Equity and Efficiency Measures of Tax-Transfer Systems: Some Evidence for New Zealand

John Creedy, Jamas Enright, Norman Gemmell and Nick McNabb

NEW ZEALAND TREASURY

WORKING PAPER 08/04

DECEMBER 2008

THE TREASURY
Kaitohutohu Kaupapa Rawa

New Zealand Government

NZ TREASURY WORKING PAPER 08/04

Equity and Efficiency Measures of Tax-Transfer Systems: Some Evidence for New Zealand

MONTH/YEAR

September 2008

AUTHORS

John Creedy
University of Melbourne
Australia

Jamas Enright
The Treasury
PO Box 3724
Wellington
New Zealand
Email jamas.enright@treasury.govt.nz
Telephone +64 4 917 6229
Fax +64 4 473-0982

Norman Gemmell
The Treasury
PO Box 3724
Wellington 6140
New Zealand
Email norman.gemmell@treasury.govt.nz
Telephone +64 4 917 6193
Fax +64 4 473-0982

Nick McNabb
The Treasury
New Zealand

NZ TREASURY

New Zealand Treasury
PO Box 3724
Wellington 6008
NEW ZEALAND
Email information@treasury.govt.nz
Telephone 64-4-472 2733
Website www.treasury.govt.nz

Abstract

The redistributive and efficiency aspects of personal taxes are of particular interest to both economists and governments designing tax reforms. Traditionally however, the numerous analytical tools available to calculate distributional and efficiency effects of taxes and transfers are not widely used in tax policy advice. This partly reflects the computational complexities involved in calculating some of those measures and the need for simplicity, and transparency of underlying assumptions, when presenting policy advice. This paper makes two contributions to the analysis of the equity and efficiency effects of tax policy. Firstly, it applies the methodologies proposed by economists to measure equity and efficiency outcomes of taxes to provide some evidence for the New Zealand income tax and transfer system. This makes use of Treasury's microsimulation model, *TaxWell*. Secondly, the paper examines a database of low-income New Zealand taxpayers. A decomposition by individual and household characteristics shows that different groups of low income taxpayers can be affected quite differently by various aspects of the tax/transfer system. In particular, tax-free zones do not appear to be well targeted to help those most in need.

JEL CLASSIFICATION H23 - Externalities; Redistributive Effects; Environmental Taxes and Subsidies
H24 - Personal Income and Other Nonbusiness Taxes and Subsidies

KEYWORDS Personal Income Taxes; Equity; Redistribution; Transfers; Tax Efficiency

Table of Contents

List of Figures

List of Tables

Equity and Efficiency Measures of Tax-Transfer Systems: Some Evidence for New Zealand

Introduction

The distributional consequences of tax reform are frequently prominent in policy debates in New Zealand. As an example, in advance of the 2008 Budget, the then (Labour) Finance Minister required that his proposed Budget tax reform meet an 'inequality test', namely that the reform should not worsen current inequality.[1] However, the precise interpretation given to 'inequality' also raises complex issues. In addition, in evaluating a tax reform, inequality is just one of the criteria which may be applied. It is also necessary to consider the consequences for efficiency in order to ensure that redistributive aims are achieved at minimum acceptable costs.

Concepts of both efficiency and equity are therefore central to analyses of taxation reform. A variety of previous studies have attempted to measure the efficiency and redistributive properties of actual and hypothetical reforms in New Zealand.[2] Furthermore, the New Zealand Treasury maintains a tax microsimulation model constructed to examine the effects on individuals and households of the direct tax system. The evaluation of tax policies is complicated by the fact that they frequently involve both losers and winners, and any judgements cannot avoid subjective 'value judgements' regarding the weight attached to changes affecting different groups in society. Economic analysis can make a valuable contribution to policy debate and decision making by examining and presenting the consequences, in as succinct a form as possible, of adopting a range of clearly stated value judgements.

---

1 The tax cut package included in the 2008 Budget was required to satisfy four 'tests' of which the 'inequality test' was one. The others were: no increase in government borrowing; no reductions in public services; and no worsening of inflationary pressures.

2 Research within the New Zealand Treasury has examined various aspects of the distribution of incomes and the efficiency/distributional properties of the tax system in New Zealand. See, for example, Creedy (2003a, b) Creedy and van der Ven (2003), Creedy and Sleeman (2004), Hyslop and Mare (2001), Kalb and Scutella (2003). Some years ago Treasury also developed a behavioural microsimulation model of labour supply in New Zealand to help analyse personal tax & transfer reform but the model has been little used for policy advice. For recently released assessments of the equity-efficiency properties of the current, and Budget 2008 proposed, NZ personal tax system; see http://www.treasury.govt.nz/publications/informationreleases/budget/2008.

This paper examines summary measures of the distributional and efficiency properties of the New Zealand personal income tax and transfer system in order to shed some light on the trade-offs involved. Section 2 discusses some of the measurement issues involved and the way value judgements can be specified in the context of an 'evaluation function'. Section 3 briefly summarises some inequality indices and tax 'efficiency' measures. Section 4 examines some indices of inequality for pre- and post-tax-and-transfer incomes in New Zealand using the Treasury tax microsimulation model, *TaxWell*, applied to 2006-07 Household Expenditure Survey (HES) data.[3] This section also considers sensitivity to the income units used: individual incomes, household incomes and adult-equivalent household incomes.

Section 5 compares the inequality outcomes for a number of policy scenarios including alternative tax reforms designed to be approximately revenue-neutral. In the absence of a full behavioural model, we are unable to construct 'welfare' measures such as excess burdens of taxes and transfers, but section 6 provides some clues to possible equity-efficiency trade-offs by examining effective tax rates facing different taxpayers. Section 7 focuses on data for low-income earners, arguing that at least in New Zealand, using the tax system to redistribute towards individuals with low taxable income would represent poor targeting of social assistance. Section 8 concludes.

The Evaluation of Tax Reforms

Economists have found it useful to represent the variety of ways in which different 'judges' may evaluate a tax reform using the concept of a social evaluation function, or social welfare function. Despite its name, this makes no attempt to measure the wellbeing of society, but provides a way of determining whether any specified policy change would be considered as an improvement by an individual judge. It summarises in a succinct and convenient way the overall result of complex changes which may affect many different types of individual and household. Economists have developed methods to deal with a range of value judgements, but it cannot be expected that any single analysis would cover all possible points of view. In particular, one broad value judgement is that the overall evaluation depends on the outcomes for each individual in society – each person counts, but the importance attached to changes may not be the same for everyone (for example, depending on their income or wealth, or other circumstances considered relevant).

A general form of social welfare function, W, may thus be written as depending on some measure, say z, for each of the N persons in society. This involves a value judgement that the relevant unit of analysis is the individual.[4] Hence:

---

[3] The Treasury developed the *TaxWell* microsimulation model to model the impact of taxes and benefits on individual disposable income, for costing and analysis purposes. All attempts have been made to ensure the accuracy of the model and the information used, although some errors may remain.

[4] Other properties which reflect value judgements, in addition to the individualistic nature of the welfare function, relate to additive and Paretean characteristics, and adherence to the 'principle of

$$W = W(z_1, \ldots, z_N) \quad (1)$$

A further value judgement concerns the precise way in which z, referred to as the 'welfare metric', is measured and this cannot avoid value judgements as well as creating measurement problems. Alternative welfare metrics involve the use of some measure of income, or consumption, or a measure of 'money metric utility' which allows for the value attached to leisure. Questions also arise over the time period chosen, that is whether the welfare metric covers weekly or annual values, which are complicated by the existence of short term variations (temporary sickness or unemployment), or those measured over much longer periods, where allowance can be made for systematic life cycle variations.

In considering the welfare metric, it is common to allow for the existence of income sharing, particularly within households where there may also be economies of scale. This involves the use of adult equivalence scales, which also require value judgements to be specified; these are discussed further below. In the following analysis it is not possible to allow for the value of leisure and the welfare metric is measured in terms of income per adult equivalent person.

Taxes, Redistribution and Efficiency

A number of measures of income inequality and of the redistributional impact of income taxes and social transfers are available. Since one of our objectives is to highlight the role of value judgements in reaching inequality conclusions we report the familiar Gini and Atkinson inequality indices, using a variety of 'inequality aversion' assumptions for the Atkinson index, A.[5] In considering the redistributive impact of income taxes and social transfers (such as Working for Families), we consider how these measures change for different definitions of pre-tax, post-tax and post-tax-and-transfer income, in addition to Kakwani and Reynolds-Smolensky measures of tax progressivity. The next subsection summarises those measures.

transfers', whereby welfare is judged to increase if a transfer takes place from rich to poor without affecting their rankings.

5 Similar assumptions underlie the Extended Gini index, G(v), where the parameter v describes differing value judgements relating to inequality aversion similar to Atkinson's ε (where v-1 is analogous, but not equivalent, to ε; see Creedy 1996, pp.20-21). The extended Gini is defined as follows (where v = 2 is the standard Gini): $G(v) = -(v/\bar{y})Cov\{y, (1-F(y)\}^{v-1}$.

Measures of Inequality and Redistribution

The Gini index of pre-tax income, y, G_y, is the familiar measure of the area contained between the Lorenz curve for y and the line of perfect equality (the 45^o line). The Lorenz curve describes the relationship between the cumulative proportion of individuals, *N*, (or other income unit) and the cumulative proportion of incomes, *F*(y), where individuals are ranked in ascending order of their incomes. Formally G_y can be defined as:

$$G_y = (2/\bar{y})Cov\{y_i, (1-F(y_i))\} \tag{2}$$

where $F(y_i)$ is the proportion of people with incomes below y_i, and $\bar{y}$ is mean income. Alternatively G_y can be expressed as:[6]

$$G_y = \left[\frac{N+1}{N}\right] - 2\sum_{i=1}^{N}\left(\frac{N+1-i}{N}\right)\left(\frac{y_i}{\sum_i^N y_i}\right) \tag{3}$$

The Gini measure can in fact be derived from a special kind of social welfare, or evaluation, function in which welfare is viewed in terms of 'unfairness'. If welfare is defined as the average of the minimum income from all pairwise income comparisons, it is possible to show that the welfare function is equivalent to:

$$W_G = \bar{y}\{1-G_y\} \tag{4}$$

This type of expression for the evaluation function involves two summary measures of the distribution, the arithmetic mean and the Gini coefficient. It is a convenient 'compression' of the form involving all individual values of income, and is referred to as an 'abbreviated' welfare function. In particular, it allows the implications for the trade-off between 'equity and efficiency', implied by the value judgements, to be transparent.[7]

The Atkinson measure of inequality is instead based on a 'wastefulness' judgement regarding inequality, whereby a more equal distribution of the same total income could produce an improvement, from the point of view of the judge, and hence a higher social welfare. The social welfare function, in terms of individual values, is:

$$\mathrm{W_A} = \frac{1}{1-\varepsilon}\sum_{i=1}^{N} y_i^{1-\varepsilon} \qquad \varepsilon \neq 1 \tag{5}$$

where ε reflects the relative inequality aversion of the judge (reflecting the concavity of the welfare function). Increases in higher incomes are given a relatively lower weight than for lower incomes. The Atkinson index relies on the concept of an

---

6 The connection between the Gini and the Lorenz curve can be seen from (3). The Gini equals 1 minus twice the area beneath the Lorenz curve. It can be seen that, for large N, the term in square brackets ≈ 1 and the terms ((*N+1- i)/N*) and $y_i / \sum_i y_i$ respectively measure *i*'s proportion of the population and of total income.

7 For more details on abbreviated functions, see Creedy (1996, p.25-28).

equally-distributed equivalent value of total income, y_e , which yields the same social welfare as the current distribution. This is given by:

$$y_e = \left(\frac{1}{N} \sum_{i=1}^{N} y_i^{1-\varepsilon} \right)^{1/(1-\varepsilon)} \qquad \varepsilon \geq 0; \varepsilon \neq 1 \tag{6}$$

$$y_e = \exp\left\{ \frac{1}{N} \sum_{i=1}^{N} \log(y_i) \right\} \qquad \varepsilon = 1 \tag{7}$$

The Atkinson index, A(ε), is the proportional difference between arithmetic mean income and the equally distributed equivalent:

$$A(\varepsilon) = 1 - (y_e / \bar{y}) \qquad \text{where } 0 < A(\varepsilon) < 1 \tag{8}$$

Values of ε close to zero imply a mild aversion to inequality, and thus a low preference to redistribute towards the bottom of the income distribution. That is, only a small sacrifice in total incomes would be tolerated in order to achieve income equality. A value of ε greater than 1 implies a stronger aversion to inequality (i.e. a willingness to sacrifice a large fraction of income in the redistributive process).

To illustrate, HES data used in section 2 show that average gross taxable income in New Zealand in 2006-07 was $33,503. Using the individual incomes within the HES, and a value of ε = 0.5 to calculate y_e yields y_e = $27,153. That is, ε = 0.5 represents a significant degree of inequality aversion - a willingness to sacrifice around 20% of total income in order to achieve full equality. A value of ε = 0.2 implies a much lower willingness to sacrifice income (8%), while ε = 1.0 implies a 40% sacrifice. In effect the value of A(ε) captures the proportionate reduction in mean income that the value of ε implies; hence A(ε) = 0.2 implies a 20% income sacrifice to achieve equality. This is approximately achieved here with ε = 0.5.

The rearrangement of (8) shows that the social welfare function associated with the Atkinson measure can also be expressed in abbreviated form as:

$$W_A^{'} = y_e = \bar{y}\{1 - A(\varepsilon)\} \tag{9}$$

Hence the abbreviated functions using the Gini and Atkinson measures are very similar, despite the fact that they are based on quite different value judgements. In each case they imply that, in terms of the trade-off between equity and efficiency, a 1 per cent increase in equality, $1 - I$ (where $I = G(v), A(\varepsilon)$), would be traded for a 1 per cent reduction in arithmetic mean income. Alternatively, a 1 per cent increase in total income would be just sufficient to compensate for a 1 per cent increase in inequality (as measured by the relevant index).

The Gini and Atkinson indices can be compared for alternative definitions of pre-tax, post-tax, or post-tax-and-transfer, incomes where in the case of the Gini, individuals are ranked according the value of the income measure under consideration. However for some comparisons it is useful to rank individuals according to their pre-tax incomes even when considering a post-tax income definition. This gives rise to the Concentration index, C, such that if y and z are respectively pre- and post-tax incomes then G_z is the Gini measure of post-tax incomes (ranked by z) while C_z is

the concentration measure, which takes essentially the same form as the Gini except that individuals are ranked by their pre-tax incomes.

Using these definitions, the Reynolds-Smolensky, L, and Kakwani, K, measures of the redistributive effect of a tax can be defined. This requires a Concentration index of income tax payments, C_t, which measures the extent of inequality in individuals' tax payments, ranked by their pre-tax incomes. Thus, tax progressivity is measured by:

$$L = G_y - G_z \tag{10}$$

$$K = C_t - G_y \tag{11}$$

The Reynolds-Smolensky index captures the difference in the Ginis of pre- and post-tax incomes, while the Kakwani index measures the disproportionality of tax payments relative to pre-tax incomes. With a proportional tax, the two K components, C_t and G_y, are the same (the Concentration and Lorenz curves coincide) so that K = 0. Thus, with a tax/transfer system that is progressive at all income levels, the concentration curve of tax payments lies outside (that is, further from the 45^o line than) the Lorenz curve of pre-tax incomes. Progressive taxes yield $0 \leq K, L \leq 1$.

Kakwani (1977) shows that K and L differ depending on the extent of re-ranking of individuals between pre- and post-tax incomes and the aggregate ratio of tax payments to incomes, such that:

$$L = K\left(\frac{g}{1-g}\right) - P \tag{12}$$

where g is the aggregate tax ratio and *P* is an index of re-ranking given by:

$$P = G_z - C_z \tag{13}$$

In the absence of any re-ranking K and L are proportional, with L deviating from K depending on the size of the aggregate tax take. As a result, tax reforms that are not revenue-neutral can yield changes in K and L that are not proportional.

Measures of Efficiency and Welfare

In the process of raising revenue and redistributing income, taxes generate distortions to behaviour which mean that the full economic cost of raising an additional dollar of tax revenue is greater than a dollar. This can be measured by the marginal cost of funds (MCF), or deadweight loss (DWL), or excess burden of tax concepts. Finding empirical measures of these concepts for income taxes and transfers is not straightforward however, and typically requires a variety of assumptions about individuals' behaviour and/or application of microsimulation modelling techniques.[8] The New Zealand Treasury (NZT) does not currently have

[8] See Diewert and Lawrence (1996, 2001) and Creedy and Sleeman (2004) for applications of the DWL approach to New Zealand taxes, and Creedy and Kalb (2006) for discussion of microsimulation modelling applied to taxes in Australia.

such a model and hence must assess the efficiency and welfare impacts of taxes using simpler methods.

Key components of such modelling are methods to account for the fact that different individuals may have differing preferences and face different, non-linear budget constraints that influence their labour supply and other responses to income taxation. These cannot readily be factored into tax policy evaluations without a fully specified model. However the existing literature provides a number of guiding principles.

Firstly, an approximation for the excess burden for a linear income tax is proportional to the square of the marginal tax rate.[9] The New Zealand tax system is much more complex than the simple linear case, with several tax thresholds and rates, giving rise to a piecewise-linear budget constraint. Also, means-tested transfer payments such as Working for Families, WfF, lead to non-convexities in the budget set. However, the simple 'square of the tax rate' approximation points to the need to recognise that the efficiency losses associated with increases in marginal tax rates are non-proportional. Secondly, the labour supply literature has identified a number of groups that might be expected to be especially responsive or unresponsive to changes in effective tax rates. Thirdly the literature on tax avoidance responses by taxpayers also points to some key margins likely to give rise to efficiency losses, such as divergences between the relevant personal and corporate tax rates or the impacts of progressive personal income tax scales on income splitting among taxpayers.

Since the abbreviated welfare function includes both the average income level and the degree of equality (one minus the degree of inequality), it can be used to provide a simple comparison of different tax structures, as captured by their impacts on mean incomes (efficiency) and on equality. For example, a tax change that involves an increase in inequality (either the Gini or the Atkinson index) from 0.2 to 0.25, implies a proportionate change in equality of (0.75 – 0.8)/0.8 = -0.0625. As a result, for social welfare, W, to improve, the tax change must also be associated with an improvement in mean incomes of at least 6.25 per cent. If efficiency gains are unable to generate such an improvement, the tax policy would be evaluated as harming social welfare. This evaluation depends on the inequality measure used and, in the case of the Atkinson index, the aversion to inequality, ε, and hence cannot be made without first specifying the relevant value judgement.

The abbreviated social welfare function can also be used to measure the 'welfare premium' associated with a particular tax or tax change. The welfare premium is the welfare in excess of that arising from a (hypothetical) proportional tax which raises the same revenue. In the present context, with a tax and transfer system in place, we can think of the proportional system as applying to taxes plus transfers. That is, the welfare premium compares the welfare of the current tax-transfer system with one in which current tax revenue net of transfers is distributed in proportion to pre-tax-and-

[9] See, for example, Auerbach (1985), Creedy (2004). On welfare changes with highly nonlinear budget constraints, see Creedy and Kalb (2006).

transfer income. Lambert (1993) showed that the welfare premium, Π, can be measured as:

$$\Pi = (1-g)\bar{y}(I_y - I_z) \tag{14}$$

Or, normalising by mean income:

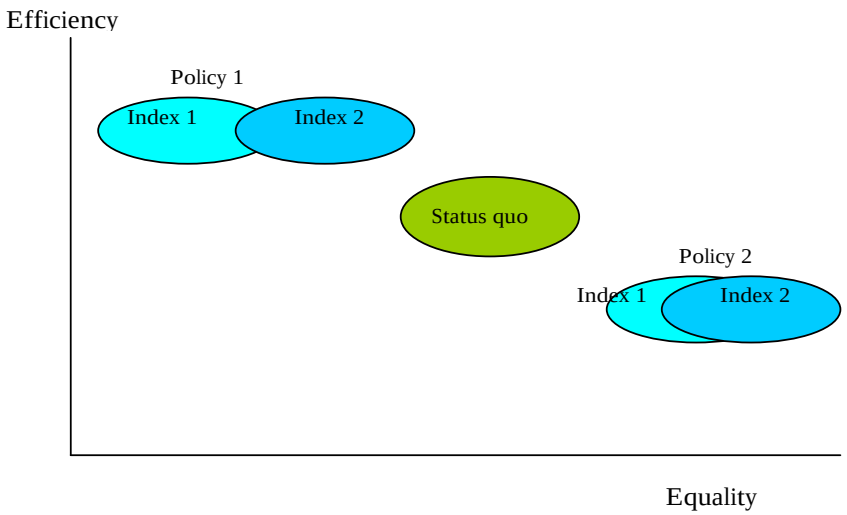
$$\pi = \Pi / \bar{y} = (1-g)(I_y - I_z) \tag{15}$$

where *I* is the chosen inequality index, such as the Gini or Atkinson measure, that is compatible with the abbreviated social welfare function. However, this exercise also assumes that mean income is unaffected by the fiscal changes.

One issue for policy advice emerging from the above concerns the question of whether the methods of generating social welfare changes in association with tax changes, such as those derived from microsimulation models, provide a suitably transparent and reliable method of evaluating reform. Given the need to value leisure and model labour supply and other responses, specify utility and social welfare functions, and make inequality aversion judgements, such methods can appear to policy-makers as too opaque or unreliable. An alternative approach would be to seek to measure efficiency aspects, for example via excess burden approximations, and inequality aspects of tax reforms separately, but which identify the trade-offs and value judgements required for policy choices.

For example, Figure 1 shows a trade-off between efficiency and inequality outcomes of two alternative hypothetical policies compared to the status quo, for differing inequality aversion judgements (represented by Index1 and Index2). For such comparisons to be useful requires a suitably comprehensive efficiency measure and an inequality measure that is not too sensitive to the particular choice of index.

Figure 1 – Equity-Efficiency Trade-offs



In Figure 1, Policy 1 could involve a reduction in a top marginal rate that improves efficiency but at the cost of reduced equality (relative to the status quo; the size of the reduction depending on inequality aversion). Policy 2 - such as an increase in a social welfare transfer – could involve the opposite choice – improved equality and

worsened efficiency. The impact of inequality aversion on the equality outcomes, captured by Indices 1 and 2, need not be the same for both policy options.

Income Inequality and Fiscal Redistribution in New Zealand

To examine the redistributional impact of taxes and transfers in New Zealand requires inequality measures of pre- and post-tax, and pre- and post-transfer, incomes. This, in turn, requires a suitable income measure. We use the income data available from the Household Expenditure Survey (HES) analysed using Treasury's microsimulation model, *TaxWell*. This is a non-behavioural model, and hence conclusions must be treated cautiously. Nevertheless it provides some information on the likely impact effects (sometimes referred to as 'static' effects) of tax-transfer policy. Results presented below are based on the 2006-07 HES sample of around 2550 households which have then been scaled up using Statistics New Zealand weights to represent the New Zealand population as a whole.

HES income data can be decomposed into taxable and non-taxable incomes, which may be 'private/personal' (such as earned/unearned incomes) or 'public' transfers from government; see Table 1. Important for present purposes is the distinction between taxable and non-taxable government transfers, where the latter affect total income but do not interact directly with the tax system. In considering the distributional impact of alternative tax and transfer policies governments could trade-off changes in taxable and/or non-taxable transfers and/or income taxes.

Table 1 – Household Expenditure Survey Incomes

Income source: **Income type:**	**Private/Personal**	**Public**
Taxable	**I.** Personal income (e.g. wages/salaries; capital income)	**II.** Govt benefits (e.g. unemployment benefit; superannuation)
Non-taxable	**III.** Some unearned income (e.g. lottery winnings)	**IV.** Govt transfers (e.g. WfF, Accom. supplement)

The analysis begins by comparing the distribution of private (earned plus unearned) income with the distribution of gross taxable income (GTI) where the latter is private taxable income plus taxable benefits.[10] To avoid confusion, the term 'benefits' is used to refer to taxable transfers from government (a component of GTI) and 'transfers' is used to refer to non-taxable transfers such as Working for Families and Accommodation Supplement.

[10] The HES incomes examined here relate to individuals 15 years and over.

For most of the analyses below the distribution of GTI is treated as the base income definition against which the distributional impacts of tax and transfer changes are compared. Thus taxes are first deducted from GTI, and then non-taxable transfers are added, to yield distributions of post-tax, and post-tax-and-transfer, incomes. In considering the distributional aspect of the social welfare system, the analysis therefore does not generally examine the benefit system though this can readily be done.

One reason for this choice relates to the assumption, implicit in all the comparisons below, that the distribution of pre-tax-and-transfer income is unaffected by these government interventions. This is a questionable assumption but is especially inappropriate for incomes prior to the receipt of government benefits such as pensions. For example, in the absence of a government pension and benefit system, the level and distribution of private income could be expected to be very different. However, this means that in considering hypothetical policy trade-offs which maintain constant inequality, these trade-offs do not include benefit changes.

The Distribution of Pre-Tax Incomes

There are number of possible income distributions we could consider, such as for earned income only, wage and salary income only, and all income excluding benefits. Similarly there are various alternative units of analysis, such as all individuals, individuals in the labour market, households, or families. We begin by considering only private/personal taxable income, PGTI, (quadrant I in Table 1) and gross taxable income, GTI, (quadrants I & II) for individuals, both including and excluding those with zero incomes.[11] Figure 2 shows the distribution of GTI including zero incomes, and Table 2 shows Gini and Atkinson indices for the various definitions. The Atkinson index necessarily includes only positive incomes.[12]

Figure 2 shows the large number of individuals on zero income (around 340k out of a total of around 3.2 million individuals in the distribution). These are largely 15-18 year olds, students and non-workers within households. There is a second mode of around 140k individuals at $13k. Thereafter the number of individuals drops so that there are generally around 10-20k individuals in each $1000 class between $20k and $60, with numbers dropping again to under 10,000 per $1000 class in excess of $60k.[13]

---

11 Some HES individuals are recorded with negative income (e.g. non-earners with a taxable loss from property); these are treated as zero taxable incomes for present purposes.

12 This distribution is similar to the bimodal distributions examined by Bakker and Creedy (1999).

13 The spikes at the lower end of the distribution are associated with level of superannuation and various benefit levels. Unlike income distribution data based on IRD records, this distribution does not reveal especially large spikes at the $38k and $60k tax thresholds due to the small sample size; see IRD (2005; p.33) at: http:// www.taxpolicy.ird.govt.nz/publications/files/bim2005.pdf .

Figure 2 – Distribution of Gross Taxable Income, 2006-07

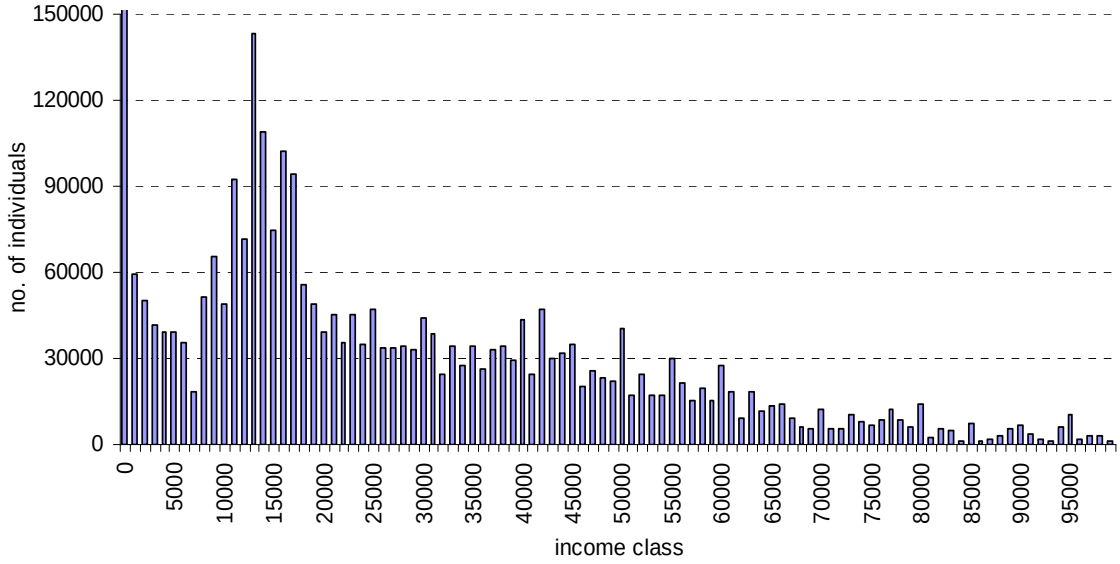


Table 2 treats the individual as the appropriate unit of analysis. However, concern may be with the inequality of income over *all* individuals, including those who may have zero income or small amounts of unearned income, despite the possibility that they live within high income households.

Table 2 – Gini and Atkinson Indices for GTI and PGTI

	Gini		**Atkinson (ε)**				
	incl. zero inc	excl. zero inc	(0.2)	(0.5)	(0.8)	(1.0)	(1.5)
PGTI	0.608	0.569	0.094	0.242	0.407	0.532	0.865
GTI	0.512	0.464	0.077	0.190	0.305	0.392	0.730

The table shows Ginis in this case to be: G_{PGTI} = 0.608 and G_{GTI} = 0.512. That is, before receipt of government benefits, income is relatively unequally distributed (recall $0 \leq G \leq 1$; with G = 0 implying complete equality). Unsurprisingly, the inclusion of benefits reduces the inequality of taxable incomes by around 0.1, or 15 per cent ((0.608 – 0.512)/0.608). When those on zero incomes are excluded, both Ginis are reduced: to G_{PGTI} = 0.569 and G_{GTI} = 0.464.

Table 2 also highlights the differences in the Atkinson measures depending on assumed inequality aversion. This indicates that, given the current distribution of income across individuals, and mild inequality aversion at ε = 0.2, A(ε) = 0.077 is obtained for GTI; that is a 7.7 per cent reduction in mean income would be tolerated to achieve complete equality. For greater degrees of inequality aversion of ε = 0.5 and 0.8, the inequality index rises substantially to 0.24 and 0.41 respectively. These results suggest that, given the relatively large numbers of individuals on low incomes in New Zealand, even relatively moderate aversion to inequality, such as ε around

0.5, generates a relatively high value of A involving a relatively large drop in mean incomes.

Whether individuals on zero or low incomes are of concern in welfare terms may depend on the choice of unit of analysis.[14] The way in which inequality indices vary depending on this classification is examined below.

The New Zealand Personal Tax and Transfer System, 2006-07

Before examining the redistributive impact of New Zealand taxes and transfers we summarise the key aspects of that system in 2006-07, the year for which we examine HES data. Personal 'taxable' incomes were subject to tax rates of 0.195, 0.33 and 0.39 above income thresholds of $0, $38k and $60k per year. That is, income is taxable from the first dollar received, with no initial tax-free zone as in Australia and most other OECD countries. However, for incomes below $38k there was a 'low income rebate' (LIR) which effectively reduces the individual's marginal tax rate to 0.15 for incomes below $9.5k and raises MTRs to 0.21 for incomes between $9.5k and $38k.[15]

The main non-taxable transfer is Working for Families, WfF, which is composed of a number of family-related tax credits.[16] The largest credit in revenue terms is the Family Tax Credit (FTC) which pays a fixed amount per child depending on the number and age of children in the family and the size of total family taxable income. In addition an In-Work Tax Credit (IWTC) is paid to families provided one member of the family works 20 hours per week or more (or two family members work 30+ hours per week). In 2006-07 the FTC was around $3,700-4,400 per year for the first child (depending on age) and around $2,400-3,900 for a second and subsequent child (depending on age). IWTC also depends on the number of children in the family and was around $3,100 per year when there are 1-3 children with additional payments for extra children. For family incomes above $35,000, the FTC and IWTC abate at a rate of 20cents per dollar of additional family income. As a result, effective marginal tax rates facing WfF recipients in this income range are raised by 20% compared to non-recipients.[17]

---

14 Households and families differ in the HES dataset. A household represents a group of individuals residing together. For example, a single household composed of two adults and two students is considered a single family if the students are the children/dependents of the adults but would be three families if the students are independent of the adults and each other.

15 The LIR is worth 4 cents per dollar of earned income up to $9.5k but then abates at 1.5cents per dollar to $38k. Wages, salaries and self-employment incomes are also subject to an accident compensation (ACC) levy of 1.3 per cent. The LIR was removed a part of the Budget 2008 reforms.

16 In addition there is a Minimum FTC that guarantees a minimum net income for sole parents working more than 20 hours per week (couples working more than 30 hours). Other non-taxable transfers include the housing-related transfer, Accommodation Supplement. This is based on housing costs and depends on family income and area of residence.

17 WfF is abated against the primary earner's income first, and then, if necessary, against the income of the secondary earner.

Taxes, Transfers and Redistribution

This subsection examines how inequality indices vary for post-tax-and-transfer incomes, compared with the inequality of GTI. The measures used are the Gini, Atkinson, Kakwani and Reynolds-Smolensky indices described in Section 3. These have been constructed for different units of analysis. Table 3 shows three cases: using individual incomes, household incomes and income per adult-equivalent person. Using the household as the unit of analysis recognises that, with income sharing within households, it may be more appropriate to consider inequality in the distribution of income *between* households. The 'household income' inequality measures in Table 3 are estimated across individuals but where each adult within the household is assumed to receive an equal share of household income.[18]

The use of household income per adult-equivalent person further recognises that sharing economies may depend on household composition and size - where there are several adults and/or children within a household. For example, adding a second or third adult to a household, and the inclusion of children may provide differing opportunities to share income. A number of adult equivalence scales are used in the literature, many of which can be captured by the simple form:

$$m = (n_a + \theta n_c)^{\alpha} \tag{13}$$

where m is the number of adult-equivalents, $0 \leq \theta \leq 1$ captures the weight attached to each additional child in the household, and $0 \leq \alpha \leq 1$ captures scale economies. Table 3 adopts a commonly used scale in NZ Treasury's tax projections – the 'Jensen scale', which approximately equates to $\theta = 0.7$; $\alpha = 0.6$.[19] Sensitivity to this scale is examined below.

A feature of the inequality indices reported below is that in all cases these relate to inequality *across individuals* where, in the case of 'household income' and 'adult-equivalent household income', the income is assumed to be shared equally among the adult household members, or the adult-equivalents as measured by (13). For example, consider a two-adult household with a household income of $50,000. With no weighting, the household is considered to have two adults with $25,000 each. Alternatively, using an adult equivalence scale such as $(n_a + \theta n_c)^{\alpha}$ with $\alpha = 0.6$, there are $2^{0.6} = 1.516$ adult-equivalents in the household yielding 2 individuals each with an adult-equivalent income of $32,988.

Table 3 reports inequality measures using the following abbreviations: Y = gross taxable income; T = tax; W = income after tax; S = transfers; Z = income after tax and transfers; g = ratio of tax to income. In discussing the results, the focus is mainly on

---

18 More precisely, since we report incomes of those aged 15 years and over, we also allocate household incomes within the HES across this group. Hence 'household-based' inequality indices in Table 3 are calculated across individuals (aged ≥ 15 years) within households where each household member is allocated $1/n_h$ of the household income, where n_h is the number of household members ≥ 15 years.

19 See Creedy and Sleeman (2006, chapter 9) for discussion and comparison of many adult equivalence scales.

the indices for incomes per adult-equivalent, as other results reveal a similar pattern. Inequality of gross taxable income, using either G_Y or A_Y, is generally lower for comparisons across households than across individuals, with the use of the adult-equivalence scale reducing inequality further. This is not surprising since inequality indices based on household incomes effectively remove intra-household inequality.

Using an adult-equivalence scale gives relatively higher income to individuals within larger households compared to weighting all adults equally. Hence the use of an adult equivalence scale improves inequality (compared to no scaling) if households on lower incomes tend to have lower 'adult equivalents' – either due to fewer additional adults or a higher ratio of children to adults.[20]

Table 3 – Inequality Measures for Incomes, Taxes and Transfers

Inequality measure	**Based on distribution across individuals using: Individual incomes**	**Household incomes**	**Adult-equivalent H'hold incomes**
Gini (G) & Concentration (C) Indices:			
G_Y	0.464	0.407	0.391
C_W	0.432	0.381	0.363
C_Z	0.406	0.352	0.333
C_T	0.565	0.490	0.479
C_S	0.362	0.304	0.489
Atkinson Index:	**A_Y**	**A_Y**	**A_Y [A_Z]**
A ($\varepsilon = 0.2$)	0.077	0.057	0.052 [0.038]
A ($\varepsilon = 0.5$)	0.190	0.139	0.128 [0.094]
A ($\varepsilon = 0.8$)	0.305	0.221	0.202 [0.149]
A ($\varepsilon = 1.0$)	0.392	0.277	0.252 [0.187]
A ($\varepsilon = 1.5$)	0.730	0.492	0.453 [0.291]
Kakwani (K) and Reynolds-Smolensky (L) Progressivity Indices:			
K_W	0.101	0.083	0.088
K_Z	0.218	0.213	0.216
L_W	0.032	0.025	0.027
L_Z	0.052	0.050	0.055
Tax ratios:	g (tax) = 0.238		
	g (tax - transfers) = 0.212		

Considering the Gini and Concentration indices in Table 3 it can be seen that the tax system modestly reduces inequality from G_Y = 0.391 to C_W = 0.363, with transfers inducing a further reduction to C_Z = 0.333. The C_T and C_S indices also reveal the redistributive nature of taxes and transfers since these exceed the value of G_Y = 0.391; for a proportional tax the concentration curve coincides with the Lorenz curve,

[20] Analysis of adult-equivalents using *TaxWell* confirms that these tend to be lower for lower income households, leading to higher adult-equivalent incomes within these households; see Appendix.

such that $G_Y = C_T$. Note that this does not apply to transfers since if these are progressive the concentration curve for transfers (unlike the Lorenz curve) lies *above* the 45^o line; the more progressive are transfers, the further above the 45^o line is their concentration curve, and hence larger C_S.[21]

Table 3 shows that, when considering the distribution across adult-equivalent household incomes, taxes and transfers (essentially WfF) are similarly redistributive: $C_T = 0.479$, $C_S = 0.489$. However, across individuals or households, transfers are noticeably less redistributive than taxes. This likely reflects the fact that, since WfF is related to child numbers and ages, it has a greater impact when these are given greater weight via the adult equivalence scale. However, across individuals, because WfF affects a relatively small fraction of taxpayers, it has less redistributive effect than taxes.[22]

The L indices of tax and transfer progressivity in Table 3 (where $L = G_Y - G_Z$) show that the gross income Gini is reduced by about 2.5 points (0.027) by the tax system and by a similar further amount by WfF. The same message emerges from the Kakwani, K, indices measuring the concentration of tax (or tax & transfers) relative to gross incomes. Tax can be seen to be more concentrated (relative to a proportional tax) by almost 9 points (0.088) and taxes and transfers by over 20 points (0.22). The Atkinson indices in Table 3 also confirm that the inequality across individuals using income per adult-equivalent is less than for individual incomes or household incomes. For example, A_Y ($\varepsilon = 0.5$) falls from 0.19 for individual incomes to 0.13 for adult-equivalent incomes. A_Z ($\varepsilon = 0.5$) is noticeably lower at 0.094.

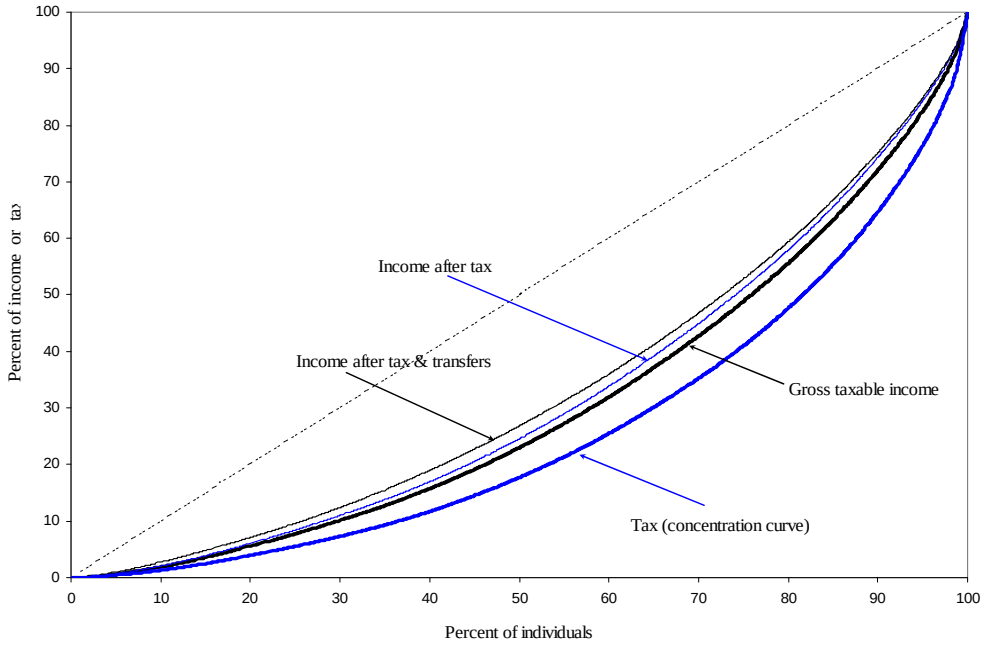
The Kakwani and Reynolds-Smolensky measures of progressivity and redistribution are all Gini-based and thus related to Lorenz and concentration curves. These are illustrated in Figure 3, where all curves are based on adult-equivalent incomes. The Lorenz curve of post-tax-and-transfer income is closer to the line of equality than that of post-income-tax income, which in turn is closer to the line of equality than that of gross income. Figure 3 also shows the concentration curve for tax payments. This lies substantially outside the various Lorenz curves, reflecting the disproportionality (progressivity) of personal taxes. Adding transfers (not shown) would magnify the progressivity effect observed for taxes alone.

---

21 In this case the concentration index measures the area between the concentration curve and the 45^o line, as a share of the total area above the 45^o line.

22 According to HES data, WfF affects about 65 per cent of families with children but only about 20 per cent of all families.

Figure 3 – Lorenz and Concentration Curves



The inequality indices for New Zealand in Table 3 may be compared with similar measures estimated for Australia. For example Creedy and Kalb (2006) estimate Atkinson indices for 'net income' (post-tax-and-transfer income), for 1997/98, similar to those in Table 3. For an adult-equivalence scale with α = 0.6 (close to the value used in Table 3) they obtain $A_Z(\varepsilon = 0.5) \approx 0.07$. Creedy *et al* (2008) provide estimates for 2003/04; they estimate $G_Z = 0.285$, $A_Z(\varepsilon = 0.2) = 0.027$, and $A_Z(\varepsilon = 0.5) \approx 0.06$.[23] These values compare to our New Zealand estimates of $G_Z = 0.336$, $A_Z(\varepsilon = 0.2) = 0.043$ and $A_Z(\varepsilon = 0.5) = 0.108$. Though differences in income definitions, equivalence scales etc make cross-country comparisons tricky, these measures tend to suggest that net incomes are more equally distributed in Australia than New Zealand.[24]

Sensitivity to Adult Equivalence Scales

The differences across columns in Table 3 suggest that the adult equivalence scale can be important in drawing a number of inequality conclusions. This subsection therefore considers sensitivity of the Gini and Atkinson indices to the particular scale adopted. Figure 4 shows the two indices for a range of values of α (the scale parameter) and three values of θ (the 'number of children' parameter): 0.4, 0.6 and 0.8. The profiles reveal a relatively 'flat' range around $\alpha =$ 0.6 - 0.7 where there is little sensitivity to the precise α value selected, but much more sensitivity at low

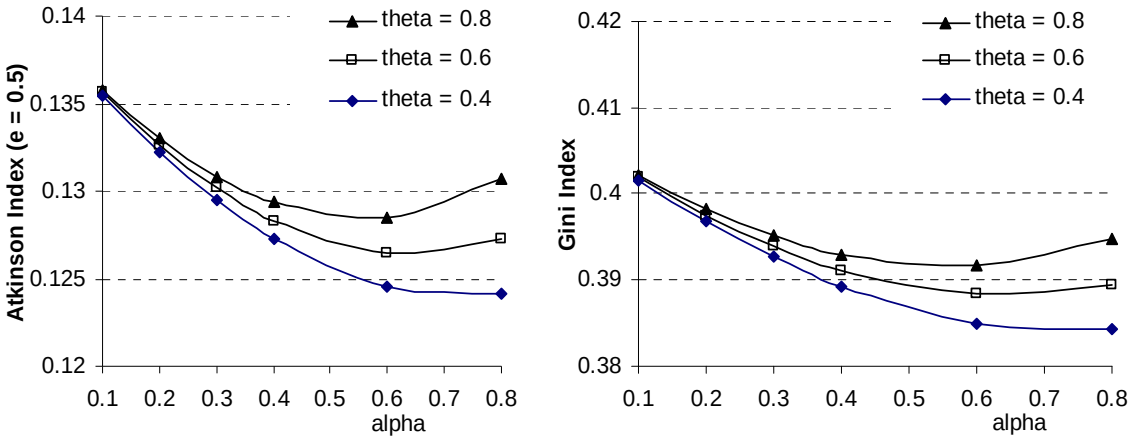
---

23 The $A_Z(\varepsilon = 0.5)$ value is inferred from other estimates.

24 Zhang and Formby (2003) and Formby *et al.* (2003) report comparable US evidence. Based on tax return data for individuals in 1995, Zhang and Formby report: $G_y = 0.52$; $G_W = 0.48$; K = 0.21; L = 0.035. Using family income data for 1996, Formby et al (2003) report lower values: $G_y = 0.36$; $G_W = 0.32$ (for an adult equivalence scale with $\alpha = \theta = 0.75$) and $G_y = 0.34$; $G_W = 0.30$ (for $\alpha = \theta = 0.5$).

values of α. Sensitivity to θ is greatest at higher α values: raising θ from 0.4 to 0.8, when α = 0.8, increases the Gini of gross income by around 0.01. To put this in perspective, the tax and transfer system as a whole reduces the concentration of gross income by around 0.06 ($G_Y - C_Z$ in Table 3, column 4). With commonly used values of α around 0.6-0.8, it is not perhaps surprising that, for income per adult-equivalent, inequality measures are relatively sensitive to changes in θ in Figure 4.

Figure 4 – Sensitivity to Adult Equivalence Scales



Redistributional Impact of Alternative Tax-Transfer Policies

This subsection reports the distributional impact of changes in a number of tax-transfer parameters. One issue of interest is, if a government wishes to maintain constant inequality, or achieve the maximum reduction in inequality for a given fiscal cost, which reforms best deliver those outcomes? Table 4 shows the Gini and Concentration indices of post-tax-and-transfer income under the 2006-07 system (using income per adult-equivalent person), for which G_Z = 0.335; C_Z = 0.332.[25]

Tax change scenario 1.1 in the table shows that an increase in the top MTR to 0.42 costs around -$360m (i.e. it raises revenue) and reduces C_Z by 0.003. This is more than reversed by raising the top rate threshold from $60k to $100k (see 1.2). However, comparing (1.2) and (1.3) shows that if the top threshold is first raised to $100k ($C_Z$ = 0.335), raising the top MTR to 0.42 then achieves negligible redistribution (-0.001). Alternatives 2, 3 and 4 show the impact of raising the other tax rates (0.33 to 0.36 or 0.21 to 0.22) at similar fiscal revenue gain, and raising the lowest rate of 0.15, to 0.17 (at slightly greater revenue gain). It can be seen that all three have minimal effect on the two inequality indices. On the other hand, raising the

[25] This analysis uses the simpler adult equivalence scale: α = 0.6, θ = 0.7. Similar results are obtained using a simpler inequality measure that focuses on the ratio of average income for the top 80% of incomes to average income for the bottom 20%.

main WfF rates by 20 per cent (with a fiscal cost of $680m) has a greater impact than raising the top MTR to 0.42.

Table 4 – Inequality Effects of Tax and Transfer Changes

No.	Tax change scenario	G_Z	C_Z	Fiscal cost, $m
	Status Quo: G_Y = 0.390	0.335	0.332	
1.1	39% rate to 42%	0.332	0.329	-356
1.2	39% rate to 42% & threshold: 60K to 100K	0.336	0.334	239
1.3	39% threshold: 60K to 100K only	0.338	0.335	397
2.	33% rate to 36%	0.333	0.331	-351
3.	21% rate to 22%	0.335	0.332	-367
4.	15% rate to 17%	0.336	0.333	-432
5.	FTC+IWTC levels raised by 20%	0.331	0.327	680

Effective Marginal Tax Rates

This section examines the range of effective marginal tax rates (EMTRs) associated with the NZ tax-transfer structure and considers the number and types of taxpayer subject to those rates. While these cannot identify efficiency costs, they can indicate where some of the incentives to adapt behaviour in response to existing or reformed tax levels are greatest.[26] To illustrate, Figures 5 and 6 show EMTRs and EATRs for secondary earners in a family with two children aged 5 and 3 years. Figure 5 shows EMTRs for secondary earners deciding to work an additional day per week (0 to 1 day; 1 to 2 days, 2 to 3 days, etc) based on an hourly rate of $15 per hour, where the primary earner is earning 67, 100 and 150 per cent of the average wage. The chart shows the EMTR associated with working an extra day per week: from 0 to 1; 1 to 2 and so on.

[26] Measurement of the efficiency effects of direct taxes, paying attention to population heterogeneity and the wide range of behavioural responses, requires the use of a behavioural tax microsimulation model, such as the Australian MITTS model; see Creedy et al. (2002) and Creedy and Kalb (2006).

Figure 5 – Effective Marginal Tax Rates for Primary and Secondary Earners

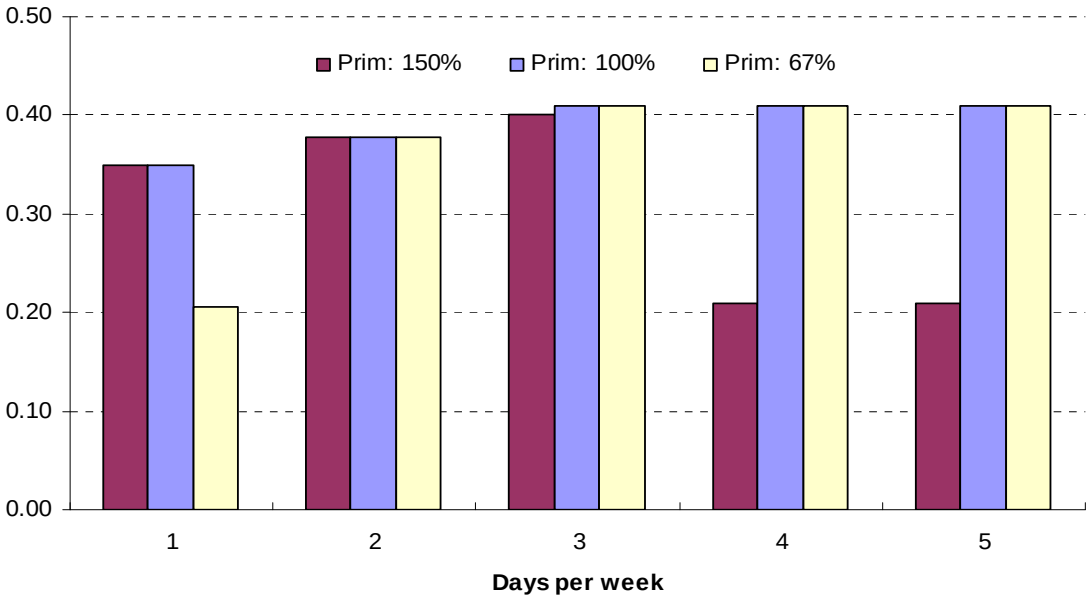
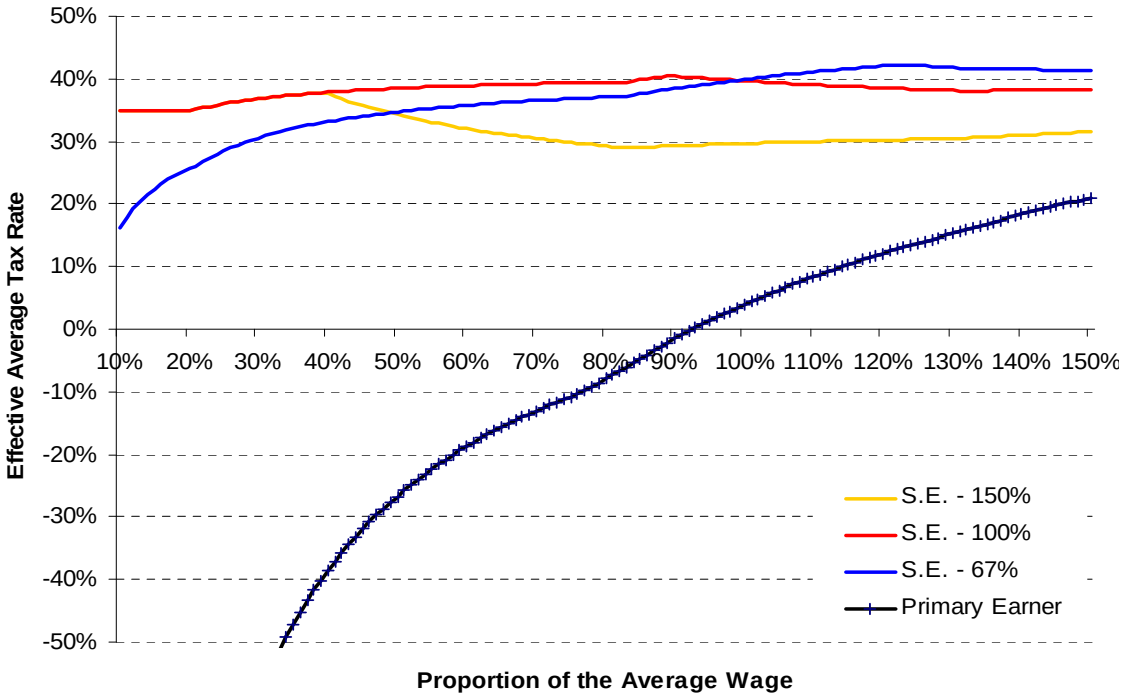


Figure 6 – Effective Average Tax Rates for Primary and Secondary Earners

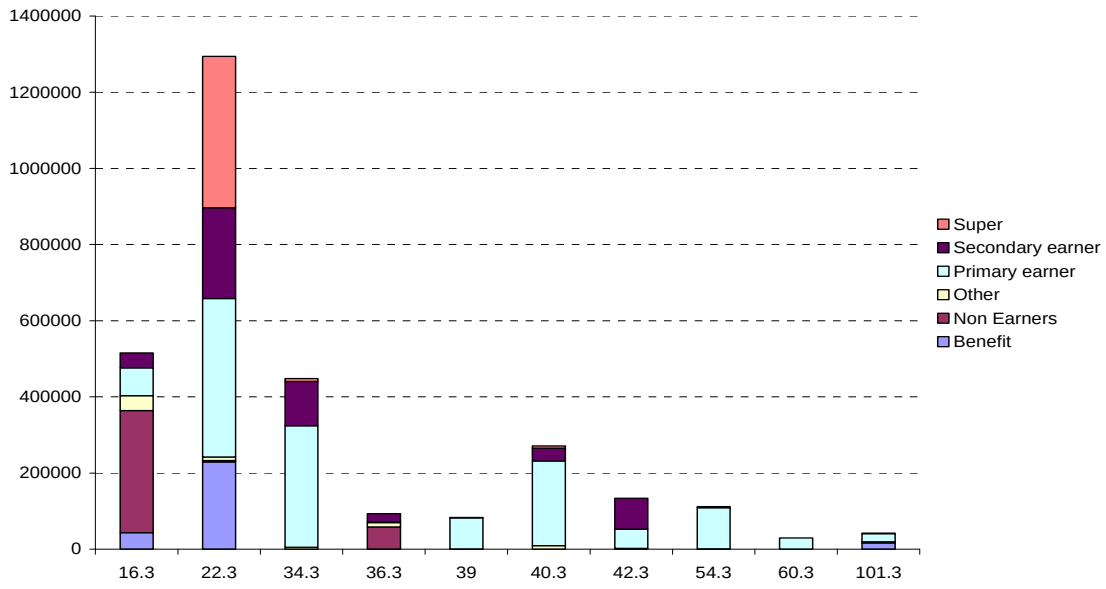


It can be seen that secondary EMTRs are typically between 35 and 41 per cent except where the primary earner is relatively highly paid or low paid. In the former case WfF has fully abated when the secondary earner works 4 days at the $15 wage rate. In the latter case, the combined income of the primary and secondary earner exceeds the WfF abatement threshold only when the secondary earner is working 1 full day per week.

Figure 6 shows EATRs for primary and secondary earners. These are likely to be more relevant than EMTRs for secondary non-earners considering entering the labour market. The Figure reveals that though average tax rates for primary earners are negative until he or she earns around the average wage, for secondary earners EATRs are typically in the 30-40 per cent range, depending on primary earners' wages.

Of course, the significance of these tax rates depends, in part, on the numbers of taxpayers for whom they are relevant. Figure 7 shows EMTRs affecting significant numbers of taxpayers, based on an analysis of HES data using *TaxWell*. These EMTRs represent the sum of the effective marginal income tax rate, the abatement of WfF (20 per cent), and the ACC levy (1.3 per cent). They do not include benefit abatement such as for unemployment. These data should be interpreted with caution; for example, the EMTRs shown for non-earners represent *TaxWell* assumptions regarding the wage that a non-earner would face should he or she decide to enter employment. The large numbers on an EMTR of 16.3 per cent reflect *TaxWell*'s assumption (which is unrealistic for many people) that those individuals would face the minimum wage if working.

Figure 7 – Numbers of Taxpayers by Type and EMTR



Despite this, some non-earners face an EMTR of 36.3 per cent because of WfF abatement. The addition of secondary to primary (and other) income is sufficient to cause WfF to abate.[27] Of particular interest is the fact that many of those facing lower EMTRs are beneficiaries or superannuitants, while many primary and secondary earners face EMTRs of 39 per cent or more. The data suggest that almost 40 per cent of primary earners (and over 20 per cent of secondary earners) face EMTRs of

[27] Where relevant, *TaxWell* implicitly assumes that WfF abates against primary earnings first and abates against secondary earnings only where primary earnings are insufficient.

39 per cent or more, even though the statutory 39 per cent tax rate affects only around 13 per cent of all earners.

The Composition of Low Income Taxpayers

This section examines individuals with low taxable incomes. One reason why this is likely to be of particular interest to governments is that those on low incomes are often targeted by tax policy aimed at reducing inequality or poverty. For example, New Zealand is unusual among OECD countries in taxing individuals' incomes from the first dollar rather than allowing an initial tax-free zone. By exempting low incomes from tax, such a zone is often presumed to reduce inequality. However, the analysis below suggests that, at least for New Zealand, it would probably be a poorly targeted instrument.

The analysis first identifies those individuals where low income is unlikely to indicate low economic welfare and/or their income is insensitive to tax policy changes (Group A). For the remainder (Group B), low incomes are likely to be a better indicator of economic wellbeing and are potentially affected by tax changes. The analysis suggests that the vast majority of individuals with low taxable income fall into Group A. This group can be further decomposed as follows:

A1. Disposable income is insensitive to tax changes at low income levels (for example, post-tax income is determined by a legislative formula);

A2. Low income individuals benefit from the income of others, or taxable income is quite different from an 'economic income' measure (for example, membership of a higher income household);

A3. Low taxable income is short-term only (for example, students).

Analysis of individuals

This subsection focuses on the 1.4 million individuals with taxable income below $18,000 per annum This is just below the income from working 30 hours per week at the minimum wage of $18,720. These low income individuals are allocated to one of eleven mutually exclusive categories based on key characteristics. Each category is then assessed to consider the extent to which low taxable income is likely to reflect low economic wellbeing and whether tax policy is a good redistributive instrument.

It would appear that up to 90 per cent could be characterised as those who receive social welfare payments and are therefore unaffected or less affected by tax design at low income levels (superannuitants and beneficiaries), or those relying on other economic or disposable income (self-employed, recipients of working for families, many secondary earners and 15-17 year olds) or those likely to have temporarily low taxable income (18-24 year olds and students). As in previous sections, *Taxwell* is applied to 2006/07 HES data to analyse information on income sources for each individual (for example, wages and salaries, self-employment) as well as their family

and household characteristics.[28] The eleven mutually exclusive categories to which individuals were allocated – to help identify whether they belong in Groups A or B above – are outlined below. The categories were selected sequentially from 1 to 11, with individuals allocated to categories in the order shown in Table 5.

Table 5 – Allocating Low Income Individuals to Groups

Category (all with taxable income < $18,000)	All or most in this Group	Some in this Group
1. New Zealand Superannuation	A1	
2. Core benefit recipient	A1	
3. Self employed	A2	B
4. Aged 15-17	A2	
5. Student	A3	A2
6. Secondary earner; family with taxable income more than $50,000	A2	
7. Family eligible for working for families tax credits	A2	
8. Aged 18-24 (excludes students)	A3	B
9. Majority of income is from non-taxable sources	A2	B
10. Secondary earner; family with taxable income less than $50,000	B	A3
11. Primary earner:	B	A3

Further details of the above eleven categories are as follows.

1. *New Zealand Superannuation (NZS) is the major source of income*. Tax changes at low incomes affect NZS in the short term only. In the medium term - between 1 to 3 years - tax changes at the average wage have the greatest impact on net NZS as a result of the legislative formula that involves annual CPI adjustments and requires the net married couple rate to be between 65 - 72.5 per cent of net ordinary-time weekly average earnings.[29] (Group A1)

2. *Core benefit is the major source of income*: Net-of-tax benefit rates are set in legislation. This means that tax changes which reduce tax paid on benefit income are

[28] Data limitations mean that some income sources could not be identified and were treated as non-taxable, while some taxpayers had very low incomes, including zero, that were difficult to explain. Our conclusions are not sensitive to those limitations.

[29] For the December 2007 quarter (the basis for the 1 April 2008 adjustment to NZS rates) ordinary-time weekly average earnings were $861.55, or $44,800 per annum.

compensated by an equivalent change in gross benefit payments to leave after-tax benefit payments unchanged. (Group A1)

3. *Self employment is the major source of income*: While reported taxable income from self employment might be low (and tax payable minimal), economic income will in many cases be much higher (e.g. business profits retained within a company, or losses used to offset personal income etc). Low taxable income may also be temporary.[30] Some self-employed will however experience low economic wellbeing associated with their low taxable income. (Most Group A2; some Group B).

4. *Aged 15-17*: Economic wellbeing for most 15-17 year olds is dependent on their parents' income. (Group A2).

5. *Students*: Students are most likely to have temporarily low income as they forego market income while engaged in study. Other policy instruments, rather than tax changes, provide better targeting to increase student income, such as increasing levels of student allowance and changes to student loan policy. (Most Group A3; possibly some Group A2).

6. *Secondary earner in a family with taxable income greater than $50,000*: Although family income of $50,000 might not be considered high, a secondary earner in such a family would enjoy higher economic wellbeing than suggested by their low taxable income. (Group A2).

7. *The family is eligible for working for families tax credits*: Families with low taxable income that receive working for families may pay little or negative amounts of tax. Individuals within this group do not receive benefits as a main income source but have family income of less than $50,000. While disposable income might be low, economic wellbeing can be increased through more targeted policy levers. (Group A2).

8. *Aged 18-24*: Low taxable income might be temporary for many, either reflecting recent entry into the workforce (i.e. part way through a year) or an expectation of higher future earnings. For some however low incomes will not be temporary and may reflect low economic wellbeing. (Most Group A3; some Group B).

9. *Majority of income is from non-taxable sources*: While taxable income is low, the majority of income is derived from other sources. In many cases this other income may be taxable but data limitations prevent it being classified as such.[31] (Most Group A2; some Group B).

10. *Secondary earner in a family with taxable income less than $50,000*: Individuals in this category are more likely to suffer low economic wellbeing associated with their

---

30 Inland Revenue data suggests that up to 40% of taxpayers with self employment as their main source of taxable income and who earned less than $18,000 in 2001, earned more than this amount in 2006.

31 The HES records a number of income types that we cannot distinguish and therefore cannot treat as taxable income. Examples include irregular income and some overseas pensions. It might be the case that such income is taxed. However, our results are not sensitive to the classification of this category which represents only 1-2% of the low income taxpayers.

low taxable income. They do not have children (so are not eligible for WfF) and are unlikely to be in full-time work. (Most Group B; some Group A3).

11. *Primary earners*: These individuals are most likely to face low economic wellbeing associated with low taxable income. They derive a majority of income from sources other than benefit, NZS and self-employment, and are not members of higher income households. Almost all individuals in this category with taxable income below $10,000 worked full-time (30 or more hours per week) for less than 6 months, with many not working at all. However, individuals entering the workforce (or country) part way through the year may fall within this category so low taxable income may be temporary, arising in the current survey period only.[32] (Most Group B; some Group A3).

The proportions of individuals with low taxable income within each category are shown in Figure 8: the category numbers shown (1 to 11) are those listed above. Hence group A1, comprising categories 1 and 2, form 39 per cent of taxpayers with income below $18,000 per year. Group A2, made up of categories 3, 4, 6, 7 and 9, form 19 per cent; and categories 5 and 8 which make up group A3, form 31 per cent.

Thus group B, comprising mainly categories 10 and 11, represents only up to 11 per cent - or around 164,000 individuals - where low taxable income may represent low economic wellbeing and tax may be an effective redistributive instrument. This number most likely represents an upper bound however, since individuals entering the workforce part of the way through the year would have low income for the survey period although many would subsequently be in full-time work. Also some individuals could be temporarily out of the workforce at the time of the survey; indeed a large proportion of those in category 11 worked for only a small part of the year. Conversely, some individuals within other categories, such as the self-employed and 18-24 year-olds, may face low economic wellbeing as a result of low taxable income. Unfortunately the data do not allow these groups to be decomposed further.

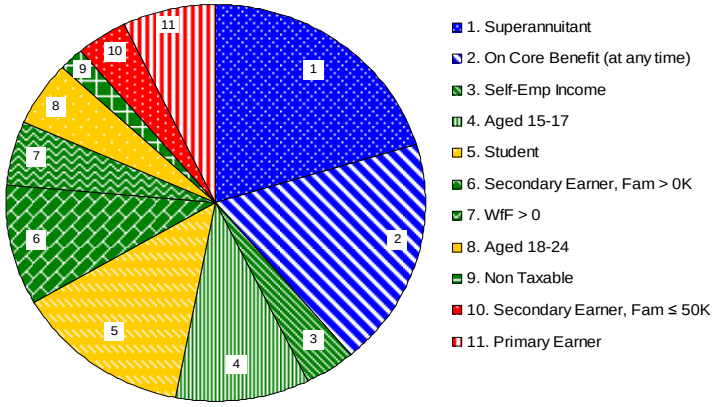
Therefore, while around 11 per cent of individuals falling within Group B might benefit especially from a tax cut on low incomes such as a tax-free zone compared to other policy options, for nearly 90 per cent of individuals earning less than $18,000 a tax-free zone would be poorly targeted. This is consistent with the conclusions of the 2001 *Tax Review*, which argued against a tax-free zone.[33]

---

[32] For example, consider a new migrant who has only been in New Zealand for six months prior to the HES survey being completed. While the migrant may have been in full-time work for those six months, their taxable income at the time of the survey will appear low.

[33] The *Tax Review* (2001, p. 60) concluded: 'Given that income is a poor indicator of need, proposals for a tax-free zone poorly target those in need and have large fiscal costs. These fiscal costs would raise marginal tax rates for most taxpayers.'

Figure 8 – Composition of Individuals with Incomes Below $18,000 p.a.



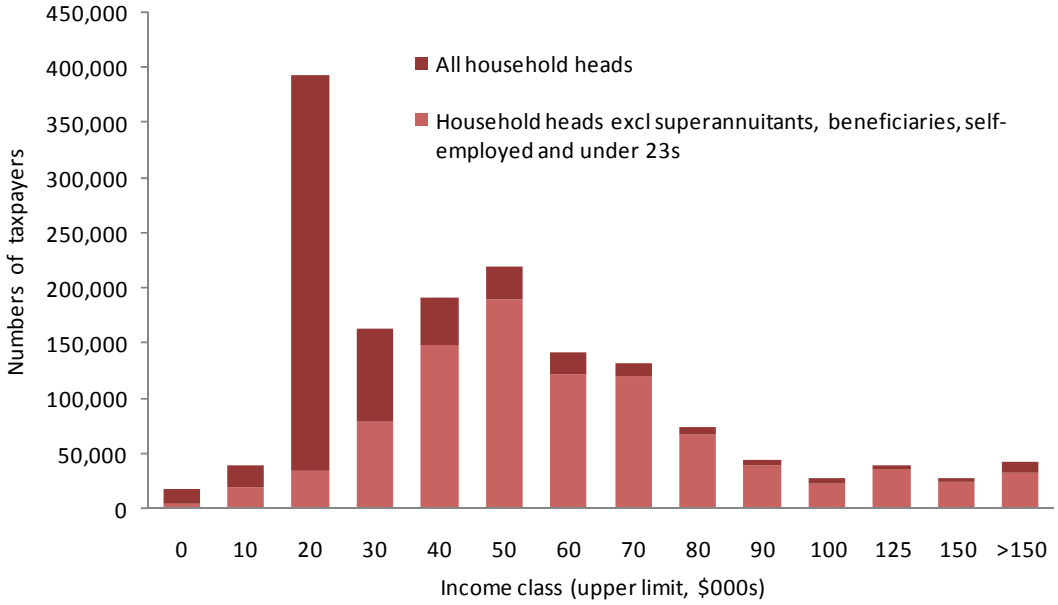
Analysis by Household

Having examined the characteristics of low-income individuals, it is also of interest to consider the extent to which the taxable incomes of heads of households might be considered a good measure of economic wellbeing. As with the analysis of individuals, if there are many heads of households for whom low taxable income may not reflect low economic wellbeing, income tax may be a poorly targeted redistributive instrument. This includes those receiving the majority of income from NZS, Core Benefit or from self-employment income; heads of households under 23 years or in receipt of student allowances; and those receiving a majority of their income from non-taxable sources. Remaining heads of household are those deriving income predominantly from wages and salaries, and would thus benefit most from reforms to income tax rates and thresholds.

Figure 9 shows the frequency distribution histogram of household heads at different taxable income levels. The 'lighter' bar component shows the numbers for whom it is estimated that taxable income is a good measure of economic wellbeing. That is, it excludes only those in receipt of income from NZS, Core Benefits, and so on (as mentioned in the previous paragraph). The large majority of heads of household, up to 650,000, earn between $20,000 and $70,000. For most of them, and those higher up the income scale, taxable incomes are generally a good measure of economic income.

By contrast, there are perhaps only about 60,000 heads of households with taxable incomes below $20,000 for whom this is a reasonable measure of their economic income. Personal income tax reforms, such as a tax-free zone, seeking to increase low household incomes would therefore be poorly targeted at this income range, and to a lesser extent, for those up to $30,000. Rather, most households affected would be in the $30,000 – $70,000 range.

Figure 9 – Heads of Households' Taxable Income



Conclusions

The paper has sought to make two contributions to the analysis of the equity and efficiency effects of tax policy in New Zealand. Firstly, it considered the available methodologies to measure tax redistribution and efficiency and has applied these to the New Zealand income tax and transfer system using Household Economic Survey data for 2006-07 and the Treasury microsimulation model, *TaxWell*. This is a non-behavioural model, and hence conclusions must be treated cautiously. Nevertheless it provides some information on the likely 'impact' effects of tax-transfer policy, and illustrates how using equity and efficiency measures of the impacts of taxes and social transfers can assist with the design and evaluation of income tax and transfer policy.

The Gini measure of inequality of gross (taxable) income was found to be 0.391 using adult-equivalent incomes as the unit of analysis. The tax and transfer system produces a distribution of post-tax-and-transfer income with a Gini that is lower by around 0.06 in absolute terms, or a 15 per cent reduction. In terms of the abbreviated social welfare function associated with the Gini measure, this is equivalent to a 9.5 per cent increase in arithmetic mean income. This would appear to result in a less equal distribution than is observed in Australia. It is important to recognise that these inequality measures require value judgements by the policy-maker or evaluator regarding their aversion to inequality as well as their view regarding the measure of wellbeing, or the welfare metric, to be used (including the choice of income unit and equivalent adult scales).

On the efficiency side, measures of tax efficiency tend to be either comprehensive, in allowing for the effects of distortions to behaviour, but difficult to calculate in practice (for example, excess burdens), or simple but partial and hence should be interpreted cautiously (for example EMTRs, which give an indication of one aspect of the

incentives facing individuals in making their labour supply decisions). The analysis of effective tax rates for New Zealand suggested that disincentive effects may be relatively high for large fractions of primary and secondary earners, though further analysis would require the use of a behavioural model.

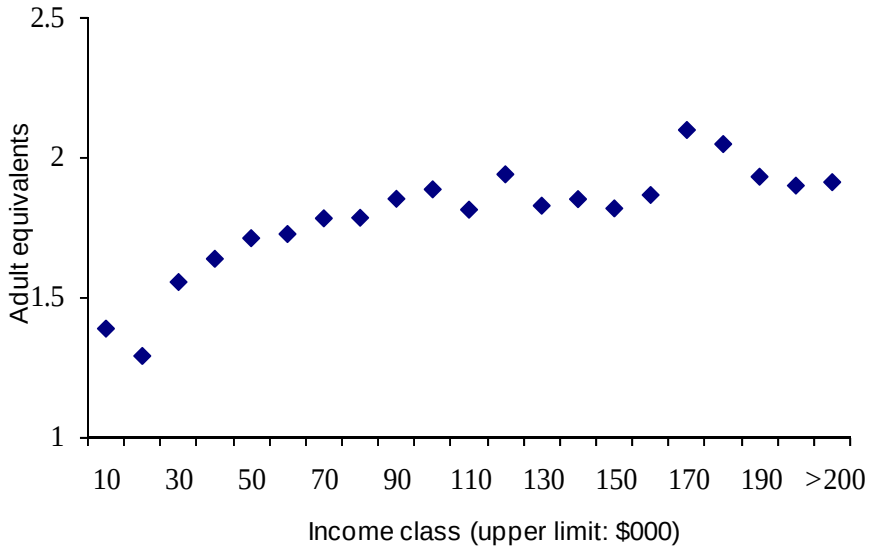
Finally, the paper has examined the characteristics of low-income taxpayers in New Zealand. A decomposition by individual and household characteristics shows that different low income taxpayers are likely to be affected quite differently by various aspects of the tax/transfer system. To help those most in economic need, tax-free zones appear less suited than positive initial tax rates or more targeted welfare measures.

Appendix: Adult-Equivalence Scales

This appendix shows the distribution of adult-equivalents across income bands within the distribution of household incomes. The adult equivalence scale used in the analysis in this paper was explained in sub-section 4.3, and is summarised by equation (13). Differences in household composition between higher and lower income households can give rise to differences in inequality measures when these are estimated with or without the use of an adult equivalence scale. For example, if lower income households tend systematically to have lower adult equivalents – because they have fewer adults and/or more children (who both receive a lower weight in the scale) – their adult-equivalent incomes will appear higher than they appear to be when measured without an adult-equivalence adjustment.

Figure 10 below shows adult-equivalents, averaged within ($1000) household income bands, estimated from 2006-07 HES data. These are calculated using the 'Jensen scale' described in sub-section 4.3. This reveals that lower income households do indeed tend to have lower adult-equivalents. As a result some of the inequality observed in per-adult household incomes can be expected to be reduced when inequality indices based on adult-equivalent incomes are used.

Figure 10 – Adult-Equivalents



References

Auerbach, A. J. (1985) The theory of excess burden and optimal taxation. In Handbook Of Public Economics, vol.1 (ed. by A. J. Auerbach and M. Feldstein), pp. 61-127. Amsterdam: Elsevier.

Bakker, A. and Creedy, J. (1999) Macroeconomic variables and income inequality in New Zealand: an exploration using conditional mixture distributions. *New Zealand Economic Papers*, 33, pp. 59-79.

Creedy, J. (1996) *Fiscal Policy and Social Welfare*. Cheltenham, UK: Edward Elgar.

Creedy, J. (1998) *Measuring Welfare Changes and Tax Burdens*. Cheltenham, UK: Edward Elgar.

Creedy, J. (2004) Labour supply incentives in alternative tax and transfer schemes: a diagrammatic introduction. *Australian Economic Review*, 37, pp. 230-241.

Creedy, J. and Kalb, G. (2006) *Labour Supply and Microsimulation*. The Evaluation of Tax Policy Reforms. Cheltenham, UK: Edward Elgar.

Creedy, J. and Sleeman C. (2005) Adult equivalence scales, inequality and poverty. *New Zealand Economic Papers*, 39, pp. 51-83.

Creedy, J. and Sleeman C. (2006) *The Distributional Effects of Indirect Taxes: Models and Applications from New Zealand*. Cheltenham, UK: Edward Elgar.

Creedy, J. and van de Ven, J. (2003) *Taxation, Reranking and Equivalence Scales*. New Zealand Treasury Working Paper 03/11.

Creedy, J., Hérault, N. and Kalb, G. (2008) *The Role of a Tax-free Threshold: Tax Policy Design and Simulating its Abolition in Australia*. Paper presented to the New Zealand Association of Economists Annual Conference, Wellington, 9-11 July 2008.

Creedy, J., Duncan, A.S., Scutella, R. and Harris, M. (2002) Microsimulation Modelling of Taxation and The Labour Market: The Melbourne Institute Tax and Transfer Simulator. Cheltenham, UK: Edward Elgar.

Diewert, E. and Lawrence, D. (1996) The deadweight costs of taxation in New Zealand, *Canadian Journal of Economics*, 29, pp. S658-S673.

Diewert, E. and Lawrence, D. (2001) *The Marginal Excess Burden of Capital Taxation in New Zealand*. Report prepared for The Treasury, New Zealand.

Formby, J.P., Bishop, J.A. and Kim, N (2003) Redistribution, welfare and equity effects of marriage tax penalties. In Y. Amiel and J.A. Bishop (eds) *Fiscal Policy, Inequality and Welfare. Research on Economic Inequality, Volume 10*, pp. 213-246.

Hyslop, D. and Mare, D. (2001) Understanding Changes in the Distribution of Household Incomes in New Zealand between 1983-86 and 1995-98. New Zealand Treasury Working Paper 01/21.

Inland Revenue Department (2005) *Briefing for the Incoming Minister of Revenue – 2005*. Wellington: New Zealand Inland Revenue.

Kakwani, N. C. (1977) Measurement of tax progressivity: an international comparison, *Economic Journal*, 87, pp. 71-80.

Kalb G. and Scutella, R. (2003) *New Zealand Labour Supply from 1991-2001: An Analysis Based on a Discrete Choice Structural Utility Model.* New Zealand Treasury Working Paper 03/23.

Lambert, P. (1993) *The Distribution and Redistribution of Income.* Manchester: Manchester University Press.

McLeod, R. and others (2001) *Tax Review 2001*. Wellington: New Zealand Treasury.

Zhang, Q. and Formby, J.P. (2003) Income tax progressivity in the United States: new evidence, 1969-1995. In Y. Amiel and J.A. Bishop (eds) *Fiscal Policy, Inequality and Welfare. Research on Economic Inequality, Volume 10*, pp.173-194.