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Effective Tax Rates on Capital in New Zealand — Changes 1972-1998

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ABSTRACT

Effective tax rates (rather than statutory tax rates) on capital assets can give us an idea of the level of distortion imposed on investment by the tax system. This paper describes a study of effective tax rates on different types of capital assets in New Zealand using the King-Fullerton methodology. While the usual caveats of the application of King-Fullerton methodology apply, a clear story emerges from the data. The model demonstrates the severely negative impact of inflation, especially under the old tax regime and at the high rates of inflation seen in the late 1970s and 80s. By comparison, the current tax system is shown to be rather consistent across different types of capital assets and means of financing. The low inflation of the past few years has contributed to the improvement, but this study shows that the new tax regime performs better even under equalised circumstances (e.g. zero inflation) for the whole period under consideration.

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1. INTRODUCTION

Effective tax rates (rather than statutory tax rates) on capital assets can give us an idea of the level of distortion imposed on investment by the tax system. Therefore, it makes sense to consider the effective taxation of capital when evaluating the distortiveness of the tax system. Statutory tax rates measure the tax burden as imposed by the government on specified income (or expenditure) streams. These statutory tax rates do not take account of depreciation or other deductions, nor do they consider the effects of inflation on the actual amount of tax paid relative to the value of the income stream. Effective tax rates are designed to correct for these facts.

To put things in perspective, this paper presents an overview of the effective marginal tax rates in New Zealand on a number of capital assets over the past 25 or so years, as faced by resident companies and investors. The results are summarised by three different types of effective marginal tax rate, which measure the extent to which the definition of taxable income coincides with economic income, and the effects of the tax system on break-even rates of return to different types of investment and on after-tax return to savers.

The study was motivated by a desire to document the performance of the current tax regime against that of its predecessor, as measured in economic terms. Treasury is also contracting a project partly based on this study which will go one step further and look at the marginal effective burden (MEB) of capital taxation in New Zealand, which, it is hoped, will give a fuller picture of the efficiency of the current tax regime. Nevertheless, the results of the current paper are very insightful by themselves. While the current paper does not compute deadweight losses, it does look beyond the statutory tax rates to study the effective taxation of a range of capital assets in New Zealand.

The New Zealand tax system contains a plethora of rules and regulations, all of which potentially affect the taxation of firms. A broad study such as the present one cannot take into account all these aspects, but instead has to concentrate on those features which are thought to have the greatest impact. This implies that the actual marginal tax rate facing an investor putting funds into the capital assets studied here may end up being higher or lower than the effective marginal tax rate computed here.

The results reflect in part the assumptions underpinning the model. The statistics presented in this paper should therefore be regarded as being no more than indicative of the effects of New Zealand's tax system since 1972.

This paper makes three main points. First, the results clearly show the disastrous effects of inflation on a nominal-income based tax system in that it raises effective tax rates more than proportionately. Second, we will see how the tax system increasingly biases the choice of financing towards debt in the presence of high inflation. Third, it will become clear how the tax system in the

1970s and 80s used to lead to diverging rates of effective taxation on the various capital assets, while the current regime is shown to be relatively neutral in its incidence.

2. WHAT IS AN EFFECTIVE TAX RATE?[1]

One should be careful to distinguish the effective marginal tax rates computed in this study from the average tax rate (the ratio of the difference between accounting profits and total taxes paid to total accounting profits) a firm faces. While the average tax rate affects the total size of profits, the effective marginal tax rate refers to the rate of return to incremental investments in different types of assets.

Another difference between the two is that accounting profits are measured for a single year, whereas the effective tax rates are in principle computed for the life of the investment project.

Effective tax rates provide information on how a tax system affects firms' incentives to invest in different types of assets and how it affects savers' wealth. Effective tax rates are generally computed as the percentage difference between pre-tax rates of return and some measure after-tax rates of return to marginal investments.

Effective tax rates are typically associated with 'marginal' investments. A marginal investment is one where the investor is indifferent as to whether the investment is made or not, given the cost of capital the investor faces. The reason for focusing on marginal investments is that tax rules are more likely to influence marginal investment decisions. Effective tax rates on such marginal projects are called 'marginal effective tax rates' (METRs). The present value and rate-of-return methods yield the same results for marginal investments, but not for other investments.

The effective tax rate for investment

Taxes on business can have two effects: they increase the cost of capital to business and/or decrease the rate of return to savers. The (overall) METR by itself does not tell us the relative sizes of these effects.

The effective tax rate for investments is the percentage difference between estimates of break-even rates of return to different types of investments and the break-even rate of return in the absence of taxes. (It can serve as an indicator of the extent to which the NZ business tax system is likely to result in more or less investment occurring relative to the amount of investment in the absence of taxes.)

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[1] The discussion in this section closely follows Arthur Andersen (1998).

The effective tax rate for saving

The effective tax rate for saving is the percentage difference between the rate of return to saving available in international capital markets (which would be the level of the return to investors in the absence of New Zealand taxes) and that under taxation, for a given level of risk.

The following example will clarify and illustrate these concepts and their interrelationship.

A Numerical Example: Measures of effective tax rates

Note that the following example assumes that the marginal investor is a non-resident investor. This is quite plausible for a small open economy like New Zealand.[2] Also, we will not consider inflation in this example; all returns are real. Finally, we do not distinguish between different means of financing at this point. The concepts are the same in all cases.

Suppose the marginal investors are non-residents who require a real after-New-Zealand-tax rate of return of 5 per cent on money lent to New Zealanders, since they can obtain the same elsewhere in the world. In the absence of taxes, New Zealanders will require the same rate of return, as they, too, can obtain 5 per cent return elsewhere in the world.

This world real rate of return, *w*, of 5 per cent serves as a bottom rate for the New Zealand market, since at a lower New Zealand rate of return, neither New Zealanders nor foreigners would be willing to invest in New Zealand. But the rate of return cannot be higher either, because a higher rate of return on New Zealand investments implies more projects are worthwhile than are being carried out. Entrepreneurs would move to make use of the funding available at 5 per cent to generate those higher returns, pocketing an above-normal profit.

New Zealand investors will not be happy with less than the 5 per cent they can make elsewhere, but if the rate of return demanded by New Zealanders were any higher, New Zealand firms would just borrow abroad. Thus, the domestic real rate of return is tied to the world real rate of return.

Now suppose New Zealand imposes a simple tax system where residents are taxes 33 per cent on all income, including interest income, and non-residents' interest income is taxed at 15 per cent.

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[2] The marginal investor would be a resident if the rate of return in New Zealand were below that of the rest of the world. That would not last, however, as capital would flow out of New Zealand, raising the rate of return on the marginal investment here. On the other hand, if the return were any higher in New Zealand than elsewhere, more investment would flow in immediately, thus lowering the return on the marginal investment. So effectively, the rate of return in New Zealand is plausibly determined by the rest of the world.

From the marginal non-resident investors' point of view, investment in New Zealand will still have to yield 5 per cent net of tax, or 5.88 per cent before tax.[3] If the rate of return is any lower, they will take their money elsewhere. So the break-even rate of return in New Zealand or required rate of return, *p*, increases to 5.88 per cent.

New Zealanders in this example are paying 33 per cent on any income earned, so they won't switch their investments out of tax considerations. Their before-tax return has increased to 5.88 per cent. But their net earnings, the after-tax return to savers *s*, will be 67 per cent of that, or 3.94 per cent.

The **total tax wedge** is the difference between the required (or break-even) before-tax rate of return to the company and the net-of-tax return to savers, or:

$$p - s = .0588 - .0394 = .0194$$

The **marginal effective tax rate** then is the total tax wedge divided by the size of the pie, the required rate of return:

$$\frac{p - s}{p} = \frac{.0194}{.0588} = 33\%$$

Because it is assumed that all interest income is taxable, the marginal effective tax rate equals the statutory tax rate on domestic savers' interest income.

The **tax wedge on investment** is given by the difference between the required before-tax rate of return and the world rate of return, or:

$$p - w = .0588 - .05 = .0088$$

The **effective tax rate for investment** is the tax wedge on investment divided by the required rate of return, its logical base:

$$\frac{p - w}{p} = \frac{.0088}{.0588} = 15\%$$

If the tax on capital were removed, the break-even rate of return for investment would decrease by 15 per cent.

The **tax wedge on saving** is defined as the difference between the world rate of return and the after-tax rate of return to savers,

$$w - s = .05 - .0394 = .0106$$

[3] Assuming the non-resident investor does not obtain a credit in the home country for taxes paid in New Zealand.

The **effective tax rate for saving** is the tax wedge on saving divided by the base, which in this case is the world rate of return. In terms of an equation:

$$\frac{w-s}{w} = \frac{.0106}{.05} = 21.2\%$$

The real after-tax return to saving is 21.2 per cent lower than it would have been in the absence of taxes on the income from capital.

The three rates are related as follows. The marginal effective tax rate is the sum of the effective tax rates on investment and saving, with the latter weighted by the ratio of the before-tax to after-tax required rates of return. This is because the effective tax rate on saving is computed relative to the after-tax required rate of return (the world rate of return), whereas the other two are computed relative to the before-tax required rate of return. And required here means in order to break even when paying the after-tax return required by the marginal, that is, foreign investor.

These concepts are further clarified in the graphical illustration below.

A graphical illustration

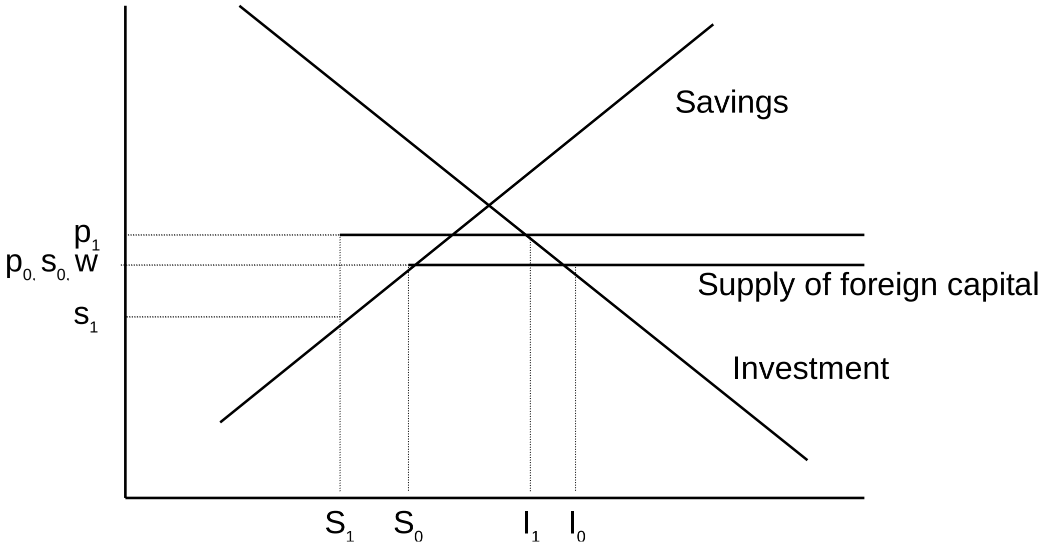
These concepts are illustrated in figure 1 below. Note the demand for and supply of funds, denoted here by investment and saving, respectively. In a closed economy, the equilibrium would occur where the two curves intersect.

In the case of a small open economy like New Zealand, the foreign supply of capital comes in as a (perfectly) elastic curve, meaning the supply of foreign funds is essentially unlimited at the minimum rate of return required by the marginal foreign investor.[4] In the initial situation, the lower one of the two horizontal lines representing the foreign supply of capital will be applicable, leading to a cost of funds (p_0) equal to the world rate of return (w_0), which in turn equals the net return to savers (s_0).

In this situation, total investment equals I_0 while total domestic saving amounts to S_0. The horizontal discrepancy between domestic investment and domestic saving represents the amount of capital imported from abroad.

[4] This is a common assumption for a small open economy.

Figure 1: Investment in a small open economy



Now, introducing a tax on the returns to investment by both residents and non-residents, the situation changes as follows. In order to continue to be indifferent between investing in New Zealand and investing elsewhere,[5] non-residents will require compensation for taxation in the form of a higher before-tax return p_1. In other words, the supply curve of foreign capital effectively shifts up by the amount of the tax on non-residents (per dollar invested).

The new equilibrium sees less total domestic investment I_1, and lower domestic savings S_1. The change in the discrepancy between domestic saving and investment depends on the relative slopes of the domestic saving and investment curves, so foreign investment into New Zealand may have fallen or risen on balance.

The net-of-tax return to non-residents continues to be equal to the world rate of return w, but the net-of-tax return to New Zealanders has fallen to s_1. The vertical difference between the before-tax and the after-tax rate of return is the total effective tax wedge. Of this, the tax wedge on investment is the difference between p1 and w, while the tax wedge on saving is given by the distance from w to s1.

3. ASSUMPTIONS AND LIMITATIONS

The key assumptions and limitations of King-Fullerton type analyses are well documented by a number of authors. See for example Fullerton (1984, 1985) and OECD (1991, 1998).

[5] And to the extent that the New Zealand tax is not creditable towards the tax bill in the home country.

Major assumptions and limitations are:

1. Future cash flows and tax rules are known with certainty. This means that the results mask differences in effective tax rates between projects involving equivalent capital outlays but with varying riskiness in their cash flows.[6]

2. The same tax structure/rates and inflation rate (are expected to) remain in place over entire project life. Computed effective tax rates thus give the basis for business decisions if they expected no changes. This shortcoming could be overcome by alternatively assuming taxpayers anticipate future tax changes – whether over the entire investment period, just within n years of investment, or just changes announced at the time of investment. Auerbach and Hines (1988) argue that "anticipated policy is important only if investment is relatively flexible" – if adjustment costs are too high, firms won't accelerate or defer planned investment so as to maximise tax advantages.

3. Capital markets are perfect, with taxes being the only reason for divergences between borrowing and lending interest rates.

4. The approach does not use data on actual taxes paid. (See Iwamoto (1992) for a formula for the relationship between ETRs and ATRs. This could conceivably be used as a double-check on ETRs, by calculating theoretical ATRs given estimated ETRs, and see how closely theoretical ATRs track actuals.)

5. It is not practicable to incorporate all the details of the tax system. For instance, some of the tax regulations concern only part of the firms and hence part of a particular type of asset. Also, for instance, the marginal personal tax rate can vary per individual. Instead of increasing the number of effective tax rates computed accordingly, we choose to concentrate on the top marginal personal tax rate (because plausibly the typical investor will be facing this marginal rate).

6. It is assumed that the company can raise funds in one of three ways—debt, equity, and retained earnings. In the New Zealand tax system, new equity and retained earnings are largely treated the same, so we only distinguish two ways in our results. More complex financial instruments, which generally blur the distinction between debt and equity, are not considered.

7. The investment is in one of seven types of capital assets: construction, plant and machinery, transport, electrical equipment, inventory, livestock, and

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6 Risk will affect effective tax rates in two ways. First, if taxable income does not equal economic income, effective tax rates will vary with the discount rate as documented by King and Fullerton (1984, pp. 282-90). Secondly, the probability of the firm going into tax loss will be positively correlated with risk. McKenzie (1994) incorporates irreversibility into a METR model, concluding that "the tax system may distort investments in risky capital to a much greater extent than is implied by previous research that ignored irreversibilities".

land. Different machines and buildings depreciate at different rates, so limiting the type of investments to just these seven capital assets reduces the amount of variation in effective tax rates.

8. It is also necessary to make assumptions about the true economic depreciation rates of the assets. The economic depreciation rates used in this study are summarised in an appendix.

9. Variation in effective tax wedges is also reduced by the fact that only one parameter can be chosen as representative of a host of parameters which may be relevant for different situations. For instance, only one rate of depreciation can be chosen for each major type of capital asset, although different statutory rates may exist within these classifications. In addition, the actual real economic depreciation of any particular building or item of machinery may differ from the assumed real depreciation rates.

10. When computing the overall effective tax rate, we assume 35 per cent debt financing. A marginal project may take any combination of debt and equity, so the overall effective tax rate must be interpreted with care. It only represents an average way of financing companies' overall activities.

There are other ways of obtaining estimates of effective tax rates, using different assumptions and methods. King-Fullerton, however, is the most internationally known and accepted method. Its results should be interpreted as distilling the essence of a tax system in a relatively straightforward manner by calculating the distortive effect of taxes on a typical investment. The actual effects of the tax system will always depend on the specifics of the individual project undertaken.

Although this may be a minor factor in the case of New Zealand, wealth taxes and grants are excluded from consideration. Wealth taxes are investor-specific. Grants are often company-specific, and are hence hard to include in a broad study.

Despite the limitations, the effective tax rates can reveal many potential distortions caused by taxation of corporate profits, namely the bias against certain types of financing arrangements, the effects of inflation, and very broadly the degree to which the tax system encourages or discourages investment in certain sectors or activities. The latter factor will be explored in a subsequent paper.

4. THE COMPUTATION OF EFFECTIVE TAX RATES

The King-Fullerton framework used for the computation of effective tax rates in this project can be represented by a recursive system of equations, which is laid out and described below. See the appendix for finer technical and computational detail.

In Figure 2, I have reproduced for illustrative purposes a standard table for the computation of the effective tax rate on non-residential construction, assuming debt financing. We start off with the given world real rate of return, which we estimate at around ten per cent.

In principle, the assumed level of the world real rate of return does not matter much to our analysis, since it is the relative performance of the New Zealand tax system over time that we are interested in. However, if we assume a very low world real rate of return, the effects of inflation will be exaggerated, as will become clear below. For the purposes of this study, the world real rate of return is assumed to be constant.

The next line contains the domestic rate of inflation, which is taken from Statistics New Zealand consumer price index data. We have used consumer price inflation as the benchmark both in order to make the different sectors comparable, and because we are not concerned with how returns are used.

Below inflation, we look at the effective taxation of non-residents' debt. This number is derived from tax rates on debt held by foreigners. Before 1990, the rate was 15 per cent if the country of residence had a double tax agreement (DTA) with New Zealand (30 per cent otherwise). In the majority of cases this rate apparently did not hold up. In 1991, the approved issuer levy (AIL) was introduced, which basically allows companies to avoid paying the 15 per cent non-resident withholding tax on interest paid to non-residents by paying instead a two percent AIL fee. Since the AIL is deductible as a cost, the effective cost to companies (and its foreign bondholders) is only 1.34 per cent.

The next item is the post-company tax nominal return on debt, which is defined as the return required by non-residents in order for them to be just indifferent about investing in New Zealand. The return has to be equal to the world real rate of return plus compensation for New Zealand inflation, grossed up to compensate for the cost AIL (which is paid on the nominal return).

The corporate tax rate currently stands at 33 per cent. Since interest expense is fully tax deductible at the corporate tax rate, the after-tax cost to the firm of borrowing at the pre-tax nominal interest rate computed above is only the share of that interest not covered by the tax deduction.

Figure 2: The Computation of Effective Tax Rates*

ETRs			
Asset: transport equipment		Type: depreciable	
Financing: debt			
Description	**Variable**	**Formula**	**1995**
World real rate of return	w		0.1
Domestic inflation	π		0.029183
Effective taxation of non-residents' debt	$\hat{\tau}_d$		0.0134
Post-company-tax nominal return on debt	i_d	$= \frac{w+\pi}{1-\hat{\tau}_d}$	0.130937
Company tax rate	τ_{comp}		0.33
Discount rate debt	ρ_d	$= (1-\tau_{comp}) * i_d$	0.087728
Depreciation allowance	d		0.095
Depreciation tax loading	α		1.2
Economic rate of depreciation	δ		.123
Present value of depreciation deductions	A	$= \frac{\alpha * d * \tau_{comp}}{\rho_d + \alpha * d}$	0.186489
Required real rate of return on asset (break-even)	p	$= \frac{1-A}{1-\tau_{comp}}(\rho+\delta-\pi)-\delta$	0.091434
Tax rate for residents	m		0.33
Real post-tax return to residents	s	$= (1-m) * i_d - \pi$	0.058545
Tax wedge on investment	wedge1	$= p - w$	-0.008566
Effective tax rate on investment	etr1	$= (p-w)/p$	-0.093685
Tax wedge on domestic saving	wedge2	$= w - s$	0.041455
Effective tax rate on domestic saving	etr2	$= (w-s)/w$	0.414548
Combined tax wedge	wedge	$= p - s$	0.032889
Combined effective tax rate	etr	$= (p-s)/p$	0.3597

*Technical detail explained in the appendix

Economic depreciation is derived from the tax regulations, and determined for non-residential construction to equal four per cent on a diminishing value basis. Depreciation loading is not available for non-residential construction (but equals 20 per cent for some of the other asset types).

Now we have come to the heart of the system, where we compute the present value of the depreciation deductions. Using this present value of the depreciation deductions we then proceed to calculate the required economic rate of return on the asset. The equations used in this part are dependent on the type of asset (whether it is depreciable or not), the depreciation deductions available, and the tax treatment. Inventories are treated differently from plant and machinery, and within inventories a distinction must be made between short and long-term holding. The technical detail involved is described in the appendix.

After we have found the economic rate of return, all that rests us is to compute the tax wedges on investment and domestic saving, as well as the combined wedge, and the respective effective tax rates on investment, domestic saving, and the combined effective tax rate.

5. BACKGROUND – The New Zealand tax system

In the following section we will illustrate how the New Zealand tax system has become less distortionary over the past 25 years. To set the background, in this section we will consider the regulations that made up the crux of the tax system during the period under consideration.

First, let us look at the taxation of non-residents. As we assume the rate of return is effectively determined by non-resident investors, it is important to note how the non-resident investor is taxed; after all, the higher the New Zealand tax rate on non-residents, the higher the pre-tax return he/she will require.

Taxation of non-resident equity

Throughout the 1970s and 80s non-residents have seen their dividend returns taxed at the non-resident withholding tax (NRWT) rate of 30 per cent, or 15 per cent if the country in question had a dual tax agreement with New Zealand.[7]

This NRWT is combined with the corporate income tax rate for each year to arrive at the total tax rate on dividends earned by non-residents. To the extent that the marginal equity investor is a foreign portfolio investor, it is usually impossible to obtain credit in the home country for any underlying company taxes paid in New Zealand.[8] In addition, NRWT isn't creditable about half of the time. Hence, the effective tax rate facing non-resident investors in equity differs from the statutory rate in a part of the cases.

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[7] There are exceptions to this general rule. For instance, the DTA with the Philippines has a top rate of 25 or 15 per cent , while that with India has a ceiling of 20 per cent.

[8] It is justifiable to argue that the marginal equity investor must be foreign portfolio investor, since they typically can move in and out very quickly, as opposed to direct investors.

On top of this, the foreign investor tax credit (FITC) regime, introduced in 1993, effectively refunds non-residents the NRWT part of taxes, so that on net they pay only an amount equal to the rate of corporate income tax, with part of it labeled as underlying company tax paid and another part as potentially creditable NRWT.

Taxation of non-resident debt

Similarly interest returns, while deductible from a company's point of view, are taxed at the NRWT (non-resident withholding tax) rate of 15 percent, or 10 per cent if the country in question has a dual tax agreement with New Zealand. However, most firms were thought to have effectively been able to avoid paying NRWT, so that the effective tax rate on interest paid to non-residents was closer to zero per cent.

In 1991, the approved issuer levy (AIL) regime was introduced, which enabled firms to pay a deductible 2 per cent fee per year in order to avoid having to pay NRWT over interest paid to non-residents. Most companies have taken advantage of this arrangement, so that the effective tax rate on interest to non-residents now lies at 1.34 per cent (after all, the 2 per cent fee is deductible from the firm's tax bill, so the real cost is only 2/3 of the nominal amount).

Inflation

The largest swings (relatively) have been observed in the rates of inflation. Starting with 10 to 15 per cent in the 1970s and early 80s, then temporarily dipping to 3.5 per cent in 1983, back up to 18 per cent by 1986, then slowly abating and hovering mostly around the one per cent mark in the 1990s.

I have used the consumer price index (CPI) as the measure of inflation. While the period under consideration saw the introduction of GST, I chose not to use a CPI excluding GST as the inflation measure. The year 1986 marked the introduction of GST at an initial rate of 10 per cent, while simultaneously abolishing the wholesale tax. The joint effect was roughly a 4 per cent increase in the price level, quite different from the nominal effect of introducing GST. Also, in 1989, GST was increased to 12.5 per cent. This will affect the effective tax rates in these two years, but does not affect the overall picture.

Corporate income tax rates

Underlying the taxation of both non-residents' and residents' returns on their investment is New Zealand corporate income tax. Together with inflation, it forms a major determinant of the required rate of return. The corporate income tax rate has fluctuated over the years, starting at 45 per cent from 1972 to 1986, via 48 per cent in 1986 and 87, and a temporary 28 per cent in 88, to 33 per cent since then.

Personal income tax rates

Considering personal income tax rates, we have considered the top bracket rate for any year. It is not practicable to compute effective tax rates for each personal income tax bracket, and besides, most of the investors will tend to have been in the top bracket anyway. The top rate has varied from 46 per cent in 1972, up to 66 per cent in 1984-85, then gradually falling to 33 per cent by 1989. For the past ten years, it has stayed at that level.

It is the interplay of these factors, together with allowed rates of depreciation and details like imputation credits that determine the effective tax rates in New Zealand.

Tax treatment of the capital assets

For this part, I have looked at seven different capital assets: non-residential construction, plant and other machinery, transport equipment, electrical machinery, livestock, inventories, and land. For each, we will consider the typical tax treatment and the special assumptions needed for the analysis.

The first group is that of depreciable capital assets: non-residential construction, plant and other machinery, transport equipment, and electrical machinery. Transport and electrical machinery are sometimes bundled into plant and equipment; that is why the latter has been termed "plant and *other* machinery."

Non-residential construction

During the 1970s and 1980s buildings received a depreciation allowance that was linear or straight line (SL), rather than the currently more common diminishing value (DV) method. As of 1 April 1993, this was changed to a system of diminishing value depreciation.[9] As there are several rates of depreciation allowance, depending on the specifics of the structure, we chose an average rate of 2 per cent SL until tax year 1992, and 4 per cent DV from 1993. This number conforms with that of other studies.

While the current depreciation allowances are supposed to be as close as possible to economic depreciation, the consensus is that economic depreciation for non-residential construction lies around 3.6 per cent DV.[10]

Plant & Other Machinery

Tax depreciation changed in 1993 from 10 per cent to 9.5 per cent DV. Economic depreciation is estimated at 12.3 per cent DV. Through 1992 there

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[9] Note that, for moderate rates of depreciation, there is a correspondence between diminishing value and straight-line deprecation of approximately 1.5 DV to 1 SL. All rates of tax depreciation are taken from various issues of Staples' Guide to New Zealand Tax Practice.

[10] See OECD (1991), p. 96.

was a loading factor of 1.2 on plant and machinery, implying accelerated depreciation by this factor. Finally, plant and machinery (as well as some hotels and farm buildings) enjoyed a 25 per cent first-year depreciation through 1985, after which this increased first-year depreciation was disallowed.

Transport Equipment

Transport equipment is listed separately in the new regime, but not in the old one. For the historical depreciation allowances for Transport Equipment I mad use of the fact that Transport Equipment is part of Plant & Machinery, obtaining a depreciation depreciation allowance of 20 per cent DV until 1992. (Some specific items of transport equipment were listed under the old regime with the same depreciation allowance.) In 1993 the regime switched to 9.5 per cent DV with a depreciation loading factor of 1.2. Economic depreciation has been estimated to be 12.3 per cent DV.

Electrical Machinery

Until 1992 the depreciation allowance was equal to 20 per cent DV, from 1993 on 22 per cent DV with a loading factor of 1.2. Economic depreciation estimated at 22 per cent DV.

Livestock

In the years through 1985, livestock was treated as trading stock, with the qualification that its tax cost was some 40 per cent of the full cost. Since 1986, livestock has effectively been valued under either standard trading stock rules or so-called ‘herd scheme’ rules. The split between the use of herd scheme and trading stock rules is estimated at 60-40.

The herd scheme treats a herd as if it were a single capital asset. Each year, the government sets the price at which livestock are valued, so that for the whole tax year the value remains the same. This way, fluctuations in market value do not affect the tax bill inasmuch as the herd size is constant. When the government-set value of livestock is higher in a subsequent year, the implied capital gain is not taxable, since the value is valid for beginning and end-year stock. However, the tax advantage gained from this valuation system cannot straightforwardly be incorporated into the computation of the effective tax rate on livestock, so the calculated effective tax rates may underestimate the support level to farmers by the government.

Under the current trading stock rules, the tax value of the stock is close to 90 per cent of the full market value. About 70 per cent of the trading stock is held over the balance date, for an average holding period of two years.

Non-agricultural Inventories

The difference between tax cost and full cost of trading stock is around 10 per cent. The portion of inventory sold within a year is 15 per cent, so that 85 per cent is held over the balance date. The average holding period for inventory held over the balance date is taken to be 2 years, which is effectively the duration of an interest-free loan from the government.

Land

For the land asset, we need to know what proportion is held on revenue account vs. capital account. Here, we assume 90 per cent is held by non-traders (i.e., on capital account) and 10 per cent by traders (on revenue account). The expected real rate of appreciation equals 1.5 per cent. Finally, the expected holding period of land by a trader is assumed to be five years. All these numbers are presumed to be constant over the period in question.

6. RESULTS

In this section, I present tables and graphs to illustrate the status of the New Zealand tax regime over the past 25 years. The spreadsheet underlying these graphs incorporates all of the features of the New Zealand tax system described above. In this graphical analysis, we distinguish not only the different capital assets, but also the method of financing, being debt versus equity.

Within equity financing, one can distinguish between retained earnings and new equity. In the earlier days, retained earnings was, from a taxation point of view, a third distinct method of financing, but in the current imputation regime the distinction between new equity and retained earnings financing has become irrelevant, as there is little or no difference in the opportunity cost of funds obtained from these sources. Hence, in this study, we will focus on debt versus equity only.

Tax Wedges on Debt and Equity Investment

The first set of graphs (figures 3 and 4) illustrates the tax wedges on debt and equity investments in the different assets under actual inflation versus zero inflation. Here I reproduce only graphs for Non-resident Construction for illustrative purposes. The graphs for other assets are very similar.[11] More numerical detail can be obtained from the summary tables at the end of the paper.

[11] They have been omitted from this paper but can be obtained directly from the author upon request.

While a tax on inflated (that is, inflation-exposed) income at times clearly wipes out any real returns that may have existed, the zero-inflation graphs show that the tax regime in force during the 1970s and 80s was nevertheless more uneven than the current one, and generally would have led to higher effective tax rates even under zero inflation rates. This conclusion is as clear for debt-financed investment (figures 3a and 3b) as it is for equity-financed investment (figures 4a and 4b).

Thus, figures 3 and 4 demonstrate the first major point of this paper in graphical form: they present clear evidence of how inflation savages the intended incidence of a nominal-income based tax system.

On the other hand, figures 3b and 4b also defuse the argument that inflation was the single driving factor in the inequality between the former and the current tax regime. After all, under zero inflation we still find significant differences in effective taxation as the tax regime has changed over time. Even controlling for inflation, the current regime is much more equal across assets (see table 2 in the back of this paper) and across methods of financing.

Figure 3a: Tax Wedge on Debt-Financed Investment in Non-residential Construction (Actual Inflation)

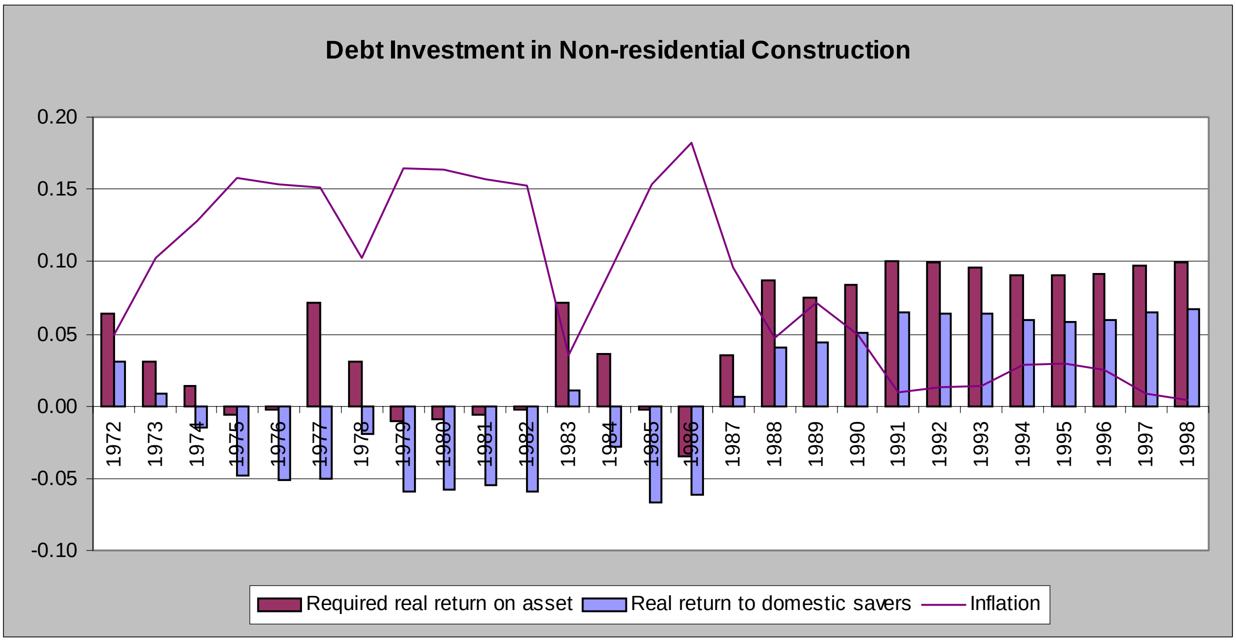


Figure 3b: Tax Wedge on Debt-Financed Investment in Non-resident Construction (Zero Inflation)

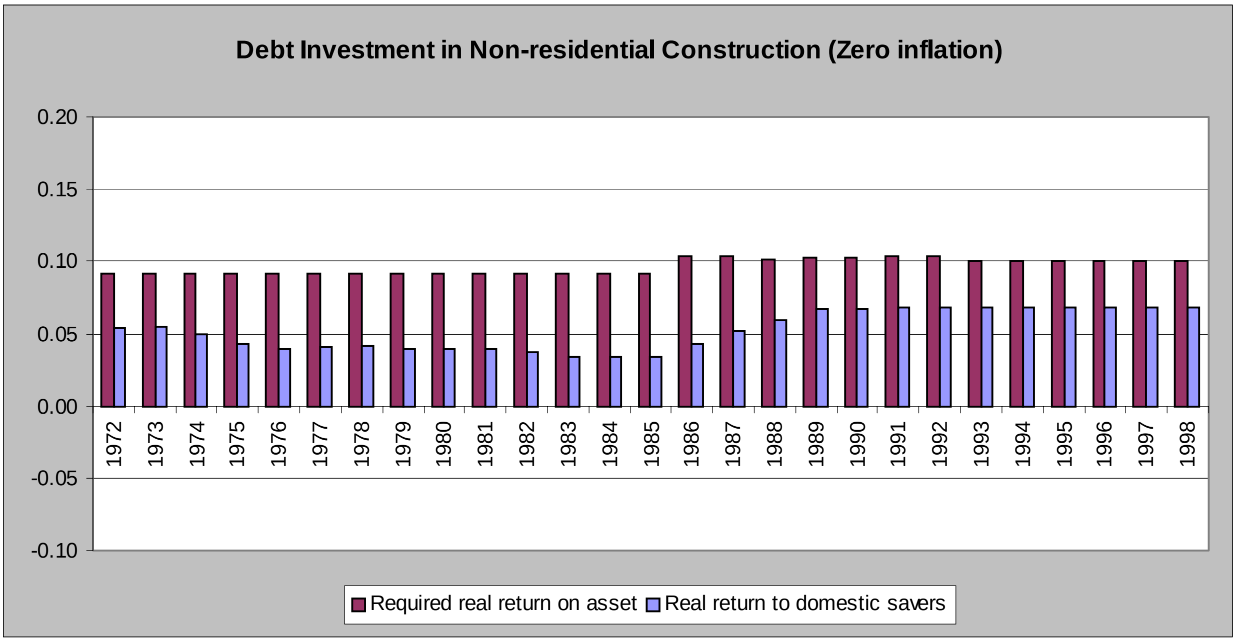


Figure 4a: Tax Wedge on Equity-Financed Investment in Non-residential Construction (Actual Inflation)

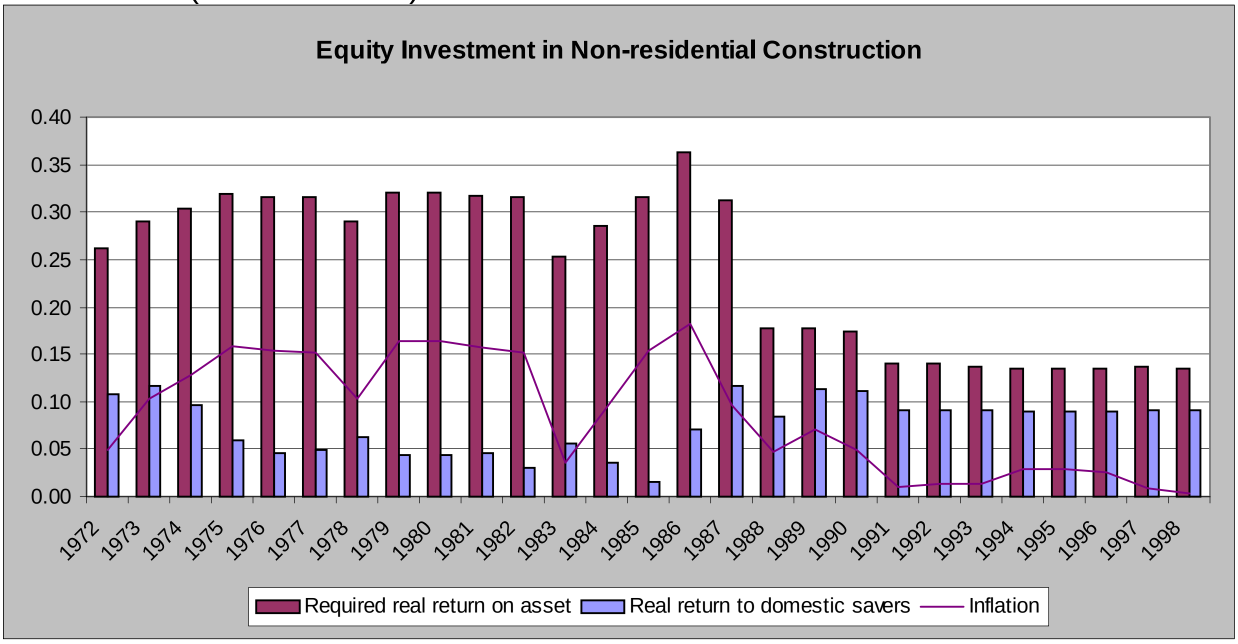
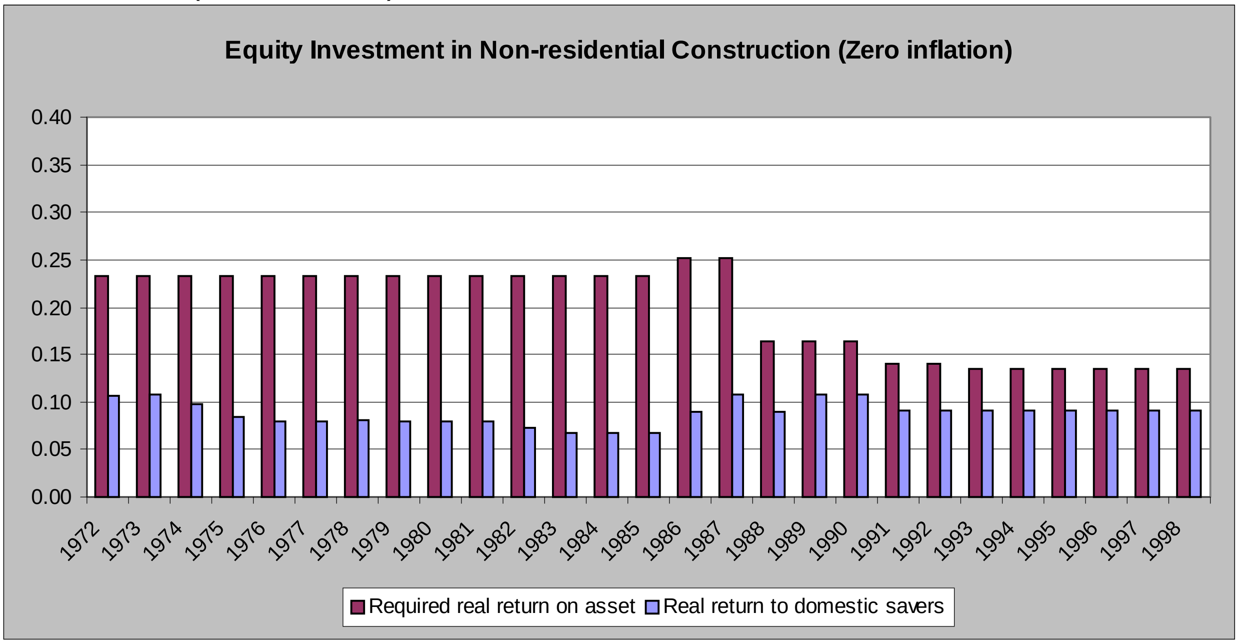


Figure 4b: Tax Wedge on Equity-Financed Investment in Non-residential Construction (Zero Inflation)



There is some variation across assets. This may point in the direction of preferential taxation for some assets relative to the others. In future research, I plan to further analyse the effective taxation of manufacturing sectors rather than capital assets, with an eye on the differential tax treatment of the various sectors.

The wedges indicate the absolute size of the slice that the government takes out. This may be more indicative than the effective tax rate especially when pre-tax (required) returns are very low or negative. When the pre-tax return is positive, the effective tax rate is the difference with the post-tax return to savers, relative to the pre-tax return.

Effective Tax Rates on Capital Assets

A second set of graphs (figure 5) shows the effective tax rates on debt, equity, and combined investments in each of the capital assets. The total effective tax rate is only defined when the required real rate of return (before tax) is strictly positive. Hence, in the 1970s and 80s some (especially debt-related) effective tax rates are missing.

Note that the effective tax rate on equity is generally lower than that on debt, except for the latest period, when all rates are at very comparable levels. It is also clear that the required real rate of return on debt-financed investment is much lower than that on equity-financed investment. The reason for this phenomenon is that effective tax rates are much lower on non-resident-provided debt finance than on non-resident-provided equity finance, since interest on debt is deductible from the firm's point of view, while dividends are paid from after-tax income.

Figures 5a and 5b compare effective tax rates under actual and zero inflation.

Figure 5a: Effective Tax Rates on Debt- and Equity-Financed Investment in Non-residential Construction (Actual Inflation)

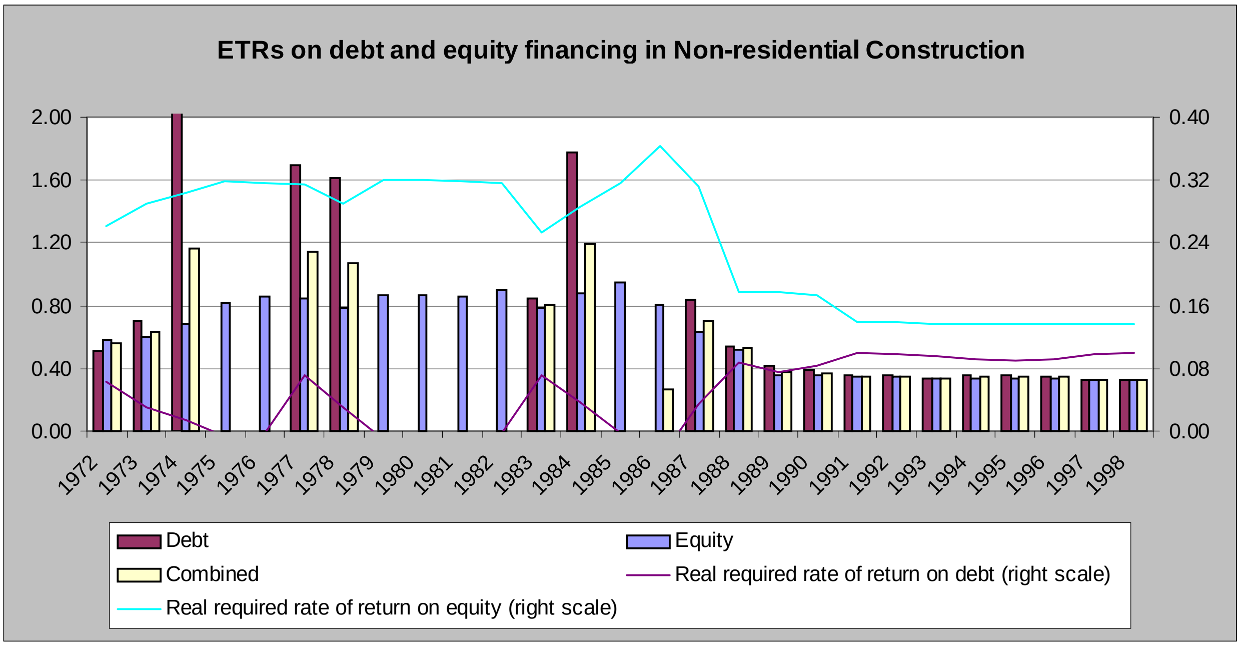
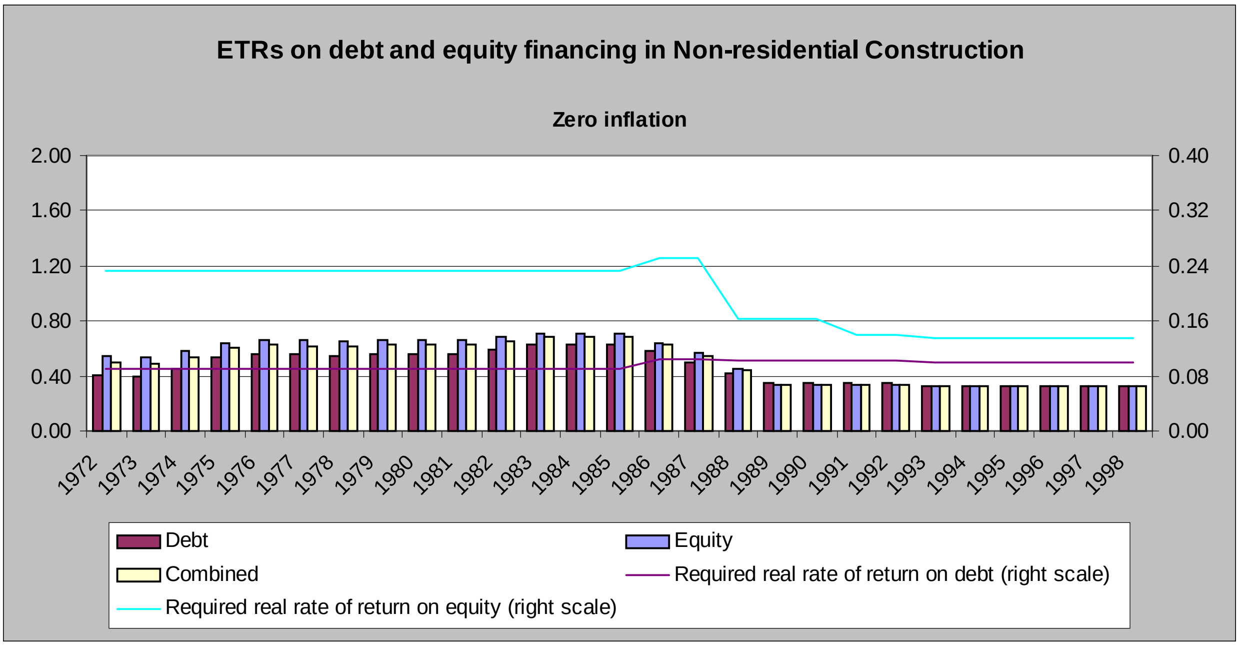


Figure 5b: Effective Tax Rates on Debt- and Equity-Financed Investment in Non-residential Construction (Zero Inflation)



Finally, in Appendix 3 we present a summary of the results in table format. The table shows the effective tax rates for all assets, all years, and three financing methods: debt, equity, and a mix of one-third debt, two-thirds equity. Analysis of a cross-section of NZSE listed companies indicates companies in most sectors use a mix of one-third debt to two-thirds equity on average.

Bias towards debt financing

Figures 3, 4, and 5 together provide evidence for the third main point of this paper, that inflation tends to bias the choice for the method of financing towards debt. Note in figure 3a that during the high inflation years the break-even rate of return for debt-financed investment in non-residential construction was routinely negative. This is caused by the fact that interest payments on debt are deductible. Under circumstances of high inflation, interest payments consist mostly of compensation for inflation. Since the whole interest payment is tax-deductible, so is the inflation part, even if it does not constitute a real cost. In other words, the government helps finance inflation-compensation payments at the rate of 33 per cent.

For example, suppose the firm has an outstanding loan worth $1000, on which it pays 10 per cent or $100 interest per year. Of this, 8 per cent is compensation for (expected) inflation and 2 per cent real return to the bondholder. The $100 annual interest payment lowers the company's tax bill by $33, leaving a net cost of $67. But with 8 per cent inflation this means that while the value of the loan has decreased by 8 per cent, the firm has only paid 6.7 per cent net to compensate for this. On net, then, the company's financial position has actually improved. In other words, the firm does not have to make a profit on the investment in order to make it worthwhile! That is, it does not require a positive rate of return on the investment to break even. The loan is essentially financed by the bondholders (and other taxpayers), as we will see below.

The reverse side of the medal implies that bondholders are taxed on the full amount of received interest payments, even if a significant part of them consists of inflation compensation, that is, only a small portion of the interest payments consists of actual real gains. Thus, under high inflation the bondholder easily ends up losing money in real terms.

For example: Suppose a $1000 bond yields 10 per cent interest or $100 per year, of which 8 per cent is compensation for inflation and 2 per cent is the real return. If taxed at 33 per cent, net tax payments are $33, leaving the bondholder with his initial $1000 as well as $67 net interest. With 8 per cent inflation, however, the value of his original investment has fallen by 8 per cent or $80. On net, then, our investor has lost $13 dollars after tax, despite the 10 per cent interest rate that was supposed to compensate for the effects of inflation.

This phenomenon is specific to debt-financing. In equity-financing, neither dividends paid by the firm nor retained earnings are deductible, so high inflation increases the required rate of return: after all, the firm has to pay its own way. The shareholders, on the other hand, are still taxed on the nominal return, so to the extent that they are compensated for inflation by higher dividends, this is taxed away by the nominal-income-based tax system. But even if the shareholders received compensation for inflation only through untaxed capital gains, leaving them more net benefit, the firm would still be worse off than with tax-deductible debt-financing.

As a result, the nominal-income-based tax system tends to favour debt-financing under inflation.

Wildly swinging effective tax rates

When a subsidy is provided by the tax system the effective tax rate generally turns negative. However, it should be noted that if the tax system delivers such a large subsidy that the required rate of return is negative, the effective tax rate will be positive, which is highly misleading. For instance, suppose that the required rate of return is –10 per cent and savers' required post-tax rate of return is +10 per cent. Then the King-Fullerton marginal effective tax rate is (-.1-.1)/-.1=200 per cent!

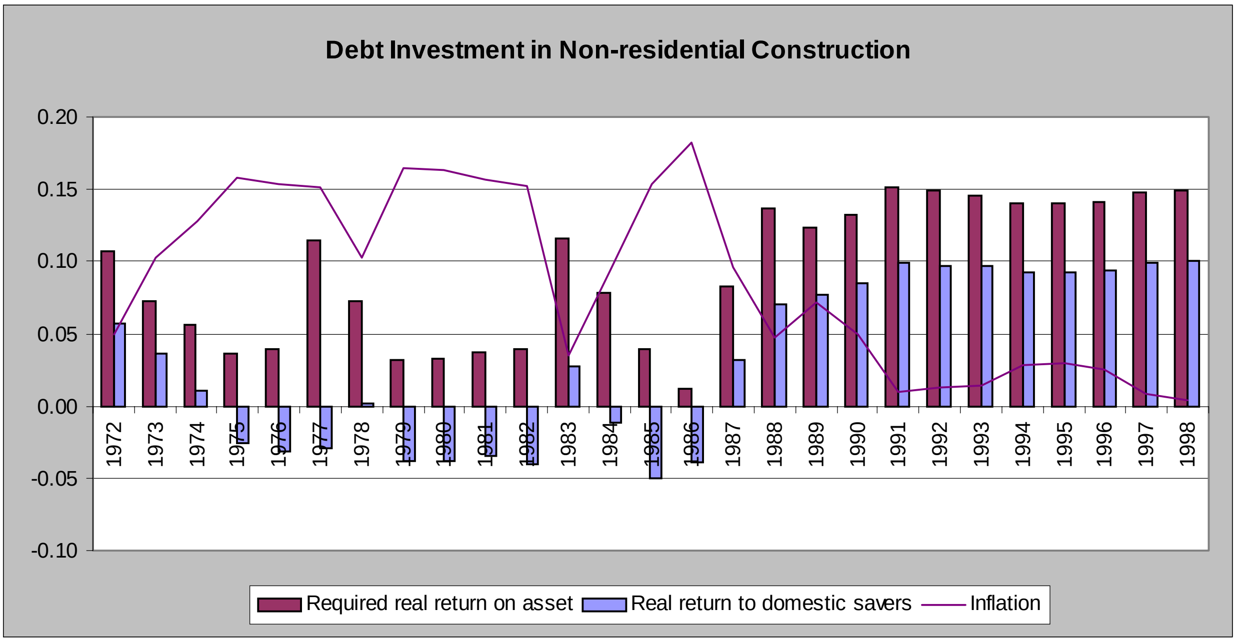
In the graph showing the effective tax rates, the required real rates of return are also shown. Where the required real rate of return turns negative, the effective tax rate becomes positive again, which, as explained above, does not imply positive tax revenue to the government. This has happened mostly for debt investment in the various assets in the 1970s and 80s.

A negative required real rate of return on debt investment implies an effective subsidy to the New Zealand so substantial that the debt-financed investment doesn't need to yield positive returns of itself. This phenomenon can for instance be due to a generous (first-year) depreciation allowance, combined with the already advantageous tax treatment for debt financing. If the non-resident is able to avoid additional taxation, the investment doesn't have to yield much return to be profitable. The lower the world rate of return, the sooner this may happen.

Note that even when the required real rate of return is negative, the taxman may still extract revenue from the saver (i.e., when the nominal return is positive and there is a high rate of inflation). A negative return to the saver (when the required rate of return is positive) on the other hand implies all real gains are effectively taxed away. This latter case has occurred often in the 1970s and 80s under high inflation.

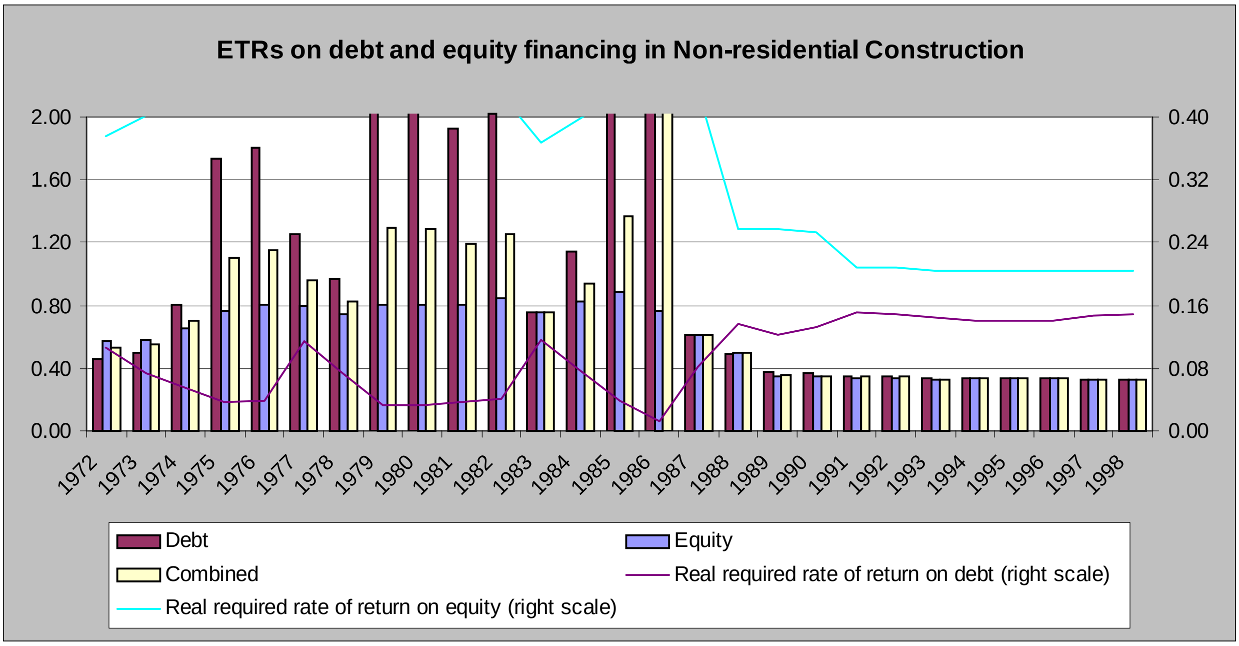
To resolve the problem of having such wildly swinging computed effective tax rates, we can assume a higher world rate of return. This will increase the required real rate of return, so that the effective tax rate will always be defined. Thus, all years will become comparable. A world rate of return of 15 per cent would achieve this. The results are shown for non-residential construction in the graphs below.

Figure 6a: Tax wedges when world interest rate at 15 per cent (Actual Inflation)



As can be seen from the graph, there have not been subsidies in non-residential construction during the period studied. (This does not include possible subsidies for hotels and the likes, which have had a slightly different depreciation allowance.)

Figure 6b: Effective tax rates when world real rate of return at 15 per cent (Actual Inflation)



International Comparison

Both the OECD and Arthur Andersen have produced interesting international comparisons of effective tax rates. I will not reproduce their results here, but just note their existence. The upshot of these studies is that New Zealand comes out looking relatively good in terms of taxing different assets similarly, with the exception of R&D and Mining (which are advantaged by the tax system in a host of countries).

Further research

As mentioned earlier, Treasury is commissioning a study into the marginal effective burden of the New Zealand capital taxation regime. It will be partly based on results from the current paper. This study is scheduled to be completed by the end of 1999.

Treasury has also commissioned a survey to determine the supply of foreign tax credits available to foreign companies who pay tax in New Zealand. This information should give us more insight into the effective taxation of non-residents' debt and equity investments in capital assets in New Zealand. Results of this survey are also expected by the end of 1999.

Future steps in this effective tax rate project, to be carried out in the following months, will involve adding research & development and forests to the range of capital assets, and studying if, and how, particular manufacturing sectors have been (dis-)advantaged by the tax system over the past 25 years.

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TECHNICAL APPENDIX:

METHODOLOGY – AN ADAPTATION OF THE KING-FULLERTON MODEL[12]

1. Introduction

This technical appendix is organised as follows. Section 2 explains the basic approach and notes that the appropriate statistic for measuring the effect of taxes on investment decisions in a small open economy is the percentage difference between the real before-tax cost of capital to firms and 'the' real world interest rate, and that the effect of taxes on savings decisions is best measured as the percentage difference between the world interest rate and the real after-tax return to savings.

Section 3 derives formulae for measuring the real cost of capital for investments in depreciable assets, inventory, land and livestock under alternative tax regimes. Section 4 considers how firms' nominal discount rates are affected by inflation and by the tax rules applying to non-residents.

2 Methodology

2.1 Preliminaries

The model adapts the methodology of King and Fullerton (1984), whose terminology we employe where feasible. The King-Fullerton methodology aims to measure the effect of a tax system on (a) the 'cost of capital' to firms and (b) real after-tax interest rates enjoyed by savers, thereby providing a guide to the tax system's impact on incentives to invest and to save. The approach is based on the 'neoclassical' investment model pioneered by Jorgenson (1963) and Hall and Jorgenson (1967), under which it is assumed firms invest in capital to the point where the marginal product of capital equals the user cost of capital.

Defined terms

p	Required real before-tax return on marginal investment
s	Real after-tax return to savers
r	Real before-tax interest rate
w	Real 'world' interest rate (rate at which foreigners would be willing to lend to New Zealanders absent taxes and inflation)
i	Nominal before-tax interest rate
ρ	Firms' nominal discount rate
π	Inflation rate
δ	Exponential rate of economic depreciation
d	Exponential rate of depreciation allowance
α	Depreciation loading *plus one* (ie, 1.2)

[12] The material in this appendix was largely the work of Peter Goss, who was the main driver of this project in its early stages.

β	Percentage difference between 'cost' of inventories for tax purposes and full cost.
θ	Proportion of company income which is *not* subject to taxation on distribution
u	Time
τ_R	Tax rate applying to resident companies
m	Tax rate applying to resident savers
τ_N^j	Tax rate applying to non-residents, where j = D for debt investments and K for equity investments
D	(superscript) Debt
K	(superscript) Equity
T	Number of years for which the asset is (expected to be) held
λ	Proportion of an asset's cost that can be immediately expensed
ψ	Expected real rate of appreciation of land

2.2 Which 'effective tax rate'?

King and Fullerton and the numerous subsequent studies which apply their methodology generally define the effective tax rate as

$$\frac{p-s}{p}, \qquad (1)$$

where *p* is the required real pre-tax return to a marginal investment and *s* the real after-tax return to the savers who finance the investment. We introduce Figure 1 to assist in the interpretation of the King-Fullerton effective tax rate.

Figure 1

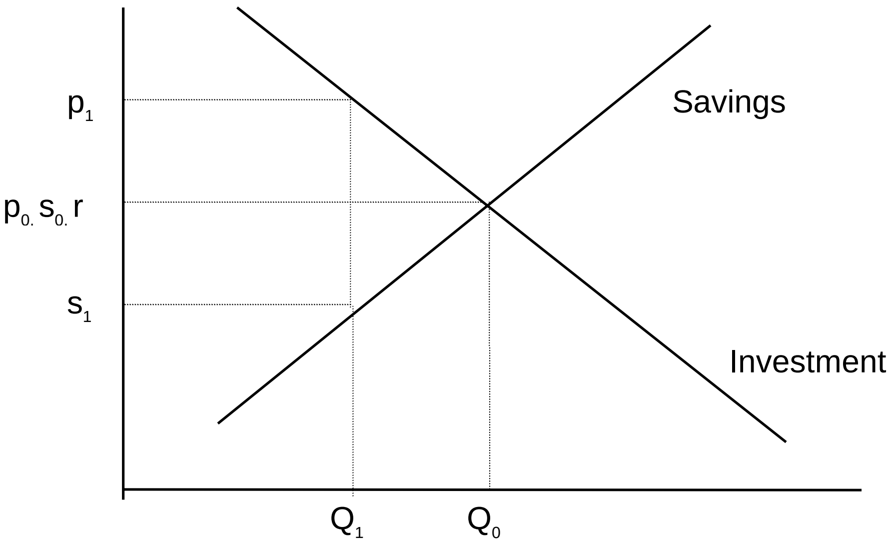


Figure 1 depicts a simple closed economy, in which savings and investment are functions of the after-tax real interest rate *r.* Without taxes, $p = s = r$ and $I \equiv S$

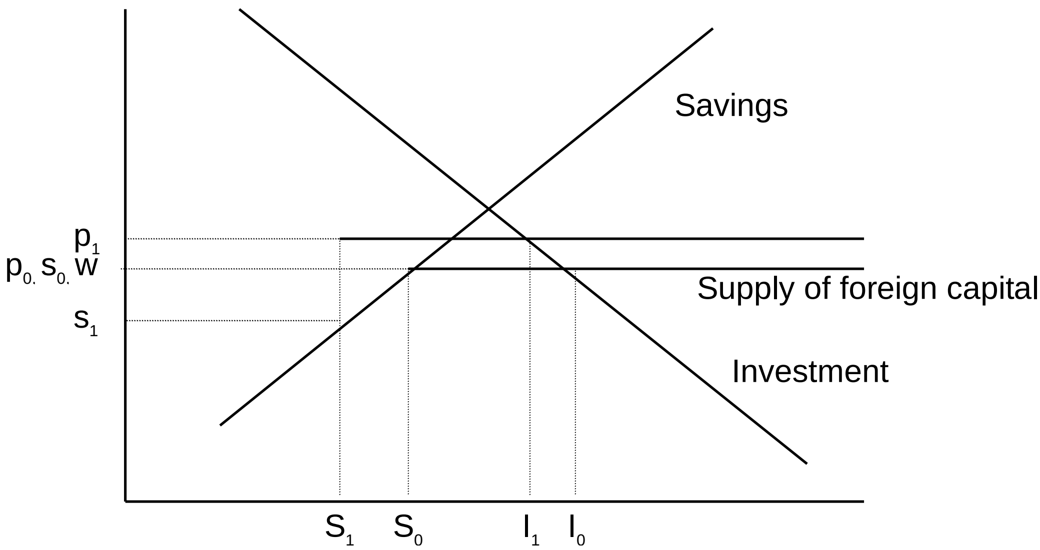
= Q₀. A tax on interest raises the before-tax cost of capital to firms to p_1, reduces the return to savers to s_1, and results in investment and savings falling to Q_1.

From Figure 1, we can see that the King-Fullerton effective tax rate, $(p_1 - s_1)/p_1$, measures the total tax-related divergence between the cost of capital to businesses and after-tax returns to savers. It does not, however, provide us with any clues about the *relative* effects of the tax on the returns enjoyed by savers and on the cost of capital to businesses. To measure these effects, we need to decompose the King-Fullerton effective tax rate into statistics which capture the percentage differences between p_1 and p_0, and s_1 and s_0, respectively.

In the closed economy world of Figure 1, it can be difficult in practice to determine what 'the' real interest rate would have been in the absence of taxes.[13] In a small open economy, however, it is reasonable to assume that the local taxes do not affect the real after-tax rate of return required by foreign lenders. Figure 2 depicts this world.

In the country depicted in Figure 2, foreigners are willing to supply capital at the interest rate *w*. Since this is below the interest rate which would be required to clear the capital market if the economy was closed, the country is a net capital importer. Without taxes, local savings would be S_0 and capital imports would be $I_0 - S_0$.

Figure 2



The effects of introducing a tax on income from capital into this economy depend entirely on how the tax affects interest paid to non-residents. In Figure

13 In practice, we would be able to observe p_1, s_1 and r_1, but not p_0, s_0 or r_0. We would need to know the slopes of the investment and savings schedules to estimate the latter variables. See McKenzie, Mintz and Scharf (1997:342) for the appropriate formula.

2, introducing a tax means firms have to earn p_1 to be able to pay w after-tax to non-residents. Consequently, the tax partly affects firms' cost of capital, which increases to p_1 and partly affects after-tax returns to savers, reducing these to s_1. If the tax was instead designed so that interest paid to foreigners was not taxable, the full burden would fall on savers: we would have $p_1 = p_0$, with the percentage difference between s_0 and s_1 equalling the tax rate.

It follows then that the appropriate measure of the effect of taxes on marginal investment decisions in a small open economy is the statistic

$$\frac{p-w}{p} \tag{2}$$

where *w* is the real after-New Zealand-tax-rate at which foreigners are willing to lend to New Zealanders.

Similarly, the percentage difference between the after-tax rate of return enjoyed by savers in a small open economy and the rate of return they would earn in the absence of taxes is

$$\frac{w-s}{w}. \tag{3}$$

In what follows, we refer to (2) as the effective tax rate on investment and (3) as the effective tax rate on savings.

3. The Cost of Capital

In this section we derive formulae for the cost of capital *p* which incorporate current and past tax rules for depreciable assets, inventory, land and livestock. Section 4 derives formulae for the real after-tax interest rate, *r,* and for the nominal after-tax rate at which firms discount their cash-flows.

3.1 Depreciable Assets

Following King and Fullerton, we consider a firm with a single asset which costs \$1 and which generates an initial before-tax cash flow of $(p+\delta)$. Nominal profits increase with inflation π, decrease at the rate of depreciation δ, are discounted at the (after-tax) nominal rate ρ and are taxed at rate τ_R. The firm's market value is

$$\begin{aligned} V_0 &= \int_0^\infty (p+\delta)(1-\tau_R)e^{-(\rho+\delta-\pi)u}du + A \\ &= \frac{(p+\delta)(1-\tau_R)}{\rho+\delta-\pi} + A, \end{aligned} \tag{4}$$

where A is the present value of all tax allowances available to the firm.[14]

Since we are interested in the tax system's effects on marginal incentives to invest, we first solve for the lowest value of p – that is, the real before-tax rate of return, or 'cost of capital' – at which the firm is willing to invest in the asset. (Equivalently, we are looking for the value of p at which the firm's market value equals the cost of its assets.) On setting V=1 and solving (4) for p, we obtain:

$$p = \frac{1-A}{1-\tau_R}\left(\rho + \delta - \pi\right) - \delta \qquad (5)$$

The present value of tax allowances available to the firm depends on the detail of the tax code, as the following examples illustrate.

1. Historical cost depreciation deductions.

If depreciation deductions are calculated on a 'historical cost' (ie, non-indexed) basis, at rate $d \neq \delta$, the deductions available to the firm will have a present value of

$$\begin{aligned} A &= \int_0^\infty d\tau_R e^{-(\rho+d)u} du \\ &= \tau_R \frac{d}{\rho + d}, \end{aligned}$$

and

14 Note that this expression does not net off payments due to suppliers of debt finance to the firm. While this approach is taken in most of the effective tax rate literature (but see Gravelle (1985) for an exception), it is somewhat at odds with the approach normally taken in the finance literature, where it is assumed that the problem is to maximise the value of the firm to its shareholders; that is, after payments to debt holders. It turns out that both approaches generate the same results, so long as due care is taken in specifying the discount rate. Under the approach adopted above, where we are maximising the value of the firm to all its owners, the discount rate is the weighted-average cost of debt and equity capital. Under the alternative approach, where we would specify the firm's value to its equity holders as

$$\begin{aligned} (1-b)V_0 &= \int_0^\infty (p+\delta)(1-\tau_R) - b\left[\delta - \pi + i\left(1-\tau_R\right)\right] e^{-(\rho'+\delta-\pi)u} du + A \\ &= \frac{(p+\delta-bi)(1-\tau_R) - b(\delta-\pi)}{\rho'+\delta-\pi} + A, \end{aligned}$$

where principal is repaid at the rate δ-π, nominal interest is tax-deductible and b is the percentage of the asset which is debt-financed, the discount rate ρ' is the nominal opportunity cost of equity finance.

$$p=\frac{(\rho-\pi)[\rho+d+\tau_R(\delta-d)]+\tau_R\delta\pi}{(\rho+d)(1-\tau_R)}. \qquad (6)$$

2. Depreciation loading

Under our current system, depreciation deductions equal Inland Revenue's best estimate of economic depreciation, but (a) are not indexed for inflation and (b) have a 20 percent 'loading'. In this case, depreciation deductions have a present value of:

$$\begin{aligned}A&=\int_0^\infty \alpha\delta\tau_R e^{-(\rho+\alpha\delta)u}du\\&=\tau_R\frac{\alpha\delta}{\rho+\alpha\delta},\end{aligned}$$

and

$$p=\frac{\rho(\rho+\tau_R\delta-\pi)+\alpha\delta r(1-\tau_R)}{(\rho+\alpha\delta)(1-\tau_R)}. \qquad (7)$$

3. Investment allowances

Finally, suppose a proportion λ of an asset's cost can be immediately expensed (that is, a tax refund of τλ is allowed when the asset is acquired) and that the remaining (1-λ) percent of the asset's cost can be depreciated on a historical cost basis. Then

$$\begin{aligned}A&=\tau_R\lambda+(1-\lambda)\int_0^\infty d\tau_R e^{-(\rho+d)u}du\\&=\tau_R\frac{\lambda\rho+d}{\rho+d},\end{aligned}$$

and

$$p=\frac{(\rho-\pi)[\rho+d+\tau_R(\delta-d)-\tau_R\lambda(\rho+\delta)]+\tau_R\delta\pi(1-\lambda)}{(\rho+d)(1-\tau_R)} \qquad (8)$$

3.2 Inventories

A one-period investment in inventory will be just worthwhile if it generates a nominal after-tax rate of return of ρ. In this section, we calculate the before-tax real rate of return (*p*) which equals (ρ-π) under alternative methods of valuing inventory.

3.2.1 Market Value

Most nominal returns to investment in trading stock are taxed as they accrue (ie, under a ‘market value’ approach).[15] Under this approach, an investor will be indifferent between investing in inventory and putting their money in the bank for a nominal after-tax return of ρ if

$$1+\rho = 1+(p+\pi)(1-\tau_R) \quad (9)$$

from which it follows that the required real before-tax rate of return to the investment is

$$p = \frac{\rho - \pi(1-\tau_R)}{1-\tau_R}. \quad (10)$$

3.2.2 Inventories valued at cost

Inventories on hand at balance date are normally valued at ‘cost’ for tax purposes. Valuing closing stock at cost rather than its market value has two effects:

1. It results in tax on the profit on the stock being deferred until the stock is sold. We model this effect in equation (11) by collecting tax on the full (compounded) nominal return in period T, when the stock is sold.

2. To the extent ‘cost’ as defined for tax purposes falls short of full cost,[16] the taxpayer effectively gets an interest-free loan from the government in period 1 of $\beta \frac{\tau_R}{1-\tau_R} \text{ x cost}$, where β is the percentage of the cost of inventory that does not have to be added back into closing stock, with the ‘loan’, along with tax on the proceeds from reinvesting the loan, being

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15 In particular, all inventory sold in the tax year in which it is acquired is effectively taxed on an accrual basis.

16 We define ‘full cost’ as all direct and indirect costs of producing/acquiring inventory *other than financing costs* – if we defined ‘full cost’ to include financing costs, it would at the margin equal ‘market value’. While we could adopt the latter approach, it would be more difficult to apply the formulae in practice, since we would need data on mark-ups to calculate β. By excluding financing costs, all we need to calculate β is knowledge of the extent to which the costs required to be incorporated in inventory for tax purposes fall short of all costs.

repaid when the stock is sold (since tax is then paid on the difference between sale price and tax cost).[17]

It follows that a marginal investment in inventory valued at cost will be just worthwhile if

$$(1+\rho)^T = \left(1+\beta\frac{\tau_R}{1-\tau_R}\right)(1+p+\pi)^T - \tau_R\left(1+\beta\frac{\tau_R}{1-\tau_R}\right)\left[(1+p+\pi)^T - 1\right] - \beta\frac{\tau_R}{1-\tau_R}$$

$$\Rightarrow \rho = \left\{(1+p+\pi)^T\left[1-\tau_R(1-\beta)\right] + \tau_R(1-\beta)\right\}^{\frac{1}{T}} - 1 \qquad (11)$$

implying that the minimum required real before-tax rate of return is

$$p = \left[\frac{(1+\rho)^T - \tau_R(1-\beta)}{1-\tau_R(1-\beta)}\right]^{\frac{1}{T}} - (1+\pi) \qquad (12)$$

3.3 Land

New Zealand taxes rents as they are received. Nominal 'capital gains' are either not taxed at all or are taxed at τ_R on realisation, though it can be analytically convenient to assume that gains are taxed at the 'accrual equivalent' rate τ_G. [18] An investment in land will be worth

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17 To see why the tax savings are grossed up by 1/(1-τ), suppose that the tax rate is 33 percent, β=1 and the taxpayer has $1 of its own to invest in inventories. Because the government will effectively pay 33 percent of the *total* cost of an investment in inventory, the taxpayer is able to invest a total of $1.49, since $1.00 = $1.49(1-.33). Thus, the initial tax savings are .33/(1-.33) = .49.

18 An equivalent formulation which explicitly accounts for the taxation of gains on realisation is

$$\begin{aligned} V_0 &= \int_0^T \left[(p-\psi)(1-\tau_R)\right]e^{-(\rho-\pi-\psi)u}du + \left[(1-\tau_R)(V_T - V_0) + V_0\right]e^{-\rho T} \\ &= \frac{(p-\psi)(1-\tau_R)}{\rho-\pi-\psi}\left(1-e^{-(\rho-\pi-\psi)T}\right) + \left[(1-\tau_R)(V_T - V_0) + V_0\right]e^{-\rho T} \end{aligned}$$

where T is the (expected) holding period. Since annual cash-flows are increasing in nominal terms at the rate $\pi+\psi$, it follows that $V_T = V_0 e^{(\psi+\pi)T}$. Setting V_0=1 and solving for p, we obtain

$$p = \frac{(\rho-\pi-\tau_R\psi)e^{(2\rho-\pi-\psi)T} - (\rho-\pi)(1-\tau_R)e^{\rho T} - \tau_R(\rho-\pi-\psi)e^{(\rho-\pi-\psi)T}}{(1-\tau)\left(e^{(\rho-\pi-\psi)T}-1\right)e^{\rho T}}.$$

$$
\begin{aligned}
V_0 &= \int_0^{\infty} \left[(p-\psi)(1-\tau_R) - \tau_G(\psi+\pi) \right] e^{-(\rho-\pi-\psi)u} du \\
&= \frac{(p-\psi)(1-\tau_R) - \tau_G(\psi+\pi)}{\rho-\pi-\psi}
\end{aligned}
\qquad (13)
$$

where ψ is the expected real rate of appreciation and

$$
\tau_G = \begin{cases} 0 \text{ if gains are not taxable} \\ \dfrac{\left(e^{(\psi+\pi)T}-1\right)(\rho-\pi-\psi)}{e^{\rho T}\left(e^{(\psi-r)T}-1\right)(\psi+\pi)}\tau_R \quad \text{otherwise,} \end{cases}
$$

where T is the number of years for which the land is (expected to be) held,[19] implying

$$
p = \frac{\rho - (1-\tau_G)\pi - \psi(\tau_R - \tau_G)}{1-\tau_R}. \qquad (14)
$$

3.4 Livestock

Since 1986, livestock has effectively been valued under (a) standard trading stock rules (with separate rules for determining 'cost') or (b) 'herd scheme' rules. For stock valued under standard rules, the formulae set out in section 3.2 above will apply. However where stock is valued under the herd scheme, a 'herd' is treated as if it were a single capital asset. So long as the herd size does not change, any change in value is disregarded for tax purposes. However, increases in the herd value due to an increase in stock numbers are taxable, while decreases in value due to a fall in stock numbers are deductible. One consequence is that a farmer who buys just enough replacement stock to maintain a constant herd size effectively gets indexed depreciation deductions. So

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19 The 'accrual equivalent' tax rate τ_G is obtained by solving for the tax rate at which the present value of tax paid if nominal gains are taxed on an accrual basis is the same as the present value of taxes payable on realisation; that is, by solving for τ_G where

$$
\int_0^T \tau_G(\psi+\pi) e^{-(\rho-\pi-\psi)u} du = \tau_R\left(e^{(\psi+\pi)T}-1\right)e^{-\rho T}.
$$

$$
\begin{aligned}
V_0 &= \int_0^\infty (p+\delta)(1-\tau_R)e^{-(\rho+\delta-\pi)u}du + \int_0^\infty \tau_R \delta e^{-(\rho+\delta-\pi)u}du \\
&= \frac{(p+\delta)(1-\tau_R)+\tau_R\delta}{\rho+\delta-\pi} \\
&= \frac{p(1-\tau_R)+\delta}{\rho+\delta-\pi}
\end{aligned}
\tag{15}
$$

and

$$
p = \frac{\rho-\pi}{1-\tau_R}. \tag{16}
$$

Prior to 1986, livestock was valued under the rules applying to inventories generally but, as the following excerpt from the *Report of the Consultative Committee on Primary Sector Taxation*[20] notes, 'tax cost' generally fell far short of 'full' cost:

> Taxpayers ... who derive income from livestock have ... been entitled, with the approval of the Commissioner, to adopt standard values, and to bring their livestock to account each year at those approved standard values, regardless of movements in cost, market prices, or indeed of changes in the minimum standard values which the Commissioner would approve for new taxpayers farming those classes of livestock.
>
> Whatever may have been the case in earlier times, in recent times minimum standard values have been well below the normal range of purchase costs for the relevant classes of livestock.

The cost of capital under the pre-1986 regime can therefore be determined using equation (12), with β set 'appropriately' high.

4. The Discount Rate

The nominal after-company-tax interest rate ρ is a key parameter in estimating the cost of capital. ρ will equal the nominal before-tax interest rate less any tax savings (effectively) available at the firm level in respect of that type of finance.

4.1 Nominal Before-Tax Interest Rate

Hansson and Stuart (1986) argue that, where the marginal investor in a small open economy is a non-resident, nominal interest rates will conform with:

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20 June 1986, p.15.

$$i^{W}\left(1-\tau_{R}^{W}\right)=i^{NZ}\left(1-\tau_{N}^{NZ}\right)\left(1-\tau_{F}^{W}\right)+\left[\mu_{0}+\mu\left(\pi^{W}-\pi^{NZ}\right)\right]\left(1-\tau_{R,forex}^{W}\right) \tag{17}$$

where '*W*' refers to the domicile of the marginal non-resident investor and the subscripts *R, N, F* and *R, forex* refer to the tax rates each country levies on domestically-sourced income earned by its residents, domestically-sourced income earned by non-residents, foreign-sourced income earned by residents and foreign-exchange gains earned by residents. Suppose there is no expected non-inflation-related drift in the exchange rate (μ_0=0), purchasing power parity obtains (μ=1), non-residents are taxed at the same rate on their domestic-sourced income and their foreign exchange gains, and define the real interest rate in the rest of the world as $w=i^{W}-\pi^{W}$. Then we can rearrange (17) to obtain

$$i^{NZ}=\left(w+\pi^{NZ}\right)\frac{1-\tau_{R}^{W}}{\left(1-\tau_{N}^{NZ}\right)\left(1-\tau_{F}^{W}\right)}. \tag{18}$$

From (18), it is apparent that the extent to which taxes affect the nominal before-tax interest rate in New Zealand depends on the interaction between foreign tax rules and the effective rate at which New Zealand taxes non-residents. We explore this interaction further in section xx below, but note that for most foreign suppliers of capital to New Zealand, τ_F either equals zero or is a function of τ_{N}^{NZ}. It is therefore useful to define the 'non-creditable' New Zealand tax rate on non-residents as

$$\hat{\tau}_{N}=1-\frac{\left(1-\tau_{N}^{NZ}\right)\left(1-\tau_{F}^{W}\right)}{1-\tau_{R}^{W}}. \tag{19}$$

Defined in this way, $\hat{\tau}_{N}$ measures the effect of the New Zealand tax system on the nominal before-tax interest rate in New Zealand, allowing us to rewrite (18) as

$$i^{j}=\frac{w+\pi}{1-\hat{\tau}_{N}^{j}} \tag{20}$$

where $j\in[D,K]$ (for debt and equity) to accommodate any differences in the non-creditable New Zealand tax rate applying to non-residents' interest and dividend receipts.

4.2 Nominal After-Tax Discount Rates

The various effective tax rate formulae set out above were derived by equating the marginal product of capital from an investment with the after-tax opportunity cost of capital, which will clearly vary according to the type of capital and the tax status of the provider of the capital.

We observed in footnote 3 that, because we are measuring total returns to providers of equity *and* debt finance to a firm, the opportunity cost of capital to the firm should be measured as a weighted average of the cost of debt and equity finance;[21] that is, as

$$\rho = b\rho^D + (1-b)\rho^K$$

where *b* is the average ratio of debt to (debt plus equity).

Debt

Since interest expense is (and has been over the full 1972-1995 period) fully tax deductible at the tax rate τ_R, the after-tax cost to the firm of borrowing at the pre-tax nominal interest rate i^D is

$$\rho^D = i^D\left(1-\tau_R\right).$$

Equity (supplied by residents)

Prior to the introduction of the imputation regime in 1988, dividends were, at least notionally, taxable on distribution, without any offset for company tax previously paid. In practice, companies had a variety of methods – notably bonus issues – available to make tax-free distributions. We therefore model the cost of resident-provided equity capital prior to 1988 as

$$\rho^K = i^K\left(1-\theta\tau_R\right)$$

where θ is the proportion of company income which was *not* subject to taxation on distribution.

Since the introduction of imputation, New Zealand residents have effectively received a refund for company-level taxes,[22] resulting in an after-tax cost of equity capital of

$$\rho^K = i^K\left(1-\tau_R\right).$$

Retained earnings

'King-Fullerton' type studies typically distinguish between investment funded out of new equity and out of retained earnings. Post imputation, there is little or no

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21 Chapters 13 and 14 of Copeland and Weston (1988) contain good background material on this point.

22 Shareholders on marginal tax rates below the company tax rate do not receive a refund for surplus imputation credits, but can offset them against tax payable on other income or carry them forward for use in a later year.

difference in the opportunity cost of funds obtained from new equity and retained earnings.[23]

4.3 'Non-creditable' tax rates on non-residents

Probably the most significant determinants of pre-tax debt and equity interest rates are the non-creditable tax rate on non-residents' debt and equity investments,

$$\hat{\tau}_N^j = 1 - \frac{\left(1-\tau_N^j\right)\left(1-\tau_F^W\right)}{1-\tau_R^W}.$$

Note:

- for jurisdictions which exempt foreign dividends, τ_F=0
- NRWT on interest was routinely avoided by NZ firms prior to the AIL regime – it would be highly misleading to incorporate statutory NRWT rates in calculating $\hat{\tau}_N^D$.

23 Only relevant pre-imputation and for resident investors with marginal tax rates in excess of the company tax rate, and only to the extent relative deferral opportunities in equities (via the company retaining and reinvesting its income) exceeded deferral opportunities available pre-accrual rules from investing in debt instruments.

APPENDIX 2: Depreciation rates, inflation, and tax rates.

				Depreciation Rates			
Year	Inflation	Company Tax Rate	Personal Tax Rate	Nonresidential Construction	Plant & Other Machinery	Transport Equipment	Electrical Machinery
1972	0.049587	0.45	0.4625	0.02	0.1	0.2	0.2
1973	0.102362	0.45	0.45	0.02	0.1	0.2	0.2
1974	0.128571	0.45	0.5	0.02	0.1	0.2	0.2
1975	0.158228	0.45	0.572	0.02	0.1	0.2	0.2
1976	0.153005	0.45	0.6	0.02	0.1	0.2	0.2
1977	0.151659	0.45	0.595	0.02	0.1	0.2	0.2
1978	0.102881	0.45	0.585	0.02	0.1	0.2	0.2
1979	0.164179	0.45	0.6	0.02	0.1	0.2	0.2
1980	0.163462	0.45	0.6	0.02	0.1	0.2	0.2
1981	0.157025	0.45	0.6	0.02	0.1	0.2	0.2
1982	0.152381	0.45	0.63	0.02	0.1	0.2	0.2
1983	0.035124	0.45	0.66	0.02	0.1	0.2	0.2
1984	0.093812	0.45	0.66	0.02	0.1	0.2	0.2
1985	0.153285	0.45	0.66	0.02	0.1	0.2	0.2
1986	0.181962	0.48	0.57	0.02	0.1	0.2	0.2
1987	0.096386	0.48	0.48	0.02	0.1	0.2	0.2
1988	0.047619	0.28	0.405	0.02	0.1	0.2	0.2
1989	0.071096	0.33	0.33	0.02	0.1	0.2	0.2
1990	0.048966	0.33	0.33	0.02	0.1	0.2	0.2
1991	0.009336	0.33	0.33	0.02	0.1	0.2	0.2
1992	0.013361	0.33	0.33	0.02	0.1	0.2	0.2
1993	0.014199	0.33	0.33	0.04	0.095	0.095	0.22
1994	0.028	0.33	0.33	0.04	0.095	0.095	0.22
1995	0.029183	0.33	0.33	0.04	0.095	0.095	0.22
1996	0.02552	0.33	0.33	0.04	0.095	0.095	0.22
1997	0.008295	0.33	0.33	0.04	0.095	0.095	0.22
1998	0.003656	0.33	0.33	0.04	0.095	0.095	0.22

Table 1: Effective Tax Rates (Actual Inflation)

SUMMARY RESULTS OF MARGINAL EFFECTIVE TAX RATE COMPUTATIONS

Underlying regime   World real rate of return: 0.1

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Domestic inflation	0.05	0.10	0.13	0.16	0.15	0.15	0.10	0.16	0.16	0.16	0.15	0.04	0.09	0.15	0.18	0.10	0.05	0.07	0.05	0.01	0.01	0.01	0.03	0.03	0.03	0.01	0.00
Company tax rate	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.48	0.48	0.28	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Personal tax rate	0.46	0.45	0.50	0.57	0.60	0.60	0.59	0.60	0.60	0.60	0.63	0.66	0.66	0.66	0.57	0.48	0.41	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
ETR non-res. debt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ETR non-res. equity	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
EMTR DEBT																											
Construction	0.54	0.72	1.97	-7.59	-25.30	1.67	1.58	-5.07	-5.35	-10.47	-37.27	0.86	1.73	-30.08	-0.74	0.84	0.55	0.43	0.40	0.36	0.37	0.34	0.35	0.35	0.35	0.33	0.33
Plant & Machinery	0.59	0.83	1.37	3.14	3.06	1.54	1.36	4.09	4.00	3.37	3.32	0.87	1.50	3.69	7.63	0.91	0.56	0.48	0.43	0.35	0.36	0.37	0.40	0.40	0.39	0.36	0.35
Transport	0.49	0.76	1.56	5.33	4.80	1.66	1.50	8.31	7.94	5.67	5.23	0.84	1.67	5.98	-12.04	0.86	0.50	0.38	0.33	0.25	0.26	0.37	0.40	0.40	0.39	0.36	0.35
Electrical Equipment	0.60	0.85	1.29	2.34	2.36	1.50	1.32	2.77	2.74	2.49	2.54	0.87	1.45	2.77	3.07	0.92	0.56	0.49	0.44	0.34	0.35	0.33	0.37	0.37	0.36	0.32	0.31
Livestock	0.53	0.83	1.29	2.04	2.06	2.02	1.32	2.26	2.25	2.13	2.16	0.86	1.44	2.28	-128.8	0.86	0.57	0.43	0.39	0.33	0.33	0.34	0.35	0.36	0.35	0.33	0.32
Inventories	0.69	0.91	1.14	1.46	1.50	1.48	1.18	1.56	1.55	1.52	1.55	0.90	1.26	1.61	1.61	0.94	0.61	0.56	0.48	0.35	0.37	0.37	0.41	0.42	0.41	0.35	0.34
Land	0.36	-0.64	0.09	-0.20	-0.46	-0.45	4.71	-0.31	-0.32	-0.40	-0.69	0.82	3.26	-0.88	0.23	5.76	0.47	0.25	0.26	0.28	0.28	0.28	0.27	0.27	0.27	0.28	0.28
EMTR EQUITY																											
Construction	0.54	0.55	0.65	0.79	0.84	0.83	0.76	0.85	0.85	0.84	0.89	0.76	0.86	0.94	0.81	0.63	0.53	0.37	0.36	0.36	0.36	0.33	0.34	0.34	0.34	0.33	0.33
Plant & Machinery	0.55	0.57	0.67	0.80	0.85	0.84	0.77	0.86	0.86	0.85	0.90	0.76	0.87	0.95	0.82	0.65	0.53	0.38	0.37	0.35	0.35	0.36	0.37	0.37	0.37	0.35	0.34
Transport	0.50	0.53	0.63	0.79	0.83	0.82	0.75	0.84	0.84	0.84	0.89	0.73	0.85	0.94	0.80	0.60	0.49	0.31	0.29	0.25	0.26	0.36	0.37	0.37	0.37	0.35	0.34
Electrical Equipment	0.56	0.58	0.68	0.81	0.85	0.84	0.78	0.86	0.86	0.86	0.90	0.77	0.87	0.95	0.82	0.65	0.53	0.39	0.37	0.33	0.34	0.32	0.34	0.35	0.34	0.32	0.31
Livestock	0.49	0.53	0.65	0.81	0.85	0.84	0.76	0.86	0.86	0.85	0.90	0.74	0.86	0.95	0.83	0.63	0.55	0.36	0.35	0.33	0.33	0.33	0.34	0.34	0.34	0.32	0.32
Inventories	0.62	0.67	0.75	0.86	0.89	0.89	0.83	0.90	0.90	0.90	0.93	0.81	0.90	0.96	0.86	0.69	0.57	0.44	0.41	0.35	0.35	0.36	0.39	0.39	0.38	0.34	0.33
Land	0.55	0.56	0.65	0.80	0.84	0.83	0.76	0.85	0.85	0.85	0.89	0.76	0.86	0.94	0.79	0.59	0.50	0.30	0.30	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
OVERALL EMTR (65 per cent equity)																											
Construction	0.54	0.61	1.11	-2.14	-8.31	1.12	1.05	-1.22	-1.32	-3.12	-12.47	0.79	1.17	-9.91	0.27	0.71	0.54	0.39	0.38	0.36	0.36	0.33	0.34	0.35	0.34	0.33	0.33
Transport	0.57	0.66	0.91	1.62	1.62	1.08	0.98	1.99	1.96	1.73	1.74	0.80	1.09	1.91	3.20	0.74	0.54	0.42	0.39	0.35	0.35	0.36	0.38	0.38	0.38	0.35	0.35
Electrical Equipment	0.50	0.61	0.96	2.38	2.22	1.12	1.01	3.46	3.33	2.53	2.41	0.77	1.14	2.70	-3.70	0.69	0.49	0.33	0.31	0.25	0.26	0.36	0.38	0.38	0.38	0.35	0.35
Plant & Machinery	0.57	0.68	0.89	1.34	1.38	1.07	0.97	1.53	1.52	1.43	1.47	0.80	1.07	1.59	1.61	0.74	0.54	0.42	0.39	0.33	0.34	0.33	0.35	0.35	0.35	0.32	0.31
Livestock	0.50	0.64	0.87	1.24	1.27	1.25	0.96	1.35	1.35	1.30	1.34	0.78	1.06	1.42	-44.56	0.71	0.55	0.38	0.36	0.33	0.33	0.33	0.35	0.35	0.34	0.33	0.32
Inventories	0.64	0.75	0.89	1.07	1.10	1.09	0.95	1.13	1.13	1.11	1.15	0.84	1.03	1.19	1.12	0.78	0.58	0.48	0.43	0.35	0.36	0.36	0.40	0.40	0.39	0.35	0.33
Land	0.48	0.14	0.46	0.45	0.39	0.38	2.15	0.44	0.44	0.41	0.34	0.78	1.70	0.31	0.59	2.40	0.49	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29

Table 2: Effective Tax Rates (Zero Inflation)

SUMMARY RESULTS OF MARGINAL EFFECTIVE TAX RATE COMPUTATIONS

Underlying regime World rate of return 0.1
ZERO INFLATION

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Domestic inflation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Company tax rate	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.48	0.48	0.28	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Personal tax rate	0.46	0.45	0.50	0.57	0.60	0.60	0.59	0.60	0.60	0.60	0.63	0.66	0.66	0.66	0.57	0.48	0.41	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
ETR non-res. debt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ETR non-res. equity	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
EMTR DEBT																											
Construction	0.44	0.43	0.48	0.55	0.58	0.58	0.57	0.58	0.58	0.58	0.61	0.65	0.65	0.65	0.59	0.50	0.42	0.35	0.35	0.35	0.35	0.32	0.32	0.32	0.32	0.32	0.32
Plant & Machinery	0.43	0.41	0.47	0.54	0.57	0.57	0.56	0.57	0.57	0.57	0.61	0.64	0.64	0.64	0.57	0.48	0.41	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34
Transport	0.32	0.30	0.36	0.46	0.49	0.48	0.47	0.49	0.49	0.49	0.53	0.57	0.57	0.57	0.47	0.36	0.34	0.23	0.23	0.23	0.23	0.34	0.34	0.34	0.34	0.34	0.34
Electrical Equipment	0.41	0.40	0.45	0.53	0.56	0.56	0.55	0.56	0.56	0.56	0.60	0.63	0.63	0.63	0.56	0.46	0.39	0.32	0.32	0.32	0.32	0.30	0.30	0.30	0.30	0.30	0.30
Livestock	0.30	0.28	0.36	0.46	0.50	0.49	0.48	0.50	0.50	0.50	0.54	0.58	0.58	0.58	0.57	0.46	0.42	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Inventories	0.46	0.44	0.50	0.58	0.61	0.60	0.59	0.61	0.61	0.61	0.64	0.67	0.67	0.67	0.57	0.47	0.41	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Land	0.39	0.37	0.43	0.51	0.55	0.54	0.53	0.55	0.55	0.55	0.58	0.61	0.61	0.61	0.50	0.40	0.37	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
EMTR EQUITY																											
Construction	0.50	0.49	0.54	0.60	0.63	0.62	0.61	0.63	0.63	0.63	0.66	0.68	0.68	0.68	0.65	0.58	0.46	0.35	0.35	0.35	0.35	0.32	0.32	0.32	0.32	0.32	0.32
Plant & Machinery	0.50	0.49	0.53	0.60	0.63	0.62	0.61	0.63	0.63	0.63	0.66	0.68	0.68	0.68	0.64	0.56	0.45	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34
Transport	0.43	0.41	0.47	0.54	0.57	0.57	0.56	0.57	0.57	0.57	0.61	0.64	0.64	0.64	0.57	0.48	0.39	0.25	0.25	0.24	0.24	0.34	0.34	0.34	0.34	0.34	0.34
Electrical Equipment	0.49	0.48	0.53	0.60	0.62	0.62	0.61	0.62	0.62	0.62	0.65	0.68	0.68	0.68	0.63	0.55	0.44	0.32	0.32	0.32	0.32	0.30	0.30	0.30	0.30	0.30	0.30
Livestock	0.40	0.38	0.45	0.54	0.57	0.56	0.55	0.57	0.57	0.57	0.61	0.64	0.64	0.64	0.64	0.55	0.46	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Inventories	0.53	0.52	0.57	0.64	0.66	0.66	0.65	0.66	0.66	0.66	0.69	0.72	0.72	0.72	0.64	0.55	0.46	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Land	0.51	0.50	0.55	0.61	0.64	0.63	0.62	0.64	0.64	0.64	0.66	0.69	0.69	0.69	0.62	0.54	0.43	0.30	0.30	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
OVERALL EMTR (65 per cent equity)																											
Construction	0.48	0.47	0.52	0.59	0.61	0.61	0.60	0.61	0.61	0.61	0.64	0.67	0.67	0.67	0.63	0.55	0.45	0.35	0.35	0.35	0.35	0.32	0.32	0.32	0.32	0.32	0.32
Transport	0.47	0.46	0.51	0.58	0.61	0.60	0.59	0.61	0.61	0.61	0.64	0.67	0.67	0.67	0.62	0.54	0.44	0.33	0.33	0.33	0.33	0.34	0.34	0.34	0.34	0.34	0.34
Electrical Equipment	0.39	0.37	0.43	0.51	0.55	0.54	0.53	0.55	0.55	0.55	0.58	0.61	0.61	0.61	0.54	0.44	0.37	0.24	0.24	0.24	0.24	0.34	0.34	0.34	0.34	0.34	0.34
Plant & Machinery	0.46	0.45	0.50	0.57	0.60	0.60	0.59	0.60	0.60	0.60	0.63	0.66	0.66	0.66	0.60	0.52	0.42	0.32	0.32	0.32	0.32	0.30	0.30	0.30	0.30	0.30	0.30
Livestock	0.36	0.35	0.41	0.51	0.55	0.54	0.53	0.55	0.55	0.55	0.58	0.62	0.62	0.62	0.62	0.52	0.45	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Inventories	0.51	0.49	0.54	0.62	0.64	0.64	0.63	0.64	0.64	0.64	0.67	0.70	0.70	0.70	0.61	0.52	0.44	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
Land	0.47	0.46	0.51	0.58	0.60	0.60	0.59	0.60	0.60	0.60	0.63	0.66	0.66	0.66	0.58	0.49	0.41	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29

Table 3: Effective Tax Rates (World Real Rate of Return at 15%)

SUMMARY RESULTS OF MARGINAL EFFECTIVE TAX RATE COMPUTATIONS

Underlying regime | World rate of return: 0.15

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Domestic inflation	0.05	0.10	0.13	0.16	0.15	0.15	0.10	0.16	0.16	0.16	0.15	0.04	0.09	0.15	0.18	0.10	0.05	0.07	0.05	0.01	0.01	0.01	0.03	0.03	0.03	0.01	0.00
Company tax rate	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.48	0.48	0.28	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Personal tax rate	0.46	0.45	0.50	0.57	0.60	0.60	0.59	0.60	0.60	0.60	0.63	0.66	0.66	0.66	0.57	0.48	0.41	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
ETR non-res. debt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
ETR non-res. equity	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
EMTR DEBT																											
Construction	0.48	0.52	0.81	1.71	1.78	1.25	0.97	2.16	2.13	1.90	1.98	0.77	1.13	2.23	4.16	0.62	0.49	0.38	0.37	0.35	0.36	0.33	0.34	0.34	0.34	0.33	0.33
Plant & Machinery	0.52	0.61	0.87	1.42	1.48	1.22	0.98	1.64	1.63	1.54	1.61	0.78	1.11	1.76	1.75	0.70	0.50	0.41	0.39	0.34	0.35	0.36	0.37	0.37	0.37	0.35	0.34
Transport	0.42	0.52	0.83	1.54	1.61	1.26	0.97	1.84	1.82	1.69	1.78	0.74	1.14	1.97	2.14	0.61	0.45	0.33	0.30	0.26	0.26	0.36	0.37	0.37	0.37	0.35	0.34
Electrical Equipment	0.52	0.64	0.88	1.34	1.40	1.21	0.98	1.52	1.51	1.44	1.51	0.78	1.10	1.64	1.54	0.72	0.50	0.42	0.39	0.33	0.34	0.32	0.34	0.34	0.34	0.31	0.31
Livestock	0.44	0.60	0.88	1.31	1.36	1.34	0.98	1.45	1.44	1.39	1.45	0.76	1.10	1.54	1.80	0.64	0.51	0.38	0.36	0.32	0.33	0.33	0.34	0.34	0.34	0.32	0.32
Inventories	0.61	0.75	0.93	1.17	1.21	1.19	0.99	1.25	1.25	1.22	1.26	0.82	1.07	1.31	1.26	0.78	0.54	0.48	0.43	0.34	0.35	0.35	0.38	0.39	0.38	0.34	0.33
Land	0.41	0.34	0.69	3.58	3.21	2.90	0.96	8.18	7.40	4.07	3.72	0.75	1.18	4.54	-0.34	0.35	0.44	0.29	0.29	0.30	0.30	0.30	0.29	0.29	0.29	0.30	0.30
EMTR EQUITY																											
Construction	0.52	0.53	0.61	0.74	0.78	0.77	0.71	0.79	0.79	0.78	0.82	0.73	0.81	0.87	0.77	0.61	0.50	0.35	0.35	0.35	0.35	0.33	0.33	0.33	0.33	0.33	0.33
Plant & Machinery	0.53	0.54	0.62	0.75	0.79	0.78	0.72	0.80	0.79	0.79	0.83	0.74	0.81	0.88	0.77	0.62	0.51	0.36	0.35	0.34	0.34	0.35	0.36	0.36	0.35	0.34	0.34
Transport	0.48	0.50	0.59	0.73	0.77	0.76	0.70	0.78	0.78	0.77	0.82	0.71	0.80	0.87	0.75	0.57	0.46	0.30	0.29	0.26	0.26	0.35	0.36	0.36	0.35	0.34	0.34
Electrical Equipment	0.53	0.55	0.63	0.75	0.79	0.78	0.73	0.80	0.80	0.79	0.83	0.74	0.82	0.88	0.78	0.62	0.50	0.36	0.35	0.33	0.33	0.32	0.33	0.33	0.33	0.31	0.31
Livestock	0.46	0.49	0.60	0.74	0.78	0.77	0.71	0.79	0.79	0.79	0.83	0.71	0.80	0.88	0.78	0.61	0.52	0.34	0.34	0.32	0.32	0.32	0.33	0.33	0.33	0.32	0.32
Inventories	0.60	0.63	0.71	0.82	0.84	0.84	0.78	0.85	0.85	0.85	0.88	0.78	0.86	0.91	0.82	0.66	0.53	0.40	0.38	0.34	0.34	0.34	0.36	0.37	0.36	0.34	0.33
Land	0.55	0.55	0.63	0.75	0.79	0.78	0.73	0.80	0.80	0.79	0.83	0.75	0.82	0.88	0.75	0.58	0.48	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
OVERALL EMTR (65 per cent equity)																											
Construction	0.51	0.52	0.68	1.08	1.13	0.94	0.80	1.27	1.26	1.17	1.23	0.74	0.92	1.35	1.95	0.62	0.50	0.36	0.36	0.35	0.35	0.33	0.34	0.34	0.33	0.33	0.33
Transport	0.53	0.57	0.71	0.98	1.03	0.93	0.81	1.09	1.09	1.05	1.10	0.75	0.92	1.19	1.11	0.65	0.50	0.38	0.37	0.34	0.34	0.35	0.36	0.36	0.36	0.35	0.34
Electrical Equipment	0.46	0.51	0.68	1.01	1.07	0.93	0.79	1.15	1.14	1.09	1.15	0.72	0.91	1.25	1.23	0.59	0.46	0.31	0.29	0.26	0.26	0.35	0.36	0.36	0.36	0.35	0.34
Plant & Machinery	0.53	0.58	0.72	0.96	1.01	0.93	0.82	1.05	1.05	1.02	1.07	0.75	0.92	1.14	1.05	0.66	0.50	0.38	0.36	0.33	0.33	0.32	0.33	0.34	0.33	0.31	0.31
Livestock	0.45	0.53	0.69	0.94	0.98	0.97	0.80	1.02	1.02	1.00	1.05	0.73	0.91	1.11	1.14	0.62	0.52	0.36	0.34	0.32	0.33	0.33	0.33	0.34	0.33	0.32	0.32
Inventories	0.60	0.67	0.79	0.94	0.97	0.96	0.85	0.99	0.99	0.98	1.01	0.79	0.93	1.05	0.97	0.70	0.54	0.43	0.40	0.34	0.35	0.35	0.37	0.37	0.37	0.34	0.33
Land	0.50	0.48	0.65	1.74	1.64	1.52	0.81	3.38	3.11	1.94	1.84	0.75	0.94	2.16	0.37	0.50	0.47	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30