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Further enquiries to:  
The Administrator  
Chair in Public Finance  
Victoria University of Wellington  
PO Box 600  
Wellington 6041  
New Zealand

Phone: +64-4-463-9656  
Emil: [cpf-info@vuw.ac.nz](mailto:cpf-info@vuw.ac.nz)

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# The Elasticity of Taxable Income in New Zealand\*

Iris Claus<sup>†</sup>, John Creedy<sup>‡</sup> and Josh Teng<sup>§</sup>

## Abstract

This paper reports estimates of the elasticity of taxable income with respect to the net-of-tax rate for New Zealand taxpayers. The relative stability of the New Zealand personal income tax system, in terms of marginal rates, thresholds and the tax base, provides helpful conditions for deriving these estimates. The elasticity of taxable income was estimated to be substantially higher for the highest income groups. Changes in the timing of income flows for the higher income recipients were found to be an important response to the announcement of a new higher-rate bracket. The marginal welfare costs of personal income taxation were consistent across years, being relatively small for all but the higher tax brackets. For the top marginal rate bracket of 39 per cent, the welfare cost of raising an extra dollar of tax revenue was estimated to be well in excess of a dollar.

**JEL Classification:** H24; H31

**Keywords:** Income taxation; Taxable income; Elasticity of taxable income; Excess burden of taxation.

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<sup>†</sup>Policy Advice Division, Inland Revenue and Centre for Applied Macroeconomic Analysis, Australian National University. P.O. Box 2198, Wellington 6140, New Zealand. Email: iris.claus@ird.govt.nz. Telephone: 64-4-890 6028. Fax: 64-4-903 2413.

<sup>‡</sup>Department of Economics, University of Melbourne.

<sup>§</sup>Policy Advice Division, Inland Revenue.

# 1 Introduction

This paper reports new estimates for New Zealand of the elasticity of taxable income with respect to the marginal net-of-tax rate. This elasticity aims to capture, in a reduced-form relationship, all potential responses to income taxation in a single elasticity measure, without the need to specify the structural nature of the various adjustment processes involved.<sup>1</sup> These adjustments include, as well as labour supply changes, income shifting between sources which are taxed at different rates, and tax evasion through non-declaration of income. The elasticity of taxable income has the added attraction that, under certain assumptions, it can easily be used to obtain a measure of the excess burden of income taxation. The only previous estimates for New Zealand, produced by Thomas (2007), relate to the 1986 tax changes.

Given the difficulty of constructing and estimating structural models dealing with the different types of adjustment, along with the data requirements, the popularity of the elasticity of taxable income is not surprising. The widespread use of the measure is indicated by the fact that a recent survey of estimates, by Saez, Slemrod and Giertz (2009), includes 111 references. However, it must be recognised that this ability to ‘cut through’ considerable complexity is not without significant costs. In particular, the strong – and usually untested – assumption is made that there are no income effects of tax changes. This means, for example, that a change in the marginal tax rate in a lower tax bracket than the one occupied by an individual has no effect on taxable income. Furthermore, a simple constant elasticity specification of the relationship between taxable income and the net-of-tax rate is typically used, as in the present paper. This implies a special quasi-linear form of the utility function: for an introduction to the basic analytics, see Creedy (2010). Furthermore, in obtaining empirical estimates there is the ever-present danger of attributing changes in income to changes in the marginal net-of-tax rate, when they may have arisen for other unobserved reasons as part of a general process of relative income dynamics.<sup>2</sup> The assumption is of course also

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<sup>1</sup>Early contributions are by Lindsey (1987) and Feldstein (1995).

<sup>2</sup>This is discussed further below, in section 5.

used, as is common in reduced-form models, that all members of the population group considered have the same elasticity. In addition, the elasticity is in practice affected by, for example, the costs of income shifting between sources and time periods, along with detailed tax regulations other than simply the marginal rates. These influences cannot be captured in a reduced-form approach. Hence, any estimates must be treated with caution.

Despite these problems, the more recent New Zealand tax structure provides a good context for attempting to estimate an elasticity. The estimates are obtained using a special dataset, constructed using a random sample of administrative data collected by the New Zealand Inland Revenue. The details of the sample method and the variables obtained are provided in Appendix A. In 2001 there was a change involving only a single tax rate change: this was the introduction of a top marginal income tax rate of 39 per cent for higher-income earners who previously faced a 33 per cent rate, and corporate and trust rates remained unchanged. An elasticity can thus be obtained by comparing the income shares of those who were affected by the tax change and those who were not affected. This necessarily relates only to those at the top end of the income distribution. There was subsequently a relatively long period during which there were no changes in the income thresholds or the marginal tax rates. The existence of fiscal drag makes it possible to apply a difference-in-difference approach, by distinguishing treatment and control groups respectively in terms of those individuals who were sufficiently close to an upper income threshold that they moved into a higher tax rate bracket, and those who remained in the same bracket. This approach can therefore be extended to relatively lower income ranges. A feature of the results presented here, shared by a number of studies for other countries, is that they indicate quite substantial values of the elasticity of taxable income for high-income individuals. This finding clearly contrasts with those studies which have concentrated on estimating labour supply elasticities. Hence disincentive effects on high-income groups of tax rate increases cannot easily be dismissed.

Section 2 briefly discusses the marginal rate structure of New Zealand's income tax system. The emphasis here is on only the income tax system, and no consideration is

given to the effect of the benefit structure which can substantially influence the effective marginal rates faced by those in the lower ranges of the income distribution. This is because the policy reform examined applies only to the top income tax bracket and, where fiscal drag is used, only the top two brackets are considered. The basic concept is briefly defined in Section 3. Section 4 concentrates on estimates obtained by considering the introduction of the 39 per cent rate, and Section 5 examines the implications of fiscal drag, whereby some individuals experience a change in their marginal rate on moving into a higher tax bracket. Brief comparisons with other studies, and further qualifications, are made in Section 6. Welfare effects are considered in Section 7. In view of the concentration on higher-income earners, only the excess burden arising from the top marginal rate is examined. Brief conclusions are in Section 8.

## 2 New Zealand's Income Tax System

New Zealand's income tax system was transformed with economic reforms that began in 1984. These reforms were designed to improve efficiency while raising revenue by broadening the tax base and lowering marginal income tax rates; see, for example, Evans *et al.* (1996). The tax base was broadened by introducing a comprehensive goods and services tax (GST) and a fringe benefit tax, and by eliminating many tax concessions, exemptions, and investment and export incentives. The top personal marginal income tax rate was cut from 66 per cent to 33 per cent and the number of tax brackets was reduced from eleven to three.<sup>3</sup> Aggregate tax revenue actually increased despite the reductions in the tax rates.

The income thresholds and effective tax rates (allowing for the low income rebate) for 1994 to 2008 are shown in Table 1. The 'composite' years, 1997 and 1999, are years when a tax rate or income threshold change came into effect during the income tax year, which starts on 1 April and ends on 31 March.

New Zealand's personal income tax system introduced during the reforms remained virtually unchanged until 2001, although during 1994 to 2001 the middle income tax

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<sup>3</sup>The company tax rate was lowered from 48 per cent to 33 per cent.

Table 1: New Zealand Effective Tax Rates 1994-2008

<b>Taxable income</b>	<b>Effective rate %</b>
1989/90 to 1995/96	
\$1 - \$9,500	15
\$9,501 - \$30,875	28
over \$30,875	33
1996/97 composite year	
\$1 - \$9,500	15%
\$9,501 - \$30,875	25
\$30,876 - \$34,200	26.25
over \$34,200	33
1997/98 to 1998/99	
\$1 - \$9,500	
\$9,501 - \$34,200	15
over \$34,200	24
	33
1998/99	
\$1 - \$9,500	15
\$9,501 - \$34,200	21.75
\$34,201 - \$38,000	24
over \$38,000	33
1999/00	
\$1 - \$9,500	15
\$9,501 - \$38,000	21
over \$38,000	33
2000/01 to 2007/08	
\$1 - \$9,500	15
\$9,501 - \$38,000	21
\$38,000 - \$60,000	33
over \$60,000	39

bracket was subject to some threshold and rate adjustments. However, in 2001 a new top personal marginal tax rate of 39 per cent for income above \$60,000 was introduced, with the company and trust rates remaining at 33 per cent.<sup>4</sup> This policy change provides a useful natural experiment for studying the responsiveness of taxpayers to changes in marginal tax rates. Furthermore, over the period 2001 to 2008 no threshold or rate changes were made to the other tax brackets.<sup>5</sup> As a result of income growth a large number of taxpayers experienced an increase in their marginal rate because they moved into a higher tax bracket. These fiscal drag effects may thus also provide information about taxpayers' responses to rate changes.

Figure 1 plots the average marginal tax rates faced by the top decile, the ninth decile and the combined eighth and seventh deciles of income earners, along with their shares of taxable income, from 1994 to 2008. Between 1994 and 2000 all top decile income earners faced a marginal tax rate of 33 per cent. Over this period their share of taxable income increased from 33.7 per cent in 1994 to 36 per cent in 1999. Following the announcement of the 39 per cent top personal rate for income above \$60,000 the top decile's share of taxable income rose sharply to 38.9 per cent in 2000. However, following the introduction of the 39 per cent rate it fell to 33.9 per cent in 2001. Between 2001 and 2008 the share of taxable income obtained by the top decile fluctuated between 33.7 per cent in 2008 and 34.6 per cent in 2005. By 2006 all top decile earners faced the new top marginal rate of 39 per cent.

Over the period 1994 to 2008 those in the ninth decile of taxable income contributed, on average, 17.3 per cent to the personal income tax base. Their marginal tax rate averaged 33 per cent from 1994 to 1998 and 2002 to 2006. Between 1999 and 2001 it fell below 33 per cent for three years following a threshold and a tax rate adjustment of the middle rate. The average marginal tax rate reached 34.1 per cent in 2007 and 34.9 per cent in 2008 as the number of taxpayers who moved into the top tax bracket

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<sup>4</sup>The average monthly exchange rate for 1994 to 2008 was US\$0.60 per NZ\$1.

<sup>5</sup>Changes to the Working for Families (WfF) package began in October 2004 and were implemented in stages through 1 April 2007. They included changes to in-work incentives and family entitlement and support to meet childcare and accommodation costs. Low- to middle-income families were the key target group for these changes.



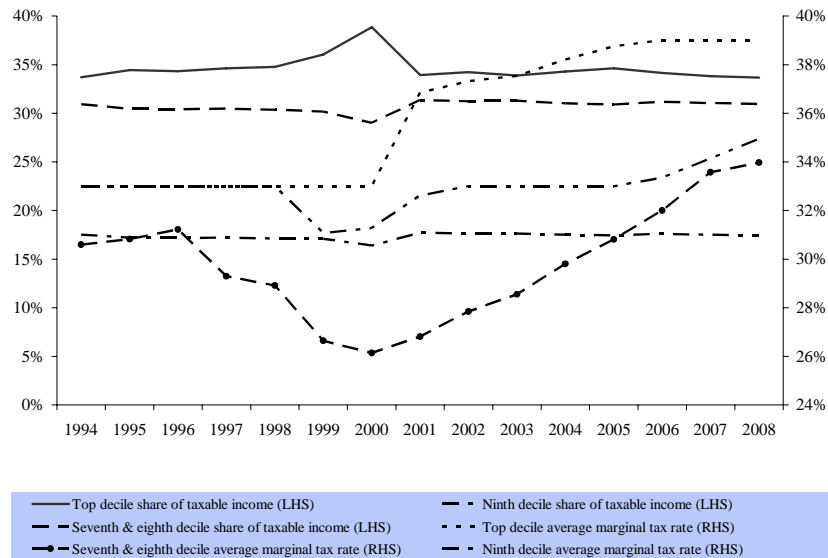


Figure 1: Income Shares and Average Marginal Tax Rates: Top Deciles

increased.

Between 1994 and 1996 the average marginal tax rate of the seventh and eighth deciles of taxable income was around 31 per cent. However, it fell sharply to reach a low of 26.1 per cent in 2000 due to various threshold and tax rate adjustments. Since 2001 it has been rising steadily to reach 34 per cent in 2008. Over the period 2000 to 2008 these income earners experienced a slightly larger increase in their average marginal tax rate than the top decile of income earners (7.8 percentage points compared with 6 percentage points). But in contrast to the top decile earners, whose share of taxable income fell, their contribution to the personal income tax base rose slightly from 30.3 per cent between 1994 and 2000 to 31.1 per cent between 2001 and 2008.

Figure 2 plots the average marginal tax rate faced by the top percentile and the 90-99th percentiles of taxable income earners, along with their shares of taxable income from 1994 to 2008. Both groups experienced an increase in their marginal tax rate. The share of taxable income remained virtually unchanged for the 90-99th percentiles. However, for the top percentile, it rose sharply in 2000, the year before the introduction of the 39 per cent rate, and then fell. Between 1994 and 2000 the top percentile of

income earners contributed on average 10.2 per cent of personal income tax revenue compared with 9.3 per cent between 2001 and 2008.

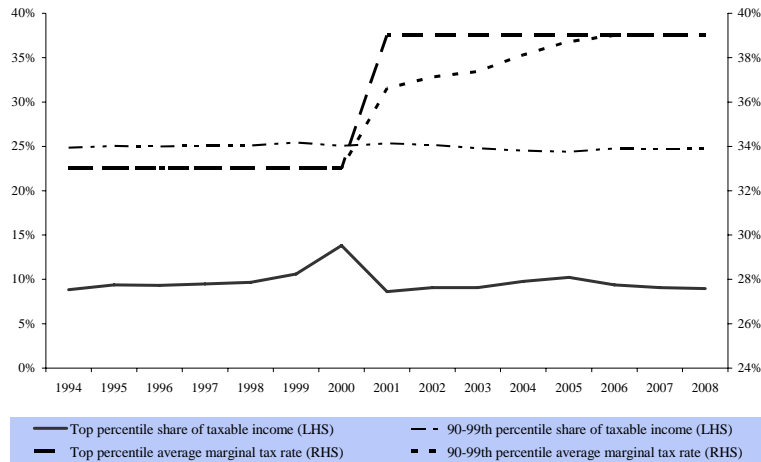


Figure 2: Income Shares and Average Marginal Tax Rates: Top Percentiles

The sharp increase in taxable income of the top percentile of income earners in 2000 was due to a rise in dividend income during that year. Under New Zealand’s imputation system, credits are attached to dividends for income tax paid at the company level. Following the announcement of the introduction of the 39 per cent top personal marginal rate, companies paid out large profits before the new top personal rate came into effect. There was subsequently a decline in dividend income following the introduction of the 39 per cent top marginal rate .

### 3 The Elasticity of Taxable Income

The responses to tax changes are summarised by the elasticity of taxable income,  $\eta$ , defined as the proportional change in declared income,  $z$ , divided by the proportional change in the net-of-tax rate,  $1 - \tau$ . Hence:

$$\eta = \left( \frac{1 - \tau}{z} \right) \frac{dz}{d(1 - \tau)} \quad (1)$$

A popular constant-elasticity reduced-form specification is the following:

$$z = z_0 (1 - \tau)^\eta \tag{2}$$

where  $z_0$  denotes the individual's income in the absence of taxation (that is, when  $\tau = 0$ ). Importantly, this specification assumes that income effects of tax changes are assumed to be zero. Indeed, it can be shown that (2) follows from an assumption that utility takes the quasi-linear form  $U = c - \left(\frac{1}{1+\eta^{-1}}\right) \left(\frac{z}{z_0}\right)^{1+\eta^{-1}}$ , where  $c$  is consumption and  $z$  enters negatively in the direct utility function in view of the effort required to obtain it; for further discussion and alternative specifications, see Creedy (2010, p. 562-564). This specification, ubiquitous in the literature, is thus adopted for its convenience as an approximation, rather than the belief that it accurately describes individuals' preferences. By assumption the elasticity  $\eta$  is the same for all individuals in the relevant population group considered.<sup>6</sup>

## 4 Introduction of 39 Per cent Rate

This section presents estimates of taxpayers' responses following the introduction of the 39 per cent top personal marginal rate, a policy change which affected relatively few individuals. A change in only the top marginal income tax rate is assumed to have no effect on those subject to lower rates.<sup>7</sup> Let  $P_t$  denote the share of income of the affected group at time  $t$ , and their average marginal tax rate is  $\tau_{P_t}$ . Let  $t = 0$  and  $t = 1$  denote pre- and post-change periods. If the share of income in the relevant group would have remained constant in the absence of the policy change, an estimate can be obtained using:

$$\hat{\eta} = \frac{\log P_1 - \log P_0}{\log(1 - \tau_{P_1}) - \log(1 - \tau_{P_0})} \tag{3}$$

This method requires only summary data relating to the cross-sectional taxable income distribution in two periods.

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<sup>6</sup>Given information about  $z$  and  $\tau$  for a group of individuals, a simple regression of  $\log z$  on  $\log(1 - \tau)$  and a constant, thereby omitting the unobservable  $z_0$ , cannot be expected to provide a useful estimate of  $\eta$ , since the omitted variable is correlated with  $\tau$ .

<sup>7</sup>It may in practice modify the plans of those individuals who are just below the threshold.

Elasticities obtained using equation (3) are reported in Table 2, along with 95 per cent confidence intervals (shown in brackets) obtained by bootstrap resampling using 1,000 simulations. The elasticities are for the top decile and top percentile of taxable income earners, based on the year 1999, which pre-dates the announcement of the 39 per cent top rate. This avoids the problem associated with income shifting after the announcement, but before the implementation, of the change as discussed in Section 2. Elasticities for the top decile are between 0.4 and 1.0.<sup>8</sup> Taxable income fell sharply in 2001 after income shifts into 2000, so that the elasticity is higher when that year is used. However, it becomes more stable where later years are used for comparisons. Negligible values were obtained for the ninth and lower deciles. It is likely that the lower-income groups have fewer opportunities for income shifting or for concealing income. In fact, the response of the top decile income earners is largely due to the highest earners in this group, as shown by results for for the top percentile of taxable income earners.

Table 2: Elasticity of Taxable Income in Top Decile and Top Percentile: Introduction of 39 per cent Marginal Rate

	Top Decile	Top percentile
2001	1.0 (0.8, 1.2)	2.2 (1.7, 2.7)
2002	0.8 (0.6, 1.0)	1.6 (1.1, 2.3)
2003	0.9 (0.7, 1.1)	1.7 (1.0, 2.4)
2004	0.6 (0.3, 0.9)	0.9 (-0.1, 2.0)
2005	0.4 (0.1, 0.8)	0.4 (-0.9, 2.1)
2006	0.6 (0.4, 0.8)	1.3 (0.5, 2.3)
2007	0.7 (0.5, 0.8)	1.6 (1.3, 2.0)
2008	0.7 (0.6, 0.9)	1.8 (1.4, 2.6)

Table 3 reports elasticities of taxable income for the top decile and for the top percentile of income earners, separately for males and females. The results confirm the previous finding that higher income earners are more responsive to marginal tax rate changes than lower income earners for both females and males. The results may at first sight appear to suggest that men are more responsive than women to tax rate

<sup>8</sup>Estimates obtained using a difference-in-difference estimator were found to be similar, and thus are not reported here.

Table 3: Elasticity of Taxable Income for Males and Females: Introduction of 39 per cent Rates

	Top Decile		Top Percentile	
	Female	Male	Female	Male
2001	0.6 (0.1, 1.0)	0.9 (0.7, 1.1)	1.5 (0.8, 2.1)	2.5 (1.8, 3.2)
2002	0.2 (-0.2, 0.6)	0.7 (0.6, 0.9)	1.2 (0.5, 1.9)	1.8 (1.0, 2.7)
2003	0.5 (0.0, 0.9)	0.8 (0.6, 1.1)	1.0 (0.4, 1.9)	1.8 (1.1, 2.9)
2004	0.3 (-0.1, 0.7)	0.6 (0.2, 1.0)	1.0 (0.4, 1.7)	0.6 (-0.6, 2.1)
2005	0.2 (-0.2, 0.5)	0.5 (0.0, 1.0)	0.7 (-0.3, 1.7)	0.0 (-1.7, 2.4)
2006	-0.2 (-0.9, 0.4)	0.8 (0.6, 1.0)	-0.4 (-2.1, 1.6)	2.0 (1.2, 2.7)
2007	0.1 (-0.1, 0.4)	0.9 (0.7, 1.1)	0.6 (-0.3, 1.6)	2.0 (1.3, 2.7)
2008	0.3 (0.1, 0.4)	0.9 (0.7, 1.1)	1.2 (0.6, 1.8)	1.8 (1.2, 2.9)

changes. However, women are likely to be less responsive to tax rate changes than men simply because they have lower incomes. Over the period 1994–2008, the annual average income of the top decile of males was about 1.63 times higher than that of females.

## 5 Estimates based on Fiscal Drag

This section reports estimates of taxpayers’ responsiveness to changes in marginal tax rates by examining the behaviour of earners whose marginal tax rate increased because they moved into a higher tax bracket as a result of fiscal drag. The period 2001 to 2008 is considered, as during this time no threshold or marginal rate changes were made to the lower income tax brackets. The elasticity can be estimated using a difference-in-difference framework. This method can be applied for each tax bracket, thereby allowing for variations in  $\eta$  between brackets.<sup>9</sup> The treatment group,  $T$ , comprises those affected by the change in their marginal tax rate and the control group,  $C$ , is made up of individuals who are not affected. Consider income changes from period 0 to period 1, and let  $E(\cdot)$  denote the respective sample average. The difference between

<sup>9</sup>In addition to income tax thresholds, the real value of other tax parameters (such as allowance and deduction limits) can fall during inflation, as examined by Onrubia and Sanz (2009). However, this is unlikely to be an issue in New Zealand given the limited allowances and deductions over the period of estimation.

groups in the differences between average log-taxable income from one period to the next, denoted  $\Delta \log z$ , is given by:

$$\Delta \log z = \{E(\log z_{i1}|T) - E(\log z_{i0}|T)\} - \{E(\log z_{i1}|C) - E(\log z_{i0}|C)\} \quad (4)$$

The difference between groups in the differences between the logarithm of average net-of-tax rates from one period to the next, denoted  $\Delta \log(1 - \tau)$ , is given by:

$$\begin{aligned} \Delta \log(1 - \tau) = & \{E(\log(1 - \tau_{i1})|T) - E(\log(1 - \tau_{i0})|T)\} \\ & - \{E(\log(1 - \tau_{i1})|C) - E(\log(1 - \tau_{i0})|C)\} \end{aligned} \quad (5)$$

The estimate of the elasticity of taxable income can be obtained using:

$$\hat{\eta} = \frac{\Delta \log z}{\Delta \log(1 - \tau)} \quad (6)$$

This approach involves an assumption that without the policy change the incomes of the two groups would have grown at the same rate.<sup>10</sup> The possible bias arising from differential income growth (for non-tax reasons) is investigated by Creedy (2010, pp. 581-583), who shows that the bias depends on the difference between the marginal tax rates (the bias being higher for smaller differences between rates) as well as the difference between growth rates of target and control groups. Evidence relating to income dynamics suggests that there is usually some ‘regression towards the mean’, so it should be borne in mind that the following values are likely to reflect an upward bias.

In previous studies, equation (6) has been used by taking as the control group those individuals within a tax bracket who remain in the same bracket from one period to the next, despite a general upward movement in incomes. The treatment group consists of those who were in the same tax bracket but moved into a higher bracket and thus experience an increase in their marginal tax rate.<sup>11</sup> However, in the present context, it was found that there are significant variations in income movements. For example,

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<sup>10</sup>If systematic income changes occur for non-tax reasons, for example if there is some ‘regression towards the mean’ over time, the estimator may be biased. A method of allowing for such changes is examined by Creedy (2010).

<sup>11</sup>The denominator of (6), as a proportionate difference in net-of-tax rates, is negative. The numer-

there are many individuals who move from the second highest tax bracket, often into a lower tax bracket, while others move into the highest income range.<sup>12</sup> This type of income dynamics produces a substantial bias if (6) is directly applied. Hence the following approach was used instead.

Table 4: Elasticity of Taxable Income: Earners Moving into the Top and the Second Highest Bracket

	Earners Moving into the:	
	Highest Bracket	Second Highest Bracket
2002	0.5 (-0.1, 1.2)	0.2 (0.0, 0.3)
2003	1.7 (1.0, 2.5)	0.0 (-0.1, 0.2)
2004	1.3 (0.7, 2.0)	0.3 (0.1, 0.4)
2005	1.1 (0.6, 1.6)	0.2 (0.0, 0.4)
2006	0.8 (0.4, 1.3)	0.1 (-0.1, 0.2)
2007	0.9 (0.5, 1.4)	0.1 (0.0, 0.3)
2008	0.7 (0.3, 1.2)	0.2 (0.0, 0.4)

Note: 95% confidence intervals are reported in parentheses. They were generated from 1,000 simulations using bootstrapped resampling.

The calculations are based on people who were in the same tax bracket in period  $t$ , where some of those taxpayers moved into a higher income tax bracket in period  $t + 1$ . The difference-in-difference elasticity compares the change in taxable income of these income recipients between periods  $t + 1$  and  $t + 2$ . The elasticities of earners who moved into the top bracket and of taxpayers who moved into the second highest tax bracket are reported in Table 4. The results confirm earlier findings that higher income earners are more responsive than lower income taxpayers. The elasticities of earners who moved into the top bracket are generally slightly lower than those of the top decile of earners reported in Table 2, but they are not significantly different.

ator is expected also to be negative, since those people moving into a higher tax bracket (consisting mainly of those who were near the top of the initial tax bracket), are likely to respond to the higher tax rate by modifying the increase in their declared taxable income. This situation arises where all those in the tax bracket would experience similar rates of income growth over the time period, if there were no tax consequences.

<sup>12</sup>In the relatively low income ranges significant jumps in income are known to be associated with non-convex budget sets, but the present emphasis is on higher incomes where such ranges do not arise.

## 6 Some Comparisons

Many empirical estimates of the elasticity of taxable income have been produced for a large range of countries, as discussed by, for example, Saez *et al.* (2009). The values vary considerably, depending on the method of estimation used, the particular reform examined, and the country. After mentioning that a number of authors suggest a ‘consensus value of about 0.4’, Giertz (2004, pp. 14, 37) warns that this ‘masks considerable variation in the estimates’. Indeed, there is no reason to expect the elasticity to remain unchanged over time, or to be similar across countries having different tax structures and regulations. Furthermore, the above results have demonstrated some heterogeneity among types of taxpayer, so that there seems little value in attempting to find a consensus value.

Another feature of many estimates is that much uncertainty is attached to them. After reviewing elasticities, Meghir and Richards (2007, p. 19) comment that ‘the estimates of the effect of taxes on taxable income, whose purpose is to identify the impact of taxation on other dimensions of effort, should be regarded with caution’. Furthermore, Saez *et al.* (2009, p. 59) suggest that, ‘there are no convincing estimates of the long-run elasticity’. The suggestion, by Saez *et al.* (2009) that some ‘short-run’ elasticity estimates obtained from tax reforms may perhaps capture changes in the timing of declarations, has been confirmed by the above analysis of the introduction of the 39 per cent tax rate in New Zealand.

The use of a reduced-form specification inevitably carries with it the difficulty that, when a parameter estimate is found to change from one dataset to another, there is no way of knowing precisely what has caused the change. The role of variations in the timing of dividend income was shown to be important in the present context, particularly among the higher-income taxpayers. Giertz (2004, p. 39) suggested that, ‘much work is still needed in order to better understand the process by which incomes respond to changes’. This judgement, repeated by Saez *et al.* (2009), may perhaps suggest a desire for a more structural approach.

Where it has been possible to estimate elasticities for different income ranges, a



common result is that they vary with income, being higher for higher incomes. This result has been confirmed by the present analysis, and it is perhaps not surprising in view of the fact that higher income groups may be expected to have more opportunities to shift income between sources.

Faced with the difficulty of obtaining data in New Zealand, there is only one previous study containing estimates of the elasticity of taxable income for New Zealand. Covering a number of tax structure changes in the 1980s, Thomas (2007, p. 22) obtained estimates which ‘ranged from 0.35 to 1.10, with a preferred estimate of 0.52’; see also Thomas (2007, p. 18). The present results are thus broadly in line with those reported by Thomas.

Atkinson and Leigh (2008) describe changing shares of top incomes in New Zealand. They refer to possible impacts of changes in top marginal rates, along with a factor associated with the threat of emigration, and macroeconomic factors (whether high incomes are ‘insulated’ from fluctuations). The argument relating to the threat of emigration is that top incomes in New Zealand have had to respond to increases in top incomes in the United Kingdom and Australia, which are popular destinations for migrants. They used a time series regression in which the share of the top percentile was regressed on 1 minus the top marginal rate, top income shares in Australia and the United Kingdom, and gross domestic product (GDP) growth. However, their results do not provide elasticity estimates, and they acknowledged that shares in all three countries may have been influenced by other common factors.

## 7 Marginal Welfare Costs

This section considers the efficiency costs of personal income taxation. The results of the previous sections relate to high incomes, so emphasis here is on the welfare costs of the top marginal tax rate.<sup>13</sup> Let  $\bar{z}$  denote the arithmetic mean income within the top tax bracket, for which the tax rate,  $\tau$ , applies above the income threshold,  $a$ , and

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<sup>13</sup>Higher welfare costs for lower-income individuals in Australia were found by Creedy *et al.* (2011), using a structural labour supply model, even though labour supply changes were small. The assumption of zero income effects which is imposed in the present analysis may thus affect results.

define:

$$\alpha = \frac{\bar{z}}{\bar{z} - a} \quad (7)$$

The marginal welfare cost,  $MWC$ , is defined as the marginal excess burden divided by the change in tax revenue. Saez *et al.* (2009, p. 6) call this the ‘marginal efficiency cost of funds (MECF)’. However, the ‘marginal cost of funds’, or  $MCF$ , is usually defined as  $1 + MWC$ : on these concepts, see Creedy (1998, pp. 54-59). With the crucial assumption of zero income effects, Saez *et al.* (2009) show that the marginal welfare cost in the top bracket is:<sup>14</sup>

$$MWC = \frac{\eta\alpha\tau}{1 - \tau - \eta\alpha\tau} \quad (8)$$

Results are reported here for 2001 only, during which the top rate was raised to 39 per cent; values are similar for other years when that rate existed. The value of  $\tau$  is thus 0.39 and  $\alpha$  and  $\bar{z}$  are 2.54 and 98,871 respectively. Using a value of  $\eta = 0.5$  – around the lower end of the estimates reported above – the marginal welfare cost is found to be 4.32; hence for every extra dollar of revenue arising from a small increase in this top rate, the marginal excess burden is \$4.32, indicating a substantial efficiency effect of the top rate. However, these need to be treated with caution because of their highly sensitive variation with  $\eta$ . The sensitivity to the elasticity of taxable income is demonstrated by the finding that  $MWC$  increases to 7.13 when  $\eta = 0.54$ , and to 16.21 when  $\eta = 0.58$ , after which a small increase to  $\eta = 0.60$  increases the marginal welfare cost to 38.00. Beyond this, revenue actually falls when the marginal rate increases further. For much lower elasticities, of say 0.1 and 0.3, the  $MWC$  is found to be 0.19 and 0.95.

The above calculations assume that an increase in the top marginal tax rate causes taxable income to fall as a result of incentive effects or to be shifted into an untaxed source. However, one possible response to the introduction in 2001 of an extra income threshold, with a top marginal tax rate of 39 per cent, is to ‘convert’ some income into trust or corporate income, which continued to be taxed at a rate of 33 per cent. It

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<sup>14</sup>Creedy (2010, p. 575) extends the measure to cover all tax brackets.

Table 5: Marginal Welfare Costs 2001: Top Tax Rate with Income Shifting to Lower Tax Rate

$s$	$\eta = 0.5$	$\eta = 0.7$	$\eta = 0.9$	$\eta = 1.1$
0.2	2.07	16.98	–	–
0.4	1.16	3.03	29.18	–
0.6	0.67	1.27	2.57	7.29
0.8	0.36	0.58	0.89	1.36

can be shown that if  $s$  denotes the proportion of the reduction in taxable income that attracts a tax rate of  $t < \tau$ , equation (8) is modified so that the marginal welfare cost becomes:

$$MWC = \frac{\eta\alpha(\tau - st)}{1 - \tau - \eta\alpha(\tau - st)} \quad (9)$$

Table 5 shows the marginal welfare costs for the year 2001 for those in the top income tax bracket, under alternative assumptions about the value of  $s$ , with  $t = 0.33$ . As  $s$  increases, the range of values of  $\eta$ , for which the tax rate of  $\tau = 0.39$  is above the revenue-maximising rate, becomes smaller. These results demonstrate yet again the sensitivity of welfare costs to variations in the elasticity of taxable income, as well as the sensitivity to the value of  $s$ . The question thus arises of how much reliance can be placed on these marginal welfare cost estimates. While it would be rash to place much weight on any single value, the range of results around the values of  $\eta$  found for the higher-income groups suggests at least that they may be far from trivial.

## 8 Conclusions

This paper has provided estimates for New Zealand of the concept of the elasticity of taxable income, with respect to changes in the net-of-tax marginal tax rate. This concept has the advantage of measuring, in a reduced-form context, all possible responses to tax rate changes and of enabling the efficiency effects to be measured. Results were obtained using a special dataset constructed from a random sample of New Zealand taxpayers.

Two approaches were used to estimate elasticity values. First, the introduction of

an additional top marginal tax rate bracket provided a useful policy change as a natural experiment. Secondly, the stability of the tax structure over recent years enables the effect of fiscal drag, in shifting some individuals into a higher marginal tax rate bracket, to be considered. In using the first approach, it was particularly important to consider the possibility that some observed responses to tax changes may involve the timing, rather than the total amount, of taxable income declared, particularly in anticipation of announced changes taking effect. Furthermore, in estimating the elasticity, care needs to be taken to avoid attributing some of the changes in declared income to marginal tax changes, when they may have arisen from other dynamic factors. Non-tax-related income movements were observed, particularly when attempting to base estimates on tax rate changes arising from fiscal drag and the movement into higher tax brackets.

In view of these complications, the results should be treated with much caution. Nevertheless, it was found that the elasticity of taxable income is substantially higher for the highest income groups. Indeed for lower deciles of the income distribution, the elasticity was found to be negligible. Generally the elasticity was higher for men than for women, but this is probably because the taxable incomes of men are systematically above those of women. Changes in the timing of income flows for the higher income recipients was found to be an important response to the announcement of a new higher-rate bracket. For the top marginal rate bracket of 39 per cent, the welfare cost of raising an extra dollar of tax revenue was found to be well in excess of a dollar.

The results presented here relate to high-income individuals, namely those affected by the introduction of a new top income tax rate in 2001, and those for whom fiscal drag took them into the top rate bracket over a period of stability in the rate and threshold structure. Despite the caution with which the reported values must be treated, the results nevertheless suggest that, in contrast with those studies which have concentrated on estimating labour supply elasticities, disincentive effects on high-income groups and excess burdens associated with them cannot easily be dismissed.

## Appendix A: The Data

The database was constructed by randomly sampling Inland Revenue’s individual taxpayer population. It covers the period 1994–2008. The number of taxpayers in the random sample rises from 128,440 in 1994 to 162,651 in 2008. The sample is weighted to match the individual taxpayer population, which increased from 2,761,000 taxpayers in 1994 to 3,423,421 in 2008. The database includes people with wage/salary income (including taxable welfare benefits) and people who filed an IR5 or IR3 tax return or received a personal tax summary (PTS). It excludes people with no personal taxable income unless they filed.

The requirement for wage and salary earners to file an IR5 tax return was in part based on earnings over a threshold. This threshold increased from \$20,000 in the early 1990s to \$38,000 by 1999. However, in 2000 the IR5 tax return was replaced with the PTS, a pre-populated taxpayer square-up based on data collected from employers during the year. The income threshold was removed, with a consequential reduction in the number of taxpayers required to square-up. This has caused a structural break in the income tax data collected, especially on dividend and interest income. Taxpayers who previously filed an IR5 were not required to square up via a PTS if their only income was from salary and wages or from investments with the correct amount of tax deducted at source, or where the investment income was below a certain threshold.

Individual taxpayer information is gathered from: Client registration; Individual tax return IR3; Personal tax summary (PTS) from 2000 onwards; Salary/wage earner income tax return IR5 (pre-PTS) from 1994 to 1999; Employer monthly schedule (EMS) from 2000 onwards; Annual tax deduction certificate (TDC) from 1994 to 1999

Taxpayers are broadly categorised into two groups based on a taxpayer’s ‘entity class’, a client registration feature: (a) salary/wage earner with a salary/wage (SW) entity class; and (b) other taxpayers with a non-SW entity class (for example, self-employed or salary/wage earners with other income from rental properties or overseas investments). The selection method is: a random two per cent of total salary/wage earners (the random sample is selected from the last two digits of the IRD number); a random ten per cent of total other individual taxpayers – also based on the last two digits of the IRD number with the chosen range including the two per cent sample above.

A taxpayer generally has one IRD number and the same entity class. However, a minority of taxpayers could have a second IRD number due to bankruptcy or they might retain the same IRD number but change entity class over time. This means that the above selection method misses some taxpayers if they had an entity class change

from non-SW to SW, or were issued a new IRD number because of bankruptcy.

The dataset contains the following main variables: General variables – unique IRD number, date of birth, gender; Income variables – salary/wage income, business income, estate or trust beneficiary income, interest income, dividend income, overseas income, rental income, shareholder-employee salary, partnership income, other income, taxable income; Other variables – expenses, losses claimed, loss attributing qualifying company (LAQC) losses claimed.

The gender variable is determined based on the ‘title’ of a taxpayer (e.g. Mr, Miss) so some imputation is required. When no title is present, or the title is ambiguous, gender is randomly assigned. Variables for IR3 filers include: Salary/wage income; Interest income; Dividend income; Business income ; Estate or trust beneficiary income; Overseas income; Shareholder-employee salary; Net rents; Partnership income; Other income; LAQC losses claimed; Expenses; Losses claimed; Taxable income. For TPS/IR5 filers, variables are: Salary/wage income; Interest income; Dividend income. For non-filer TDC/EMS individuals, only salary and wage earnings are relevant. Taxable income is the sum of all incomes less LAQC losses claimed, less expenses and less losses claimed (in that order). Taxable income is zero if a taxpayer has negative taxable income (that is, a loss). As the focus is on income, rebates (such as child care, housekeeping and donations) are ignored.

The expenses variable is different from the business expenses that can be claimed in the general set of financial accounts. The expenses variable can be defined as ‘fees’ paid for professional services. This includes: A fee to someone for completing a tax return; Commission on interest or dividend income; Expenses incurred in earning income that has had withholding tax deducted; Additional expenses incurred in earning partnership income, for example, interest on capital borrowed to purchase a share in the partnership; Interest on money borrowed to buy shares or to invest; Premiums on loss of earnings insurance (income protection), provided the benefit from the insurance policy is taxable.

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## About the Authors

Iris Claus is a Senior Economist at the Asian Development Bank and a Research Associate of the Centre for Applied Macroeconomic Analysis at the Australian National University.

John Creedy is Visiting Professorial Fellow at Victoria Business School, Victoria University of Wellington, New Zealand, and a Principal Advisor at the New Zealand Treasury. He is on leave from the University of Melbourne where he is The Truby Williams Professor of Economics.

Email: [john.creedy@vuw.ac.nz](mailto:john.creedy@vuw.ac.nz)

Josh Teng is an analyst in the Policy Advice Division, Inland Revenue, New Zealand.

Email: [josh.teng@ird.govt.nz](mailto:josh.teng@ird.govt.nz)

