289	9.42	0.711	8.05	7
Wood	5.33	0.834	-0.32	0.166	4.39	13
Furniture and Fixtures	9.67	0.484	9.75	0.516	9.71	5
Paper and Allied	4.49	0.712	-10.32	0.288	0.22	18
Printing and Publishing	4.64	0.182	-4.08	0.818	-2.49	20
Primary Metals	4.20	0.778	4.50	0.222	4.27	14
Metal Fabricating	5.46	0.465	5.76	0.535	5.62	10
Machinery	5.50	0.505	8.86	0.495	7.16	8
Transport Equipment	4.72	0.762	0.97	0.238	3.82	15
Electrical Products	6.08	0.186	10.65	0.814	9.80	4
Non-metallic Minerals	4.91	0.463	-1.10	0.537	1.68	17
Petroleum & Coal Products	2.05	0.253	-3.13	0.747	-1.82	19
Chemicals	4.37	0.486	0.46	0.514	2.36	16
Miscellaneous Manufacturing	8.39	0.275	13.09	0.725	11.80	2
Total Manufacturing	4.97		1.12		3.48	
Variance (20 Industries)	3.12		35.50		11.22	
Coefficient of Variation (20 Industries)	0.3557		5.33		0.9626	

Notes: These calculations include property taxes and assume an expected inflation rate of 4.4 per cent. The proportions given in Column (2) were obtained using unpublished data from Statistics Canada.

Table 12

Effective Marginal Corporate Tax Rates Under Different Inflation Rate Assumptions (Fixed-p)

Industry	Inflation Rate		
	Zero	4.4%	10%
Food and Beverages	2.89(12)	-1.16(12)	-3.66(12)
Tobacco Products	10.67 (1)	5.54 (3)	9.73 (1)
Rubber and Plastics	5.67 (8)	0.78(11)	-1.97(11)
Leather	8.23 (6)	3.01 (7)	3.88 (6)
Textiles	0.06(17)	-3.51(15)	-4.74(13)
Knitting Mills	7.65 (7)	4.51 (5)	3.02 (7)
Clothing	9.79 (3)	5.27 (4)	9.71 (2)
Wood	0.08(16)	-4.72(16)	-8.56(15)
Furniture and Fixtures	5.29 (9)	0.96(10)	1.46 (8)
Paper and Allied Industries	-9.63(20)	-13.87(20)	-18.96(20)
Printing and Publishing	-4.01(19)	-8.00(19)	-11.60(19)
Primary Metals	4.04(11)	1.31 (8)	-0.87(10)
Metal Fabricating	4.79(10)	1.24 (9)	1.34 (9)
Machinery	8.83 (5)	4.28 (6)	6.22 (5)
Transportation Equipment	1.60(15)	-2.70(13)	-5.03(14)
Electrical Products	9.45 (4)	5.75 (2)	7.53 (4)
Non-metallic Mineral Products	-1.23(18)	-4.88(18)	-9.14(17)
Petroleum and Coal Products	2.45(13)	-4.78(17)	-9.37(18)
Chemical and Chemical Products	1.82(14)	-2.90(14)	-8.68(16)
Miscellaneous Manufacturing	10.37 (2)	5.91 (1)	7.96 (3)
Total Manufacturing	1.45	-2.86	-5.74
Variance (20 Industries)	26.3754	27.9583	52.1482
Coefficient of Variation (20 Industries)	3.5519	-1.8501	-1.2586

Note: Number in brackets refers to rank.

Table 13

Effective Marginal Personal Tax Rates Under Different Inflation Rate Assumptions (Fixed-p)

Industry	Inflation Rate		
	Zero	4.4%	10%
Food and Beverages	17.28(14)	23.29(14)	30.33(13)
Tobacco Products	18.50 (6)	25.65 (5)	35.42 (4)
Rubber and Plastics	17.92 (9)	24.39 (9)	31.99(10)
Leather	19.15 (1)	26.62 (1)	36.11 (3)
Textiles	16.66(20)	22.22(19)	28.88(19)
Knitting Mills	17.58(10)	24.12(11)	31.97(11)
Clothing	18.98 (3)	26.47 (2)	36.74 (1)
Wood	18.37 (7)	24.79 (8)	32.24 (9)
Furniture and Fixtures	18.60 (5)	25.58 (6)	34.44 (5)
Paper and Allied Industries	16.82(18)	21.97(20)	27.77(20)
Printing and Publishing	16.96(16)	22.48(18)	28.90(18)
Primary Metals	16.77(19)	22.48(17)	29.27(16)
Metal Fabricating	17.36(13)	23.63(12)	31.35(12)
Machinery	18.04 (8)	24.82 (7)	33.61 (6)
Transportation Equipment	16.99(15)	22.72(15)	29.56(15)
Electrical Products	17.54(11)	24.13(10)	32.58 (8)
Non-metallic Mineral Products	16.94(17)	22.56(16)	28.92(17)
Petroleum and Coal Products	19.09 (2)	25.81 (4)	33.57 (7)
Chemical and Chemical Products	17.49(12)	23.47(13)	30.09(14)
Miscellaneous Manufacturing	18.92 (4)	26.39 (3)	36.16 (2)
Total Manufacturing	17.43	23.41	30.42
Variance (20 Industries)	0.5221	1.5034	4.1840
Coefficient of Variation (20 Industries)	0.0414	0.0523	0.0670

Note: Number in brackets refers to rank.

Table 14

Effective Marginal Corporate Plus Personal Tax Rates Under Different Inflation Rate Assumptions (Fixed-p)

Industry	Inflation Rate		
	Zero	4.4%	10%
Food and Beverages	19.68(13)	22.39(12)	27.79(12)
Tobacco Products	27.19 (2)	29.77 (3)	41.70 (2)
Rubber and Plastics	22.57 (9)	24.98 (9)	30.65(10)
Leather	25.80 (4)	28.83 (4)	38.58 (4)
Textiles	16.71(17)	19.49(17)	25.51(16)
Knitting Mills	23.89 (7)	27.54 (7)	34.03 (8)
Clothing	26.91 (3)	30.35 (2)	42.88 (1)
Wood	18.43(15)	21.25(15)	26.44(14)
Furniture and Fixtures	22.91 (8)	26.30 (8)	35.39 (7)
Paper and Allied Industries	8.81(20)	11.15(20)	14.07(20)
Printing and Publishing	13.64(19)	16.27(19)	20.65(19)
Primary Metals	20.13(12)	23.49(11)	28.66(11)
Metal Fabricating	21.32(10)	24.58(10)	32.26 (9)
Machinery	25.28 (6)	28.03 (6)	37.74 (5)
Transportation Equipment	18.31(16)	20.63(16)	26.01(15)
Electrical Products	25.33 (5)	28.49 (5)	37.65 (6)
Non-metallic Mineral Products	15.92(18)	18.78(18)	22.42(18)
Petroleum and Coal Products	21.07(11)	22.27(13)	27.34(13)
Chemical and Chemical Products	18.99(14)	21.25(14)	24.02 (7)
Miscellaneous Manufacturing	27.32(11)	30.74 (1)	41.25 (3)
Total Manufacturing	18.62	21.22	26.43
Variance (20 Industries)	21.0350	22.6298	42.7845
Coefficient of Variation (20 Industries)	0.2463	0.2241	0.2475

Note: Number in brackets refers to rank.

Table 15

Effective Marginal Corporate Plus Personal Tax Rates in Total Manufacturing Under Different Inflation Rate Assumptions

Type of Capital		Inflation Rate 0%	4.4%	10%
Fixed-p	Machinery	1.53	3.32	4.32
	Buildings	33.67	37.08	37.47
	Inventories	39.78	43.29	63.77

Table A1

Total Effective Marginal Tax Rates in Manufacturing Industries under Various Arbitrage Assumptions

Industry	Fixed-p	Fixed-r	Fixed-r(f)	Fixed-r*
		(%)		
Food and Beverages	26.87(11)	37.95(11)	37.98(11)	45.07(10)
Tobacco Products	32.93 (6)	41.43 (6)	40.92 (7)	46.81 (9)
Rubber and Plastics	29.23 (9)	40.86 (8)	40.90 (8)	47.93 (6)
Leather	35.25 (3)	42.96 (3)	42.00 (4)	50.02 (4)
Textiles	23.73(16)	35.81(14)	35.98(14)	42.88(13)
Knitting Mills	42.62 (1)	53.95 (1)	53.01 (1)	63.32 (1)
Clothing	33.80 (4)	40.75 (9)	39.74 (9)	46.92 (8)
Wood	24.93(13)	35.03(15)	34.32(16)	41.96(15)
Furniture and Fixtures	33.66 (5)	42.83 (4)	41.41 (5)	50.77 (3)
Paper and Allied	14.17(20)	24.21(20)	23.61(20)	28.77(20)
Printing and Publishing	19.62(14)	29.22(19)	28.75(19)	35.74(19)
Primary Metals	26.23(12)	37.41(12)	38.12(10)	43.88(12)
Metal Fabricating	28.42(10)	38.10(10)	37.63(12)	44.97(11)
Machinery	31.89 (8)	41.38 (7)	41.10 (6)	47.79 (7)
Transport Equipment	23.77(15)	35.94(13)	36.04(13)	42.84(14)
Electrical Products	32.65 (7)	42.70 (5)	42.83 (3)	49.59 (5)
Non-metallic Minerals	22.00(18)	33.57(18)	33.56(17)	40.71(17)
Petroleum and Coal Products	23.64(17)	33.83(17)	32.25(18)	38.40(18)
Chemicals	24.11(14)	35.03(16)	34.90(15)	41.42(16)
Miscellaneous Manufacturing	36.70 (2)	45.04 (2)	44.20 (2)	52.23 (2)
Total Manufacturing	24.60	35.68	35.51	42.17

Note: Rank given in brackets. Expected inflation rate of 4.4 per cent is assumed.

Table A2

Effective Marginal Corporate Tax Rates Under Various Tax Rules
(Fixed-r)

Industry	(1)	(2)	(3)	(4)	(5)	(6)
Food and Beverages	-1.83	7.92	3.89	20.79	19.61	12.38
Tobacco Products	6.73	12.91	7.95	19.20	17.18	10.93
Rubber and Plastics	2.75	7.67	3.56	26.09	21.03	13.63
Leather	0.24	4.97	2.38	11.24	10.00	5.61
Textiles	-4.20	7.16	3.31	22.42	21.37	13.56
Knitting Mills	5.47	12.95	7.72	17.11	15.83	9.13
Clothing	3.16	6.48	3.56	10.46	8.66	4.54
Wood	-7.14	0.31	-1.40	15.77	14.14	8.22
Furniture and Fixtures	-1.78	3.57	1.37	10.90	9.79	5.10
Paper and Allied Industries	-21.19	2.01	-0.70	18.86	22.86	14.84
Printing and Publishing	-13.67	-2.08	-2.89	16.14	15.96	9.20
Primary Metals	3.58	15.49	9.27	30.34	28.21	19.41
Metal Fabricating	-0.08	6.95	3.43	18.44	16.20	9.49
Machinery	5.19	10.77	6.24	20.00	17.09	10.62
Transportation Equipment	-1.25	6.00	2.39	24.31	20.68	13.12
Electrical Products	7.48	13.37	8.06	23.97	20.37	13.04
Non-metallic Mineral Products	-5.93	4.14	0.97	23.40	21.06	13.25
Petroleum and Coal Products	-2.35	3.42	0.30	21.06	17.89	11.61
Chemical and Chemical Products	-2.58	5.29	1.66	25.88	22.16	14.49
Miscellaneous Manufacturing	5.21	11.34	6.85	12.76	12.15	6.97
Total Manufacturing	-2.95	6.91	3.04	22.47	20.73	13.30
Variance (20 Industries)	62.80	21.19	11.52	20.59	16.70	10.26
Coefficient of Variation (20 Industries)	-2.25	0.68	1.15	0.20	0.20	0.24
Variance (540 projects)	8174.23	4353.76	1652.40	1991.01	856.24	391.83
Coefficient of Variation (540 projects)	-30.66	9.55	13.36	1.99	1.41	1.49

Notes: Column (1) describes the current pattern of corporate tax rates (excluding property taxes) with an expected annual inflation rate of 4.4 per cent.
Column (2) involves the abolition of the investment tax credit.
Column (3) combines the abolition of the investment tax credit with a 10 percentage point cut in statutory corporate tax rates.
Column (4) involves capital cost allowance based on economic rather than accelerated depreciation.
Column (5) combines capital cost allowances based on economic depreciation with the abolition of the investment tax credit and a 10 percentage point cut in statutory corporate tax rates.
Column (6) is the same as column (5) except that the statutory corporate tax rate is reduced by 20 percentage points.

Table A3

Effective Marginal Corporate Rates Under Various Tax Rules (Fixed-r(f))

Industry	(1)	(2)	(3)	(4)	(5)	(6)
Food and Beverages	-6.91	3.71	3.52	17.51	19.51	13.49
Tobacco Products	1.07	7.99	7.11	14.82	16.67	12.01
Rubber and Plastics	-3.54	2.11	2.52	22.38	20.67	14.71
Leather	-1.08	3.53	3.22	9.79	10.67	6.97
Textiles	-9.00	3.34	3.12	19.57	21.38	14.61
Knitting Mills	3.99	11.37	8.42	15.61	16.33	10.33
Clothing	3.19	6.29	4.90	10.17	9.78	5.91
Wood	-9.41	-1.95	-0.78	13.72	14.53	9.50
Furniture and Fixtures	-1.65	3.37	2.76	10.49	10.81	6.42
Paper and Allied Industries	-30.29	-3.55	-1.62	14.82	22.70	15.89
Printing and Publishing	-15.06	-3.63	-1.88	14.62	16.45	10.36
Primary Metals	-6.28	8.84	7.42	26.09	27.84	20.37
Metal Fabricating	-1.88	5.12	4.17	16.74	16.65	10.70
Machinery	1.15	7.11	6.07	16.87	17.05	11.81
Transportation Equipment	-6.07	1.84	2.07	21.38	20.63	14.20
Electrical Products	2.64	9.15	7.56	20.60	20.18	14.14
Non-metallic Mineral Products	-10.43	0.39	0.87	20.73	21.11	14.33
Petroleum and Coal Products	-11.60	-4.76	-2.05	15.32	16.71	12.45
Chemical and Chemical Products	-10.18	-1.01	0.30	21.99	21.76	15.52
Miscellaneous Manufacturing	3.53	9.59	7.51	11.07	12.70	8.31
Total Manufacturing	-8.97	1.99	2.29	18.78	20.41	14.29
Variance (20 Industries)	80.06	21.91	11.06	16.90	15.36	9.79
Coefficient of Variation (20 Industries)	-0.91	2.53	1.49	0.22	0.19	0.22
Variance (540 projects)	6112.97	3690.05	1682.61	1835.62	869.40	400.26
Coefficient of Variation (540 projects)	-9.80	1.85	2.23	18.83	20.46	14.33

Notes: Column (1) describes the current pattern of corporate tax rates (excluding property taxes) with an expected annual inflation rate of 4.4 per cent.
Column (2) involves the abolition of the investment tax credit.
Column (3) combines the abolition of the investment tax credit with a 10 percentage point cut in statutory corporate tax rates.
Column (4) involves capital cost allowance based on economic rather than accelerated depreciation.
Column (5) combines capital cost allowances based on economic depreciation with the abolition of the investment tax credit and a 10 percentage point cut in statutory corporate tax rates.
Column (6) is the same as column (5) except that the statutory corporate tax rate is reduced by 20 percentage points.

Table A4

Effective Marginal Corporate Tax Rates Under Various Tax Rules (Fixed-r*)

Industry	(1)	(2)	(3)	(4)	(5)	(6)
Food and Beverages	-8.26	5.20	1.57	20.80	20.76	13.11
Tobacco Products	0.71	9.65	5.36	17.22	16.92	10.70
Rubber and Plastics	-2.31	4.87	1.13	27.20	22.57	14.66
Leather	-5.77	0.99	-0.46	8.64	9.07	5.00
Textiles	-11.42	4.66	1.16	22.88	23.06	14.69
Knitting Mills	2.67	12.68	7.30	16.96	16.89	9.74
Clothing	-1.69	2.99	1.20	7.74	7.52	3.88
Wood	-13.62	-3.07	-4.03	15.56	14.90	8.63
Furniture and Fixtures	-7.01	0.38	-0.87	9.14	9.41	4.85
Paper and Allied Industries	-36.72	-1.29	-3.55	18.57	25.13	16.43
Printing and Publishing	-22.71	-6.21	-5.95	15.98	17.06	9.83
Primary Metals	-1.47	15.04	8.48	32.23	31.05	21.58
Metal Fabricating	-5.60	4.34	1.37	18.20	17.06	9.99
Machinery	0.09	7.90	3.94	19.16	17.35	10.73
Transportation Equipment	-6.66	3.39	0.15	25.29	22.22	14.13
Electrical Products	3.32	11.48	6.39	24.22	21.44	13.74
Non-metallic Mineral Products	-12.12	2.07	-0.93	24.79	23.20	14.69
Petroleum and Coal Products	-9.52	-1.26	-3.52	20.51	18.17	11.70
Chemical and Chemical Products	-8.95	2.23	-1.05	27.18	23.99	15.74
Miscellaneous Manufacturing	0.79	9.41	5.36	10.51	11.83	6.73
Total Manufacturing	-9.71	4.26	0.74	22.92	22.27	14.33
Variance (20 Industries)	124.62	30.82	16.56	29.88	24.01	14.63
Coefficient of Variation (20 Industries)	-1.04	1.38	6.35	0.24	0.22	0.27
Variance (540 projects)	*	8719.59	2707.60	3282.04	1288.61	594.31
Coefficient of Variation (540 projects)	-18.09	21.91	69.92	2.50	1.61	1.70

Notes: Column (1) describes the current pattern of corporate tax rates (excluding property taxes) with an expected annual rate of inflation of 4.4 per cent.
Column (2) involves the abolition of the investment tax credit.
Column (3) combines the abolition of the investment tax credit with a 10 percentage point cut in statutory corporate tax rates.
Column (4) involves capital cost allowance based on economic rather than accelerated depreciation.
Column (5) combines capital cost allowances based on economic depreciation with the abolition of the investment tax credit and a 10 percentage point cut in statutory corporate tax rates.
Column (6) is the same as column (5) except that the statutory corporate tax rate is reduced by 20 percentage points.
The asterisk in column (1) denotes a number with more than six digits.

Table A5

Effective Marginal Corporate Tax Rates in Total Manufacturing Under Various Tax Rules and Alternative Arbitrage Assumptions

		(1)	(2)	(3)	(4)	(5)	(6)
Fixed-p	Machinery	-23.69	-12.19	-7.96	18.16	20.53	14.07
	Buildings	15.71	20.50	15.92	19.30	18.62	12.92
	Inventories	22.69	22.69	17.97	22.69	17.97	12.59
	Debt	-57.30	-47.70	-32.00	-26.87	-12.97	-8.00
	New Shares	25.44	31.32	23.14	43.68	36.30	24.64
	Retained Earnings	25.61	31.46	23.06	43.69	36.40	24.62
Fixed-r	Machinery	-44.26	-17.96	-14.56	22.03	23.03	14.90
	Buildings	17.64	23.39	15.96	22.10	19.33	12.31
	Inventories	23.86	23.86	16.84	23.86	16.84	10.70
	Debt	-98.62	-76.84	-45.87	-44.95	-19.51	-11.34
	New Shares	30.80	37.06	27.61	47.27	40.86	29.15
	Retained Earnings	30.84	37.11	27.65	47.33	40.92	29.20
Fixed-r(f)	Machinery	-55.48	-25.18	-15.81	18.44	22.86	15.91
	Buildings	13.37	19.63	15.43	18.23	18.88	13.27
	Inventories	20.13	20.13	16.34	20.13	16.34	11.69
	Debt	-85.94	-67.89	-46.45	-39.52	-19.78	-12.80
	New Shares	31.87	38.85	27.94	49.39	41.43	28.45
	Retained Earnings	31.87	38.85	27.94	49.39	41.43	28.45
Fixed-r*	Machinery	-68.66	-25.42	-20.07	23.54	25.93	16.95
	Buildings	17.27	24.17	16.32	22.64	20.32	12.91
	Inventories	21.83	21.83	15.30	21.83	15.30	9.67
	Debt	-152.18	-111.86	-61.71	-64.78	-26.68	-15.17
	New Shares	33.81	41.59	31.55	52.46	46.45	34.06
	Retained Earnings	33.75	41.49	31.47	52.35	46.34	33.96

Notes: Column (1) describes the current pattern of corporate tax rates (excluding property taxes) with an expected annual inflation rate of 4.4 per cent.
Column (2) involves the abolition of the investment tax credit.
Column (3) combines the abolition of the investment tax credit with a 10 percentage point cut in statutory corporate tax rates.
Column (4) involves capital cost allowance based on economic rather than accelerated depreciation.
Column (5) combines capital cost allowances based on economic depreciation with the abolition of the investment tax credit and a 10 percentage point cut in statutory corporate tax rates.
Column (6) is the same as column (5) except that the statutory corporate tax rate is reduced by 20 percentage points.

Footnotes:

1 Canada's stock of capital (excluding inventories and residential construction) increased at average annual rates of 4.9, 5.0 and 5.3 per cent, respectively, during the periods 1958-66, 1967-73, and 1974-80.

2 Sven-Olof Lodin, Progressive Expenditure Tax - An Alternative? A Report of the 1972 Government Commission on Taxation (Stockholm: LiberFörlag, 1978), U.S. Department of the Treasury, Blueprints for Basic Tax Reform, (Washington, D.C.: Government Printing Office, 1977), Institute for Fiscal Studies, The Structure and Reform of Direct Taxation, Report of a Committee chaired by Professor J.E. Meade (London: Allen and Unwin, 1978).

3 Mervyn A. King and Don Fullerton (Editors), The Taxation of Income from Capital (Chicago: The University of Chicago Press, 1984).

4 Robin Boadway, Neil Bruce, and Jack Mintz, "Taxation, Inflation, and the Effective Marginal Tax Rate on Capital in Canada", February 1984, 17 Canadian Journal of Economics 62.

5 Department of Finance, The Corporate Tax System: A Direction for Change, Ottawa, 1985.

6 At the personal level, however, proposals in both the U.S. and Canada to permit increased contributions to tax-deductible retirement savings schemes would, if implemented, constitute moves towards expenditure-based tax systems.

7 Mervyn King, Public Policy and the Corporation (London: Chapman and Hall, 1977) and supra Note 3.

8 Supra Footnote 3, at Chapter 2.

9 See, for example, Glenn Jenkins, Capital in Canada: Its Social and Private Performance, 1965-1974, Economic Council of Canada, Discussion Paper No. 98 (Ottawa: Economic Council of Canada, 1977).

10 For a more exhaustive discussion of these issues see Don Fullerton, "Which Effective Tax Rate?", March 1984, 37 National Tax Journal 23.

11 Supra Footnotes 3, 4 and 5. The Department of Finance use a methodology that is practically the same as that of Boadway, Bruce and Mintz, except that personal taxes are ignored.

12 The personal tax rate could be defined as $(x-s)/p$, in which case $t_c+t_p=t$.

13 More specifically, in the case of machinery and buildings,

$$c(r) = \frac{(1-\bar{g}-A_z)}{(1-\tau)} (\rho+\delta-\pi)+ w_c -\delta$$

where $\bar{g}$ is the investment tax credit rate, A_z is the present discounted value of capital cost allowances associated with a unit of investment, δ is the rate of depreciation, and w_c is the rate of property tax. For inventories,

$$c(r) = \frac{\rho^{-}\pi+\tau(\pi^{-}0.03)}{(1-\tau)} + w_c,$$

thus reflecting the 3 per cent inventory allowance. As shown in Table 1, ρ depends on i and therefore on r.

14 Supra Footnote 3, at 11.

15 Ibid.

16 This assumption does not, of course, preclude there being a large proportion of infra-marginal investment financed by foreigners.

17 M. Feldstein and C. Horioka, "Domestic Saving and International Capital Flows", September 1980, 90 Economic Journal 314, M. Feldstein, "Domestic Savings and International Capital Flows in the Long Run and the Short Run", March 1983,

European Economic Review 129, and L. Summers, "Tax Policy and International Competitiveness", 1985, mimeo.

18 Supra Footnote 3, at 28.

19 Use of the dividend tax credit in conjunction with preferred shares has also improved the degree of tax refundability for Canadian corporations with tax losses. See Glenn Jenkins, "The Role and Economic Implications of the Canadian Dividend Tax Credit", Economic Council of Canada, 1985, mimeo.

20 Remark that corporate profit rates have fallen too.

21 On the tax form, the actual credit allowed is 22.67 per cent of grossed-up dividends which in fact is a federal credit of 34 per cent of grossed-up dividends reduced to allow for the granting of a provincial counterpart credit.

22 These estimates take into account the $1,000 deduction for interest, dividend and capital gains income.

23 Supra Footnote 7, at 61.

24 Supra Footnote 3, at 24.

25 If the tax rate on pension income (m_2) is indeed less than that on earnings prior to retirement (m_1), the rate of return

on savings held by pension funds is

$$\frac{(1+i)\ (1-m_2)}{(1-m_1)} - 1.$$

Clearly, if $m_2=m_1$, no tax is paid on interest income, whereas if $m_1>m_2$, income from savings held by pension funds is subsidized as a result of the deferral.

26 This section is based on B. Dahlby and A. Macnaughton "Taxation of Life Insurance in Canada", Economic Council of Canada, 1985, mimeo.

27 Exempt life insurance policies constitute over 90 per cent of all policies sold.

28 As in the case of households, it is assumed that life insurance companies expect to realize 10 per cent of their capital gains in each year and then use equation (12) to calculate the effective accrued tax rate on capital gains z_I.

29 This rate is calculated by adding the 36 per cent federal rate to a weighted average provincial rate of 13.09 per cent. The latter was calculated by weighting the general provincial corporate tax rates by the provincial distribution of life insurance company employees.

30 Within these categories, the range was even wider, varying from 82.20 per cent on buildings in Knitting Mills financed by retained earnings owned by households to -138.33 per cent on machinery in Paper and Allied Industries financed by new shares sold to life insurance companies.

31 The tax rate for each industry can be obtained by taking a weighted average of rates over three types of capital, or over three sources of finance or over three owners.

32 We are not suggesting that statutory corporate tax rates actually be reduced by 20 percentage points. Such a reduction would lead to a drastic drop in total corporate tax revenue and result in large windfall gains for owners of existing capital. Rather, our intent is to show how changes in the statutory corporate tax rate influence effective marginal corporate tax rates.

33 Supra Footnote 5, at 18.

34 Some features of the existing tax system were introduced in order to counteract the impact of inflation. Such features would perhaps be withdrawn in the absence of inflation. Otherwise the revenue raised by the corporate tax could decline considerably. Our calculations with zero inflation assume that there would be no inventory allowance.

35 See Glenn Jenkins, The Impact of Inflation on Corporate Taxes and the Cash Flows of Business, Economic Council of Canada, Discussion Paper No. 286 (Ottawa: Economic Council of Canada, 1985).

36 Supra Footnote 4, at 77.

37 See M. Daly et al., "The Importance of Arbitrage and Inflation Assumptions for Effective Marginal Tax Rate Computations", Economic Council of Canada, mimeo.

38 Even if the corporate tax system subsidizes investment at the margin, it can still yield positive tax revenue from inframarginal investments.

39 Simulations of the impact of the Department of Finance's proposals on effective marginal tax rates using the King and Fullerton methodology can be found in M. Daly, et al., The Taxation of Capital Income in Canada: A Comparison with Sweden, the U.K., the U.S.A. and West Germany, Economic Council of Canada, Discussion Paper No. 289 (Ottawa: Economic Council of Canada, 1985).

40 A more detailed discussion of the importance of arbitrage for effective marginal tax rate calculations can be found in M. Daly et al. "The Importance of Arbitrage and Inflation

Assumptions for Effective Marginal Tax Rate Computations", Economic Council of Canada, mimeo.

41 Supra Footnote 3, at 12.

42 See David F. Bradford and Don Fullerton, "Pitfalls in the Construction and Use of Effective Tax Rates" in Charles R. Hulten (Editor) Depreciation, Inflation and the Taxation of Income from Capital (Washington, D.C.: The Urban Institute Press, 1981).

43 Supra Footnote 4, at 66.

44 See, for example, B.M. Fraumeni and D.W. Jorgenson, "The role of capital in U.S. economic growth, 1948-1976," in Capital, Efficiency and Growth, ed. G.M. von Furstenberg (Cambridge, Mass.: Ballinger, 1980). Fraumeni and Jorgenson find a roughly constant real after-tax rate of return in the corporate sector.

45 Supra Footnote 3, at 16.