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ABSTRACT

The Distributional Effects of Consumption Taxes in New Zealand

This paper investigates the distributional effects of the GST in New Zealand, and the case for the introduction of reduced rates to address distributional concerns. The analysis is based on a consumption tax micro-simulation model constructed using expenditure micro-data from the Household Economic Survey for 2012/13. The distributional effects of excise taxes on tobacco, alcohol and petrol are also considered. The paper finds that the lifetime distributional impact of the GST is either proportional or at worst slightly regressive. Excise taxes are also found to be roughly proportional or slightly regressive, though they are of far smaller magnitude than GST burdens. Simulation results show that the introduction of a European-style multi-rate GST system would have a progressive impact on overall GST burdens, but that such a reform would benefit richer households significantly more than poorer households in dollar terms. Given it is the overall progressivity of the tax system that matters, New Zealand's current approach of providing targeted support to poorer households via the Working for Families tax credit package can be seen as a far more cost effective way of supporting poorer households than the introduction of reduced GST rates for specific expenditure items.

Keywords: GST, VAT, excise taxes, consumption taxes, distributional effects

JEL Codes: H23, H24.

THE DISTRIBUTIONAL EFFECTS OF CONSUMPTION TAXES IN NEW ZEALAND

Alastair Thomas[1]

1. Introduction[2]

The New Zealand goods and services tax (GST) has long been held out by academics and policymakers as an example of best practise design of a value added tax system (see, for example, Cnossen, 2002). Its broad base and single rate structure minimises compliance and administrative costs, avoids distortions to consumption decisions, and at the same time raises significant revenue. Nevertheless, public concern is occasionally raised regarding the perceived regressivity of the GST, with consequent calls for the introduction of reduced rates of GST on basic necessities such as food and water supply to address these distributional concerns. This paper investigates the distributional effects of the GST, and the case for the introduction of reduced rates to address distributional concerns. Additionally, the distributional effects of excise taxes on tobacco, alcohol and petrol are considered. The analysis is based on a consumption tax micro-simulation model constructed using expenditure micro-data from the Household Economic Survey for 2012/13.[3]

Consistent with recent European studies (see, e.g., IFS, 2011), and with previous work with New Zealand data (New Zealand Treasury, 2009), the paper finds that the GST in New Zealand is highly regressive when measured as a percentage of current income across the income distribution, but roughly proportional when measured as a percentage of expenditure. Reflecting the fact that higher spending households spend a greater proportion of their total expenditure on the few items in the New Zealand system that are untaxed or exempt, the paper finds the GST to be slightly regressive when measured as a proportion of expenditure across the expenditure distribution. The paper argues that expenditure provides a better measure of the lifetime distributional impact of a consumption tax, and therefore concludes that the lifetime impact of the GST is either proportional or at worst slightly regressive. This suggests that public

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2 . This paper presents an extended version of the analysis undertaken for New Zealand as part of the 20-country study in OECD/KIPF (2014).

3 . Access to the data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in the study are the work of the author, not Statistics New Zealand. Particular thanks are due to John Upfold, Fiona Wharton and the staff of the Microdata Access Team at Statistics New Zealand for assistance with the Household Economic Survey micro-data.

concerns regarding a highly regressive GST are unwarranted. Excise taxes are also found to be roughly proportional or slightly regressive, though they are of far smaller magnitude than GST burdens.

Nevertheless, even a proportional GST may cause equity concerns (just as a proportional income tax may). For example, food and basic necessities will generally make up a greater proportion of the total expenditure of low spending households. As such, a proportional GST is more likely to constrain spending on necessities by the poor than by the rich. Such concerns can be addressed by the progressive income tax and/or benefit system. An alternative approach is to attempt to introduce some progressivity into the GST system through the use of zero or reduced rates, as has been attempted in most European countries.

To examine the merits of moving to a multi-rate system, the paper simulates the adoption of the UK's value-added tax rate structure on the New Zealand data. Results show that a move to such a European-style system with a narrow base (compared to New Zealand's current base) would have a progressive effect, lowering GST burdens proportionately more for poor households than for rich households. However, any progressivity gains are shown to come at a high fiscal cost as rich households also gain significantly from the reform.

Looking in more detail at the effects of reduced rates on specific expenditure items shows some reduced rates to be worse than others at providing support to the poor. Reduced rates typically introduced to support the poor – such as on food, water supply, electricity and heating fuels – would have a progressive impact on GST burdens if introduced in New Zealand, providing a proportionately greater benefit to poor households than to rich households. However, they would still be a very poorly targeted way of providing this support. At best they would provide at least as much benefit in aggregate terms to the rich as to the poor, but in general they would provide more – often significantly more – aggregate benefit to the rich than the poor. Some reduced rates – such as on natural gas and public transport – would be even less effective, providing only a roughly proportional, rather than progressive, impact. Meanwhile, reduced rates often introduced for non-distributional reasons, such as books and air travel would provide vastly more benefit to the rich, to the extent that they would actually have a regressive impact on GST burdens.

Given it is the overall progressivity of the tax system that matters, New Zealand's current approach of providing targeted support to poor households via the Working for Families tax credit package can be seen as a far more cost effective way of supporting poor households than the introduction of reduced GST rates for specific expenditure items.

The paper is structured as follows: Section 2 details the underlying micro-simulation methodology adopted in this paper. Section 3 discusses further the relative merits of measuring consumption tax burdens relative to current income or expenditure, before basic distributional results are then presented in section 4. Sections 5 and 6 present simulation results for a shift towards a multi-rate GST system. Concluding comments are provided in section 7.

2. Methodology

This section briefly outlines the consumption tax micro-simulation model developed for this paper, discussing first the data used, then the calculation of taxes and output of the model, and finally the underlying assumptions and limitations of the model.

Data

The micro-simulation model uses expenditure micro-data from the most recent (2012/13) New Zealand Household Economic Survey (HES) to model consumption taxes. The HES is a sample survey of households carried out every three years by Statistics New Zealand. It provides detailed information on household consumption expenditure on goods and services, and possession of durables. It also captures

various demographic characteristics of households. The sample size of the 2012/13 HES dataset is 3,002 households.

Calculation of taxes

The model simulates GST, as well as ad-quantum excise taxes on alcohol (beer, wine, spirits), tobacco (cigarettes, cigars, roll tobacco), and petrol. The model is constructed by matching expenditure from the HES data to its corresponding tax rates (GST and excise taxes). A micro-simulation program then calculates the amount of GST and excise taxes paid by each household by applying the tax rates to the corresponding expenditure amounts. Where excise taxes are levied, these are simulated first so that the base for the GST includes the excise tax amounts.

The model simulates two scenarios: one with the current tax rates (as of 1 January 2013), and one with "new" rates enabling estimation of the effect of a tax rate change on the consumption tax burden, both on individual households and in aggregate. To obtain aggregate revenue figures, the taxes paid by each household are adjusted according to population weights and then aggregated. However, the model underestimates the consumption tax revenue actually collected in 2012/13.

There are four main reasons for this inaccuracy: first, the underlying quality of the micro-data results in expenditure often being underestimated (and underestimated to different extents across expenditure types). Second, some inaccuracy arises from the imperfect application of GST and excise rates to expenditure categories in the HES data (this is discussed in more detail below). Third, fraud is not simulated, resulting in some overestimation of revenue. Finally, only consumption taxes paid by households are simulated – meaning that GST paid by the public sector, charities and businesses is not accounted for. As businesses can be expected to pass on the GST to the final consumer this is generally not a problem. However, annual revenue figures may include some GST paid by businesses that has not yet been passed on to the consumer (and not yet claimed back by the business) and this GST will not be simulated by the model.

Assumptions and limitations

The microsimulation modeling and resulting analysis are based on a number of assumptions and have several limitations. These are discussed below.

Tax incidence

The modelling makes the assumption that GST and excise taxes are borne entirely by the final consumer. This is a standard assumption made in most similar studies (see, e.g. IFS, 2011; Leahy, Lyons and Tol, 2011; Decoster et al., 2010). However, it should be noted that GST and excises may in some cases be less than fully (or even more than fully) passed on to consumers.[4]

Behavioural responses

The model assumes there are no behavioural responses when simulating changes in tax rates. An implication of this is that, for a GST rate increase (decrease), consumers spend more (less) money post-reform than pre-reform. For the analysis of the distributional effects of the current system this is not an issue. However, by not incorporating behavioural responses, the modelling of large changes in consumption tax rates – as in sections five and six – may result in some inaccuracy. The simulation results should therefore be considered as indicative of patterns rather than precise values. One alternative to

4 . See IHS (2011) for a detailed discussion of the theoretical and empirical literature.

assuming no behavioural responses would be to estimate behavioural elasticities based on a demand system.[5] Such an extension, however, is left for future work.

Income data

Results based on household expenditure survey income data at low income levels may be misleading due to the presence of households with transitorily low income (Bozio et al., 2012; Decoster et al., 2010).[6] For example, many self-employed workers may have low income levels at certain stages of their businesses' development, but will continue to have unaltered (high) expenditure. Alternatively, some households may be drawing down savings to fund their consumption. In either case it is likely to be misleading to consider them "low-income" households for distributional analysis.

To mitigate this concern, we exclude households from the analysis where:

- the household reports negative or zero income; and/or
- the household has an expenditure-to-income ratio of four or greater.

Durable goods

Modelling consumer durables poses a problem as these are infrequent purchases and the HES data only provides a snapshot of expenditure. For example, a car is likely to be owned for several years before being replaced, so it would be relatively arbitrary whether or not a car was purchased in the survey period (and therefore was included as expenditure). Ideally, we would want to apportion the cost of durables over their useful life in order to reduce any overstatement of expenditure for households that have undertaken such purchases during the survey period (or any understatement for households that made such purchases outside the survey period). However, this would require accurate information on length of ownership and expenditure on durables (both purchased within and outside the survey period), and is therefore not a feasible option.

On the other hand, not modeling durables would underestimate consumption and tax revenue significantly. We therefore include consumer durables (with the exception of housing – for which no data is available in the HES) in the modeling. Given that the basis of the analysis is the presentation of averages across decile groupings, we are effectively making the assumption that, within each decile group, the number of households that purchase durables in that period, and the number that do not, will "average out" – thereby reflecting approximately the same expenditure for that decile as would be modeled if we were able to apportion the expenditure across the useful life of the durable.

GST exemptions

In the modeling, GST exemptions are simulated as zero rates. Because some revenue is collected through the GST embedded in the price of exempt goods and services (due to the inability to claim input tax credits), this assumption may also result in some underestimation of actual GST revenue. Input-output table analysis could be used to estimate this embedded tax. However, such an exercise is beyond the scope of this paper.

5 . Such elasticity estimates were, for example, estimated for New Zealand using 1995-2001 HES data by Creedy and Sleeman (2006).

6 . The reliability of income data is an issue across all income levels. Previous studies (e.g. Decoster et al., 2010) suggest that income is generally under-reported to at least some extent in household budget surveys. There is also evidence to suggest that income may tend to be under-reported to a greater extent for some income sources (e.g. self-employment income) than others (see, for example, Hurst et al., 2014).

Excise duties

Excise duties pose a modelling difficulty as they are based on quantity rather than value (i.e. ad-quantum rather than ad-valorem). In the absence of quantity data, we use average prices (provided by Statistics New Zealand) for each product to estimate quantities from the HES expenditure data in order to simulate these taxes.[7] Expenditure data is available for both on- and off-license expenditure on alcohol so that excise taxes on alcohol consumed in restaurants and bars can also be modelled. Separate average price figures were obtained for on- and off-license alcohol.

Assuming both average prices and expenditure information are accurate, aggregate tax figures will also be accurate under the above approach. However, some inaccuracy may result at the individual level. Specifically, for households that consume products that are more (less) expensive than average we will simulate higher (lower) taxes than they actually pay because we will be assuming that they consume higher (lower) quantities than they actually do.

Several additional assumptions are necessary. As alcohol is taxed at different rates depending on strength, we assume that all beer has greater than 2.5% alcohol content; all wine has between 9-14% alcohol content; and all spirits have greater than 14% alcohol content. Additionally, the tobacco content of cigarettes is assumed to be less than 0.8kg per 1,000 cigarettes.[8]

3. Base of analysis: income vs. expenditure

A problem immediately encountered when working with expenditure microdata to examine the distributional effects of consumption taxes is that the conclusions drawn are strongly driven by whether the author chooses to present consumption tax burdens relative to current income or expenditure. For example, the often-made conclusion that the GST (or "VAT" as it is referred in European countries) is a regressive tax follows from the analysis of GST/VAT burdens measured as a percentage of current income across the income distribution. Numerous European country studies (see, e.g. Leahy, Lyons and Tol, 2011; Ruiz and Trannoy, 2008; O'Donoghue et al., 2004) adopt this analytical approach, and as a result conclude the GST/VAT is a highly regressive tax. In contrast, studies that present GST/VAT burdens as a proportion of current expenditure across either the income or expenditure distribution (see, e.g. IFS, 2011; Metcalf, 1994) find that GST/VAT systems are relatively proportional, or even slightly progressive.[9]

The key point to note, as has been highlighted by various authors (e.g. IFS, 2011; Creedy, 1998; Caspersen and Metcalf, 1994) is that this common regressive result is driven by savings behaviour, not the inherent nature of the tax. Consider the broad-based single-rate GST in New Zealand: in the absence of savings, we could expect high-income and low-income households to pay relatively similar proportions of their income in tax. But the picture changes when households do borrow and save. As is shown in figure 1, savings rates tend to increase with income (with low-income households being net borrowers and high-income households net savers, on average). This means that higher income households will tend to have proportionately less of their income subject to GST (in the current period) than lower income households, resulting in high-income households paying less GST as a percentage of current income than low-income

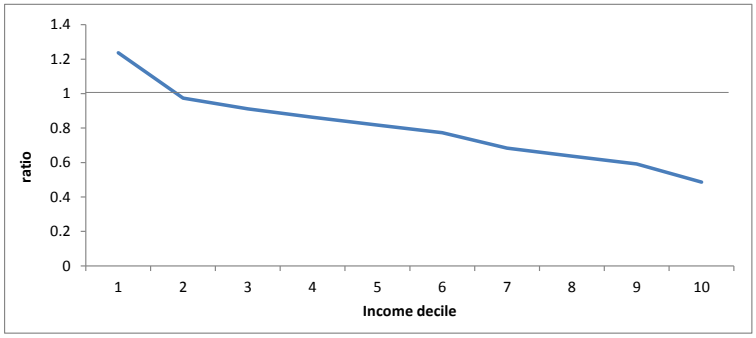
7 . Taking the monetary expenditure as a starting point, this is divided by the average price to obtain an estimate of the quantity purchased. The ad-quantum rate is then applied to this estimated quantity to estimate the tax paid.

8 . Note that alcohol is also subject to a small levy paid to the Alcohol Advisory Council of New Zealand. This hypothecated levy is not included in the modelling.

9 . See Warren (2008) for a review of different approaches to examining the distributional effects of consumption taxes

households. This savings pattern is an OECD-wide trend[10] – hence the regressive results of income based studies.

Figure 1: Expenditure-to-income: New Zealand (2012-13)



Source: 2012-13 New Zealand Household Economic Survey

However, analysis based on current income ignores the fact that the income that is saved by households in the current period will still be spent, and thereby incur GST in the future[11], or is being used to pay back debt-funded previous expenditure that has already incurred GST. Likewise, part of the current year's GST burden may relate to income that was earned in a previous year, but saved and only consumed now, or relate to future earnings that have been borrowed against.[12] This time inconsistency of income and its associated tax burden suggests that current income is not an appropriate base for distributional analysis, and that a lifetime analysis is necessary to fully assess the distributional effect of a consumption tax.[13]

The practical problem faced, and reason why so many studies have focused on current income, is that it is an exceptionally difficult task to estimate either lifetime tax burdens or lifetime income.[14] The appropriate question then is whether current income or current expenditure is the best available proxy for lifetime income.

The choice between current income and current expenditure is actually a slightly more complicated issue, because, as IFS (2011) point out, we need to consider it in two contexts: first, we need to rank households from lifetime poor to lifetime rich; and second, we need to measure the relative magnitude of the tax faced by each household.

10 . See OECD/KIPF (2014).

11 . In NPV terms, the future GST will be equivalent to the GST on immediate consumption, assuming tax rates and bases stay the same over time, and savings are not taxed. If savings are taxed, income saved may incur higher taxation than income immediately spent. Expenditure patterns may also change over time and, if this involved a shift towards less or more heavily taxed goods, then this would also alter the NPV of the future GST payments.

12 . Income could also be received or given in the form of a bequest, which when spent will also incur GST. In a lifetime context, we would include bequests received in the lifetime resources of the recipient, and correspondingly exclude bequests given from the lifetime resources of the giver.

13 . Ideally we would present lifetime consumption tax burdens, measured as a percentage of lifetime income, across lifetime income deciles.

14 . Though not impossible, see, for example, Fullerton and Rogers (1993) who estimate lifetime tax burdens and incomes. Caspersen and Metcalf (1994) estimate lifetime income and compare this with simulated VAT based on current expenditure data.

Income vs. expenditure distribution

With regard to ranking households from poor to rich, there is an arguable case for measuring tax burdens across both the income and expenditure distributions. For households that are not saving or borrowing, either measure is likely to be a reasonable proxy for lifetime income, and hence a reasonable means of ranking households. However, for households that borrow or save, income will be a better estimate of lifetime income for some households and expenditure a better estimate for other households. To see this, consider four stylised households engaging in borrowing/savings:

- *Life-time rich, low current income, high current expenditure:* while many low- (current) income households will be lifetime poor households, some (e.g. students, self-employed, retirees drawing down savings) will actually have much higher lifetime incomes. These households may be spending more than they currently earn and paying higher GST as a result. Such households are not likely to pose as large a distributional concern to governments as the lifetime poor, yet ranking by current income will do so. Current expenditure will therefore be a better ranking method.

- *Life-time rich, high current income, low current expenditure:* for households with middle and higher lifetime income levels that are currently saving a significant portion of their income (e.g. for retirement, or for their children's education), ranking them by their expenditure will imply they are less well off than they in fact are. Current income in this case will be a better ranking method.

- *Life-time poor, low current income, high current expenditure:* some lower income households may be living beyond their long-term means. However, such high expenditure will not be sustainable, and they will eventually have to reduce their expenditure to pay back the debt they are currently incurring. Ranking them by their expenditure will consequently overestimate their lifetime living standard. Current income will therefore be a better ranking method.

- *Life-time poor, high current income, low current expenditure:* some households may temporarily be earning above their lifetime income level and be saving in expectation of a future fall in income (e.g. with the expectation of one partner leaving the workforce to care for children). Ranking by current income will therefore overestimate their long term living standard. Expenditure will be a better ranking method.

Given the ambiguity illustrated above as to the best means of ranking different households, we adopt the approach taken by IFS (2011) and present results across both income and expenditure distributions in the subsequent sections of this paper.

Income vs. expenditure base

With regard to the appropriate base for determining the relative magnitude of the tax, the case for preferring expenditure is clearer. Indeed, even when current income is a better proxy for lifetime income, it will still be better to use expenditure as the base of the tax calculation. Consider, again, the same four stylised borrowing/saving households as above:

- *Life-time rich, low current income, high current expenditure:* measuring the tax burden on transitorily low-income households relative to current (low) income will overestimate the magnitude of the tax burden relative to their higher lifetime income. Instead higher current expenditure will be a better base for assessing the lifetime impact of the tax on this household.

- *Life-time rich, high current income, low current expenditure:* in contrast, measuring the tax burden on middle and higher income savers relative to current income will underestimate the magnitude of the tax burden relative to their lifetime income – even though income remains a better estimate of their lifetime income. This is because the reduced level of current expenditure also reduces the amount of tax currently paid. Measuring the temporarily lower GST burden relative to temporarily lower expenditure will better reflect the lifetime impact of the tax on the household.

  For example, consider a household with annualised lifetime income of NZD 100,000 that is currently saving for retirement and only spending NZD 50,000 per year. If we assume a GST rate of 10%, they will pay GST of NZD 5,000 this year. GST measured as a percentage of current income is 5%, while GST as a percentage of expenditure is 10%. It is the 10% figure that better reflects the long-run magnitude of the GST burden on this household. That is, over their lifetime they will earn, on average, NZD 100,000 per year, and will pay 10% – not 5% – of this in GST.

- *Life-time poor, low current income, high current expenditure:* measuring the tax burden relative to current (low) income will overestimate the magnitude of the tax burden relative to their (low) lifetime income – even though, as above, current income remains a better proxy for lifetime income. This is because they will eventually have to reduce their expenditure to pay back the debt they are currently incurring, thereby reducing their long term GST burden also. Measuring the temporarily higher GST burden against temporarily higher expenditure will better reflect the lifetime impact of the tax on the household.

- *Life-time poor, high current income, low current expenditure:* again, measuring the tax burden on transitorily high-income households relative to current (high) income will underestimate the magnitude of the tax burden relative to their lower lifetime income. Instead, lower current expenditure will be a better base for assessing the lifetime impact of the tax on this household.

It should be borne in mind that there are still potential rationales for using income as the base: most obviously, it is the base against which income taxes are assessed and therefore enables the aggregation of income and consumption taxes in distributional analysis.[15] Nevertheless, while we present overall tax burden results as a percentage of both income and expenditure, in our view, the arguments for using expenditure as the base are stronger, and this will be the main focus of the analysis and conclusions drawn in this paper.

As already noted, papers analysing GST/VAT as a proportion of expenditure unsurprisingly show countries GST/VAT systems to be roughly proportional or even slightly progressive, depending on the country. However, this does not necessarily mean they are fair. Assuming diminishing utility of consumption, a proportional tax will still have a greater negative impact on the welfare of the poor than of the rich.[16] At the extreme, it may reduce the consumption of necessities by the poor, but just reduce the consumption of luxuries by the rich. A proportional tax may also have a greater welfare cost on credit constrained households than on those with full access to finance. However, these are not reasons to consider a consumption tax regressive. Rather, they are reasons to consider increasing the progressivity of the tax/benefit system as a whole (whether that progressivity is introduced through consumption taxes,

15 . And, of course, it is the distributional effect of the tax (and benefit) system as a whole that we should be most concerned with. However, again, such an aggregation of effective rates could lead to misleading conclusions regarding the long run distributional effects of the tax system as a whole.

16 . Creedy and Sleeman (2006) examine the welfare effects of consumption taxation in New Zealand. Ball, Creedy and Ryan (2014) examine the welfare effects of zero-rating food in New Zealand.

income taxes, or the benefit system). The ability of the GST to provide such progressivity is the focus of sections 5 and 6 of this paper.

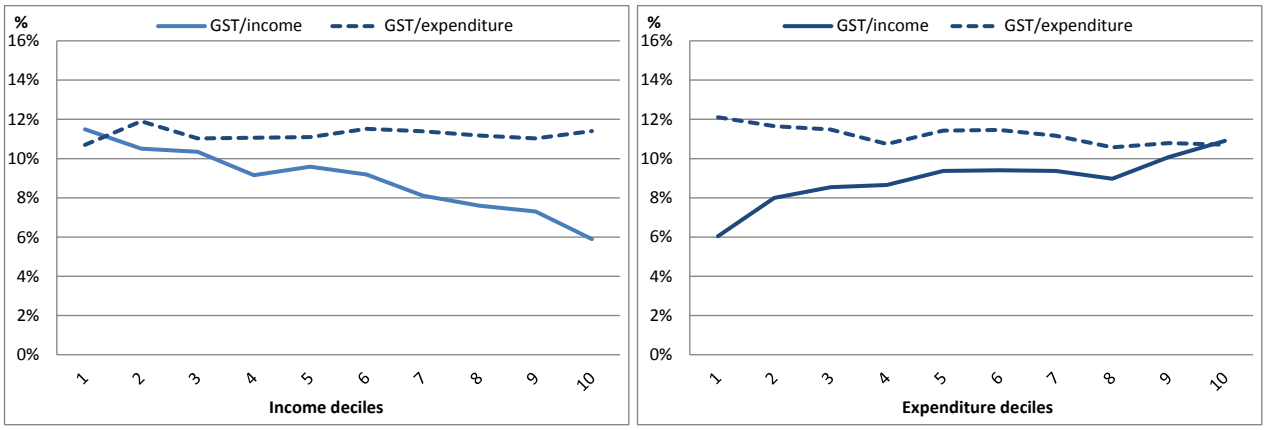
4. Distributional impact of the current system

This section presents basic distributional results from the microsimulation model. The overall distributional picture is first presented, with average household[17] GST, excise tax, and total consumption tax burdens reported separately across both income and expenditure distributions, before results across various demographic factors are presented. While a graphical exposition of the results is favoured below, the results are also presented in tabular form in Annex A.

GST

Figure 2 presents the basic results for GST. The left hand panel presents the average GST burden borne by households as a percentage of disposable income and as a percentage of pre-tax expenditure, respectively, across equivalised disposable income deciles.[18] The right hand panel presents the same results across equivalised pre-tax expenditure deciles.

Figure 2: Average GST burdens per household



Looking first across equivalised income deciles, the GST – as expected – looks highly regressive when the base is income, and roughly proportional when expenditure is the base. As noted earlier, these two results are consistent with other studies, with the difference between the two results being driven by savings behavior.

The story changes when looking across the expenditure distribution. As a percentage of income, the GST now looks progressive. However, this result is once again driven by the misleading effect of savings behaviour: at low expenditure levels, households tend to be net savers, so GST as a percentage of income appears relatively low. Meanwhile, because high expenditure households tend to be net borrowers, GST as

17 . The unit of analysis is the household, not the individual. While there is the same number of households in each decile, the total number of individuals will differ across deciles.

18 . Equivalisation – to take account of differing levels of need – is based on the OECD-modified scale. This scale gives a weighting of 1 to the first adult household member, 0.5 to the second and additional household members aged 14 and over, and 0.3 to each child under 14. Gross income or pre-tax expenditure is divided by the total household weight to determine the household's "equivalised" income or expenditure. Alternative scales adjusting for both need and economies of scale may affect results in a not insignificant way. Sensitivity of results to differing equivalisation measures is left for future work.

a percentage of income appears relatively high. In contrast, when measured as a percentage of expenditure – which excludes the influence of borrowing and saving – the GST appears slightly regressive.

Focusing on the expenditure-base results, we can conclude that the GST in New Zealand is either roughly proportional or slightly regressive. Given the broad base and single rate structure of the GST, it is no surprise that it would look close to proportional across the income distribution. However, the slight regressivity of the GST across the expenditure distribution does provide the interesting insight that higher spending households spend a greater proportion of their total expenditure than lower spending households on items that are either untaxed or exempt from tax (for example, financial services, and international air transport).

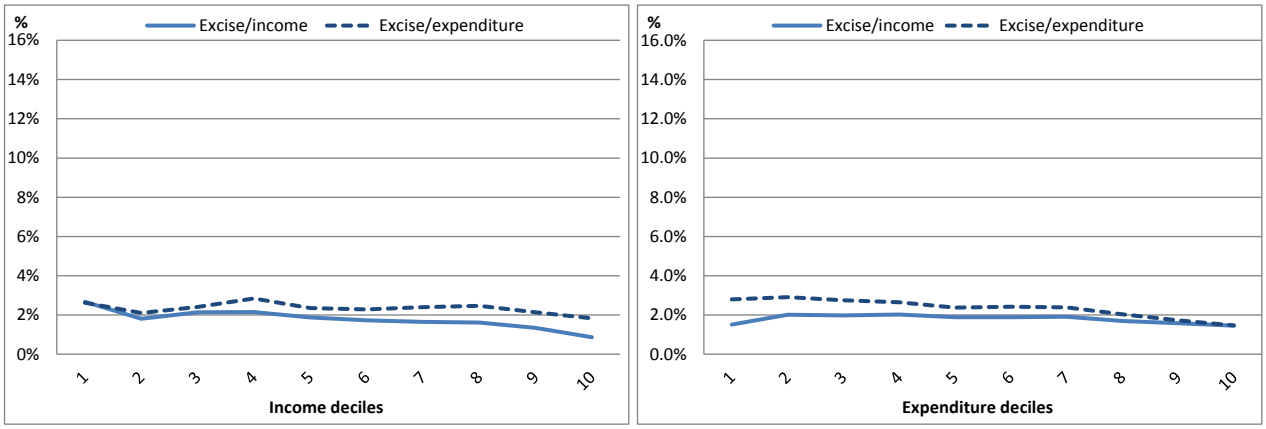
It should, however, be borne in mind that there will be some GST embedded in the production chain of exempted goods that is not captured in the modelling, but – to the extent that it is passed on into consumer prices – will be borne by workers. And this is likely to reduce the degree of regressivity shown in Figure 2. Nevertheless it still appears reasonable to conclude that the GST in New Zealand is roughly proportional or just slightly regressive.

This result contrasts slightly with available results for most other countries, which tend to find the GST/VAT to be either proportional or slightly progressive when measured as a percentage of expenditure. However, such results are driven by the presence of reduced rates on expenditure items consumed in greater proportions by lower spending households (see, e.g., OECD/KIPF, 2014; IFS, 2011).

Excise taxes

Figure 3 presents the basic results for excise taxes on alcohol, tobacco and transport fuels.[19] In comparison to GST, the magnitudes are far lower, reflecting the lower levels of expenditure on goods subject to excise taxes. Results are more consistent across all four measures showing a roughly proportional or slightly regressive pattern.

Figure 3: Average excise tax burdens per household



The results when measured as a percentage of income across income deciles appear more regressive than when measured as a percentage of expenditure. Equally, results measured as a percentage of income across expenditure deciles are less regressive (they appear roughly proportional in fact) than when measured as a percentage of expenditure. This implies that some of the influence of savings behaviour on

19 . As diesel vehicles are taxed under a road user charge system rather than through excise taxation, the resulting tax burden is not captured in the modelling.

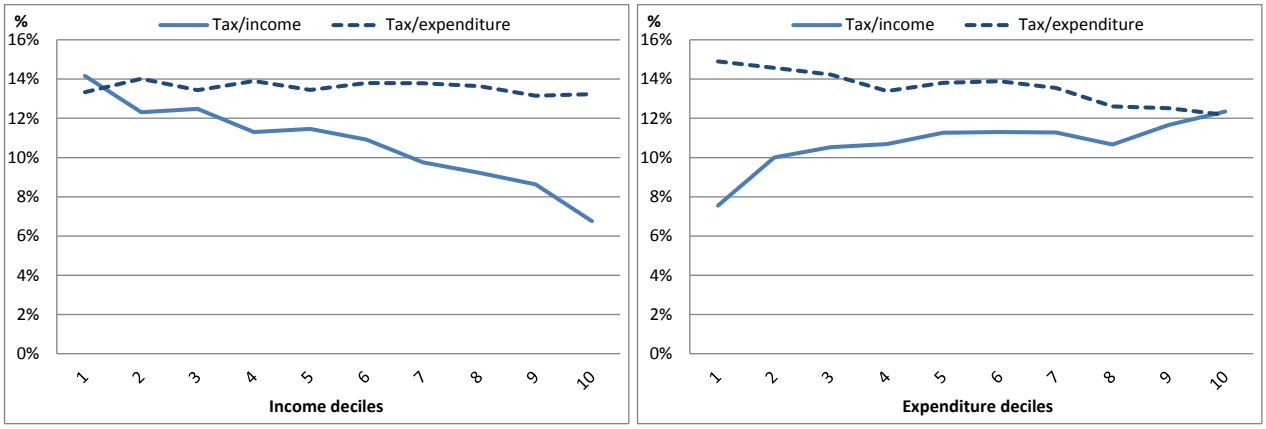
GST burdens is also reflected in excise tax burdens, though to a lesser extent given the less direct relationship between total expenditure and excise tax burdens as compared to GST burdens.

Irrespective of any distorting effect due to savings behaviour, it is perhaps slightly surprising that the results are not more regressive, particularly given the addictive nature of alcohol and tobacco (suggesting a similar quantity will be consumed irrespective of income/total expenditure). Part of the explanation may relate to the influence of transport fuels on the overall results – with poorer households being less likely to own, let alone drive, a car.[20]

Total consumption taxes

Figure 4 presents the combined results for both GST and excise taxes. Given the lower magnitude of excise taxes than GST, they have only a relatively small impact on the overall trends for consumption taxes, which as a whole still largely exhibit the trends of the GST. That said, the slight regressive trend as a proportion of expenditure across expenditure deciles has clearly increased with the combined effects of both GST and excise taxes. However, in comparison to the strongly regressive picture presented as a percentage of income across income deciles, the expenditure-based regressive pattern is still relatively small. Meanwhile, across income deciles, the expenditure-based pattern remains roughly proportional. Overall, therefore, we can conclude that the total consumption tax burden is either roughly proportional or at worst exhibits a small degree of regressivity.

Figure 4: Average total consumption tax burdens per household



Demographics

Figure 5 presents the household average tax burden results across household type, as a percentage of gross income (left panel) and as a percentage of pre-tax expenditure (right panel). For both income and expenditure bases, average tax burdens tend to be highest for households without children. Average tax burdens are lowest meanwhile for single parent households, particularly when measured as a percentage of expenditure. One possibility for this lower relative tax burden when measured as a percentage of expenditure rather than income is that such generally low-income households may borrow to pay a large proportion of their expenditure (but smaller proportion of their income) on untaxed expenditure items such as rental accommodation.

20 . Future work will examine in more detail the distributional effects of excise taxes on energy products in New Zealand. See Flues and Thomas (2015) for an examination of the distributional effects of excise taxes on energy products in 21 OECD countries.

Figure 5: Average total consumption tax burdens by household type

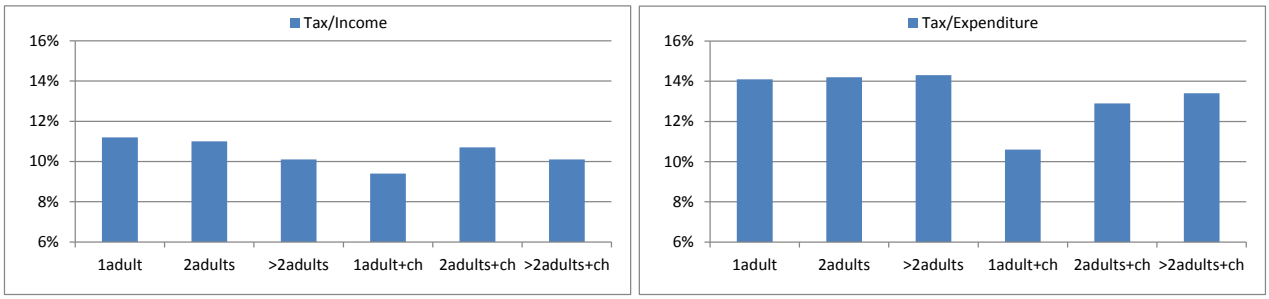
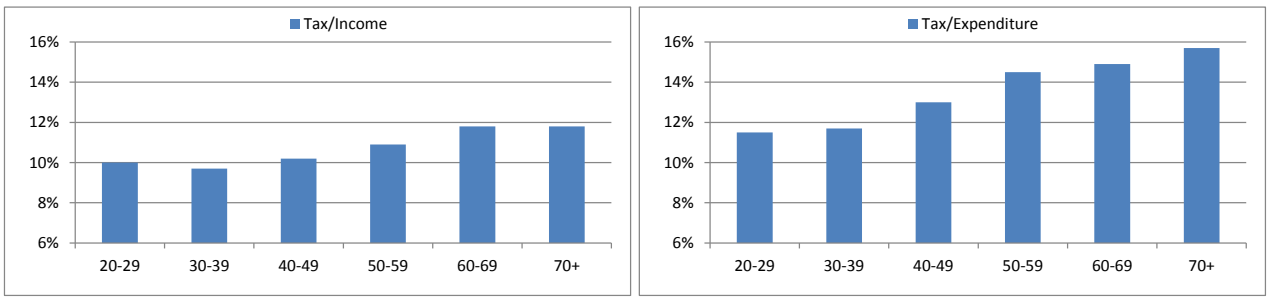


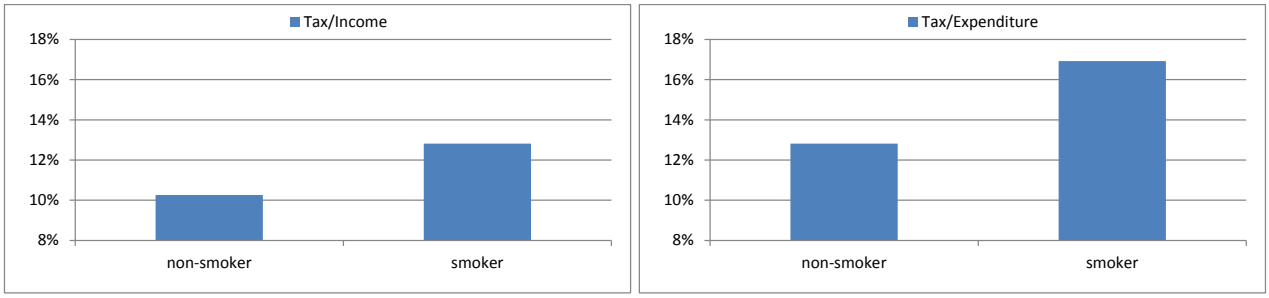
Figure 6 now presents household average tax burdens across age groups. Across both income and expenditure bases, average tax burdens increase with age (with the slight exception of the two youngest age groups on the left hand panel). As pointed out by New Zealand Treasury (2009), this result is likely due to untaxed housing expenses constituting a falling proportion of income (and expenditure) as age increases.[21]

Figure 6: Average total consumption tax burdens by age of household head



Finally, figure 7 compares household average tax burdens for smokers and non-smokers. Unsurprisingly, smokers face significantly higher tax burdens, irrespective of base, due to the higher excise tax burdens they face.

Figure 7: Average total consumption tax burdens for smokers and non-smokers



5. A multi-rate GST in New Zealand?

To consider the distributional effects of adopting a multi-rate GST system in New Zealand, we simulate the adoption of the UK's VAT rate structure. The UK provides a useful example of the VAT structure of a typical European country with a large number of reduced rates and exemptions. The standard

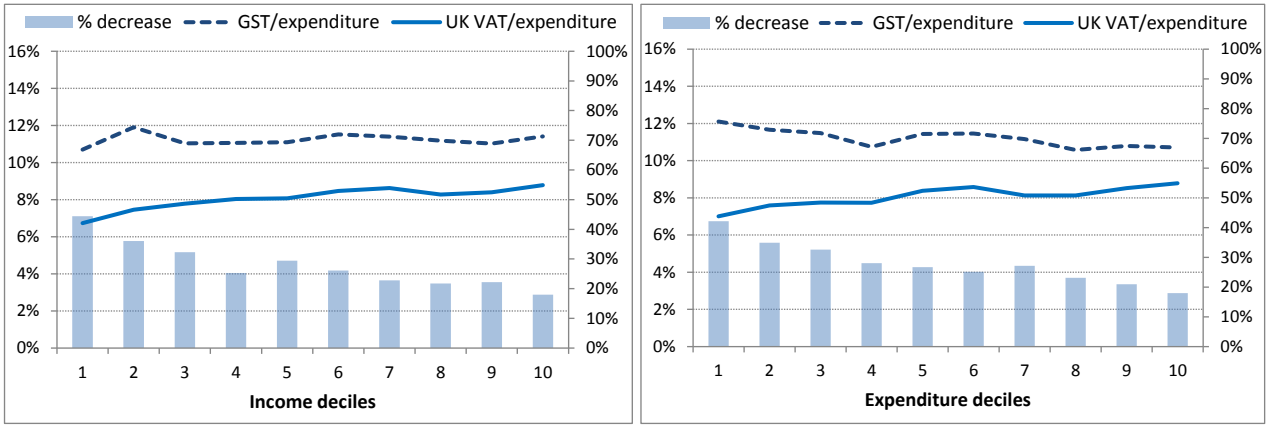
21 . Housing is not actually untaxed as GST is imposed on the sale of newly constructed housing, and this cost can be expected to be capitalised into rental prices. However, this price effect is not captured in the modelling.

VAT rate in the UK is 20% (as of 1 January 2013). A zero rate of VAT applies to most food products (excluding chocolate, confectionary, ice cream, some cakes and biscuits, snack foods, soft drinks, mineral water, fruit and vegetable juices, energy drinks, restaurant food, and ready-to-eat meals), children's clothing and footwear, the purchase of housing, water supply, pharmaceutical products, domestic and international passenger transport, books, newspapers and magazines. A 5% rate applies to electricity, gas for heating, solid and liquid fuels for heating, and insulation for housing. Meanwhile, rental of residential property, educational expenses, most medical and dental expenses, postal services, financial services, life insurance, and admission to certain cultural events are exempt.

The underlying assumption made in this simulation is that the introduction of the UK rate structure in New Zealand would not result in any alteration in households' consumption bundles (i.e. no behavioural response). This is of course a simplification, and there would still likely be some behavioural response to the removal of reduced rates (away from higher taxed and towards lower taxed items). The simulation results should therefore be considered as indicative of patterns rather than precise values.

Figure 9 (and Annex B) presents the results of the simulated reform and compares this with the current rate structure (from Figure 2). Average household GST burdens are presented as a percentage of pre-tax expenditure across equivalised household disposable income deciles (left panel) and equivalised household pre-tax expenditure deciles (right panel). In addition, Figure 9 also presents the percentage reduction in the GST burden across both income and expenditure deciles (measured on the right hand axis).

Figure 9: Average GST burdens per household: pre- and post-reform



Despite the higher standard rate, we see that the move to the UK rate structure results in a large reduction in the tax burden across the board. This emphasises the narrowness of the UK VAT base in comparison to New Zealand's GST base. However, we do see a progressive effect from the reform – with the GST reduction for low income/expenditure households being significantly greater than that for high income/expenditure households. Across income deciles, the GST has moved from being roughly proportional to slightly progressive, while across expenditure deciles the previously slightly regressive GST now also appears slightly progressive.

These results are, of course, unsurprising as low income/expenditure households can be expected to consume a greater proportion of their total expenditure on reduced and zero-rate goods than higher income/expenditure households. This after all is the reason why many of these reduced rates are present in the UK in the first place. The increase in the standard rate adds to this overall effect as these goods correspondingly form a greater proportion of higher income/expenditure household's total expenditure.

While the switch to the UK's multi-rate system clearly does have a progressive effect, it comes at some cost: total simulated GST revenue falls by 22% from NZD 9,441 million to NZD 7,319 million. As

Figure 9 has shown, this revenue loss comes from GST reductions for both the poor and the rich, which highlights one of the main criticisms of multi-rate systems: that they are a blunt instrument with which to target the poor. The next section examines this issue in more detail.

6. Who gains from reduced rates?

In this section we look at who would benefit from the introduction of the reduced rates simulated in the previous section, and how this would vary depending on the particular expenditure item. We do this by calculating the "tax expenditure" (i.e. the reduction in tax paid) related to different goods and services subject to reduced rates. For each expenditure item, the tax expenditure is calculated as the monetary difference between the actual GST collected from each household (at the 15% rate) and the simulated GST revenue at the reduced (5% or zero) rate under the UK's structure. Effectively, the standard 15% GST rate is being used as the benchmark against which to calculate the size of the tax expenditure.

Once again, the underlying assumption behind the analysis is that the introduction of the reduced rates induces no alteration in households' consumption bundles (i.e. no behavioural response). As in reality there would still likely be some behavioural response to the introduction of reduced rates, the results presented below are likely to underestimate to some extent the size of the actual tax expenditure.[22]

We first consider the overall effect of all reduced GST rates, before then considering reduced rates on specific consumption items grouped broadly by policy intent. The first group covers reduced rates that are most likely introduced to provide support to poor households: food, pharmaceutical products, and children's clothing and shoes. We then consider reduced rates for utilities and energy products, which may also be introduced to support the poor. Finally, we consider reduced rates that are more likely to be introduced for non-distributional purposes, such as supporting cultural activities and perceived social goods. While once again a graphical exposition of the results is favoured below, the results are also presented in tabular form in Annex C.

All reduced rates

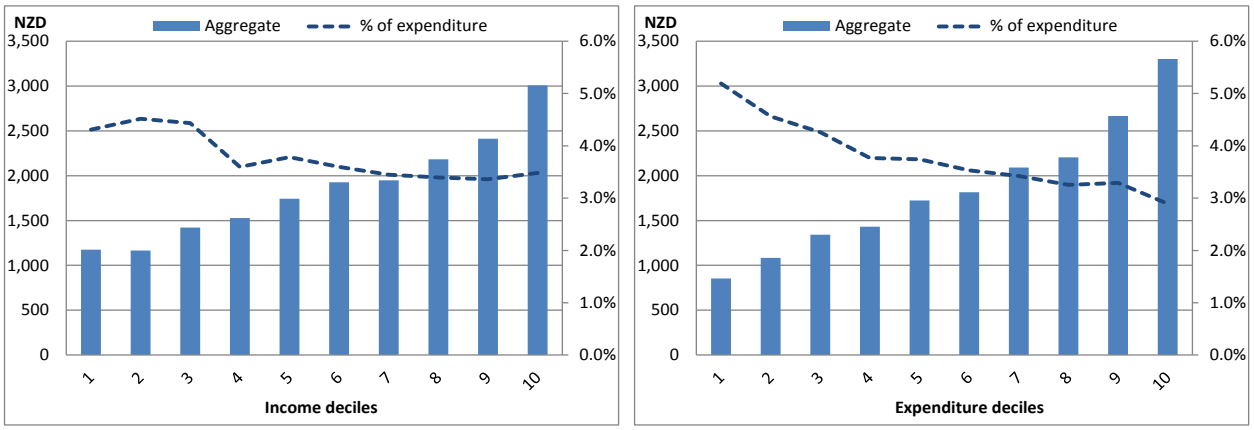
Figure 10 summarises the tax expenditure results for all reduced GST rates: solid bars present the average tax expenditure per household across income deciles (left hand panel) and expenditure deciles (right hand panel). The dotted lines present the same results as a percentage of household expenditure.

Considering first the aggregate tax expenditure results, Figure 10 shows a clear pattern with higher income/expenditure deciles benefiting from successively larger tax expenditures. The tax reduction for households in the top income decile is a touch over NZD 3 000 compared to just under NZD 1 200 for the bottom decile. Across expenditure deciles the result is even more extreme: the top decile receives just over NZD 3 300, which is close to four times the tax expenditure received by the bottom decile.

While these differences are large, looking at their size relative to household expenditure nevertheless shows that the poor still gain proportionately more than the rich – consistent with the results presented in section 5. This can be seen from the downward sloping dotted lines in Figure 10.

22. While we have also simulated a number of exemptions in the multi-rate reform, we do not present results for the tax expenditures associated with these expenditure items. This is due to the added complexity associated with the likely presence of some tax that has been embedded in the production chain (due to the inability to claim input tax credits for exempt goods). As we model these exemptions as zero-rates, the modelling will underestimate the amount of tax collected from these expenditure items post reform, thereby overstating any estimate of the tax reduction from the exemption.

Figure 10: Average tax expenditure per household from all reduced rates



Reduced rates typically aimed at supporting the poor

Figures 11 and 12 examine the targeting of the simulated zero rate on food products. Figure 11 presents the tax expenditure results for all food subject to the zero rate, while figure 12 presents results for a subset of this – fresh fruit and vegetables.

Figure 11: Average tax expenditure per household from zero rates on all food

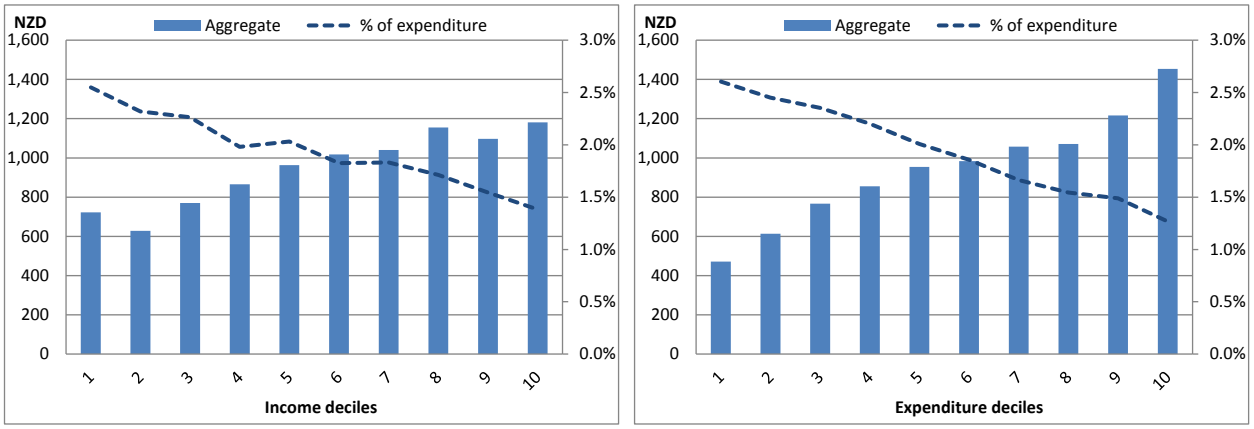
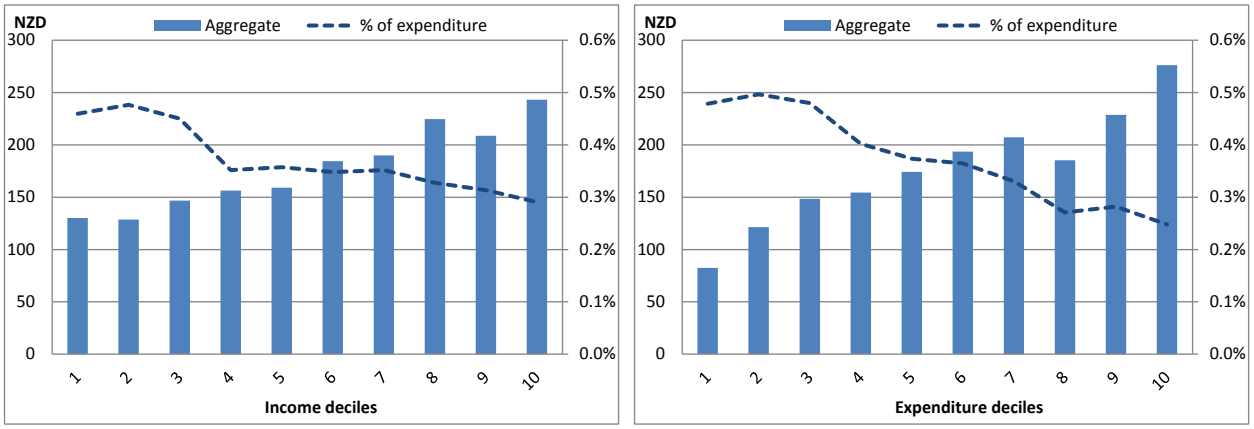


Figure 12: Average tax expenditure per household from zero rate on fresh food and vegetables



The patterns shown in both Figures 11 and 12 are very similar, with richer households (whether measured by income or expenditure) again receiving a significantly greater aggregate tax reduction than poorer households – though the difference is not as marked as was the case for all reduced rates. As before, the difference tends to be greater across expenditure deciles than across income deciles. For all food subject to the zero rate, the tax reduction for households in the top income decile is almost NZD 1 200 compared to just over NZD 700 for the bottom decile. Meanwhile, the top expenditure decile receives over NZD 1 400 compared to approximately NZD 470 received by the bottom decile. Looking at the relative size of the tax expenditures we see that the poor gain considerably more than the rich as a proportion of expenditure.

Despite their policy intent, the significant tax expenditures provided across the entire income/expenditure distributions clearly illustrate that reduced rates for food are not a well targeted way of supporting poor households. Nevertheless, they do still have a progressive impact on overall GST burdens. And despite being poorly targeted, they do provide a significant level of support to poor households, highlighting why reduced rates for food are a key part of multi-rate GST/VAT systems in many countries. Indeed, a comparison with figure 10 shows that the reduced rate on food would provide more than half of the total support to poor households from all reduced GST rates.

A similar increasing pattern emerges in the aggregate tax expenditure results for the zero rate on pharmaceutical products (figure 13). While the aggregate amounts are less than for food, they are still significant with top decile households benefiting from a tax reduction of around NZD 85 (income deciles) to NZD 95 (expenditure deciles). These amounts are, respectively, around three-and-a-half times the reduction gained by the bottom income decile, and more than seven times the reduction gained by the bottom expenditure decile. As a proportion of expenditure, the reduced rates on pharmaceuticals still tend to benefit lower rather than higher income/expenditure households. However, it is households in the second and third income/expenditure deciles that tend to benefit the most, with bottom decile households benefiting only to a similar degree as higher income/expenditure households.

Figure 13: Average tax expenditure per household from zero rate on pharmaceuticals

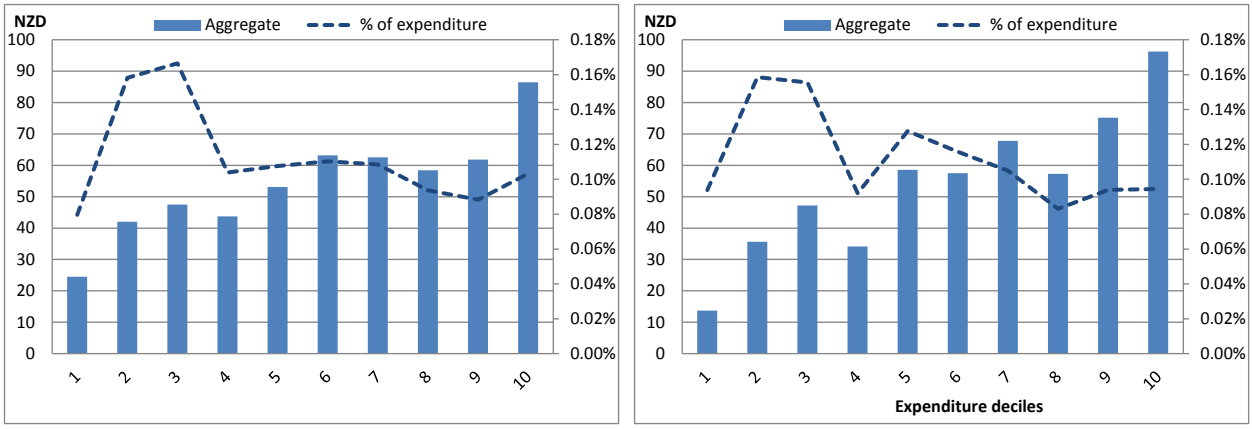
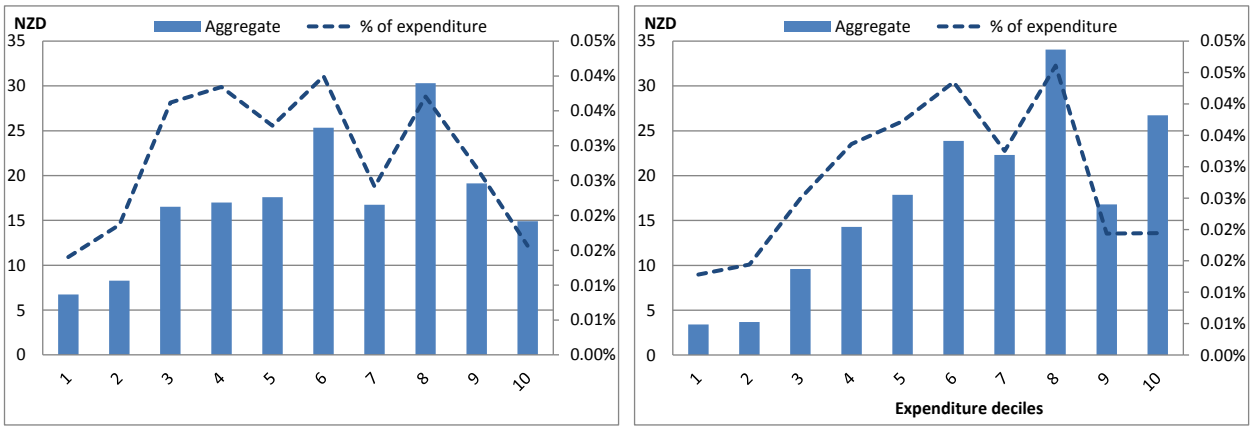


Figure 14 presents the average household tax reduction from the zero rate on children's clothing and shoes. Across income deciles, a slightly mixed pattern emerges with both the aggregate and proportionate tax reductions varying across the income distribution – although the bottom two deciles still benefit the least in aggregate terms. When measured across expenditure deciles the same increasing pattern as before emerges – with the rich benefiting significantly more than the poor. As a proportion of expenditure, households in the upper middle of the expenditure distribution tend to benefit the most, with the top two deciles benefiting to a far smaller degree – though still by more than the bottom two deciles.

Figure 14: Average tax expenditure per household from zero rate on children's clothing and shoes

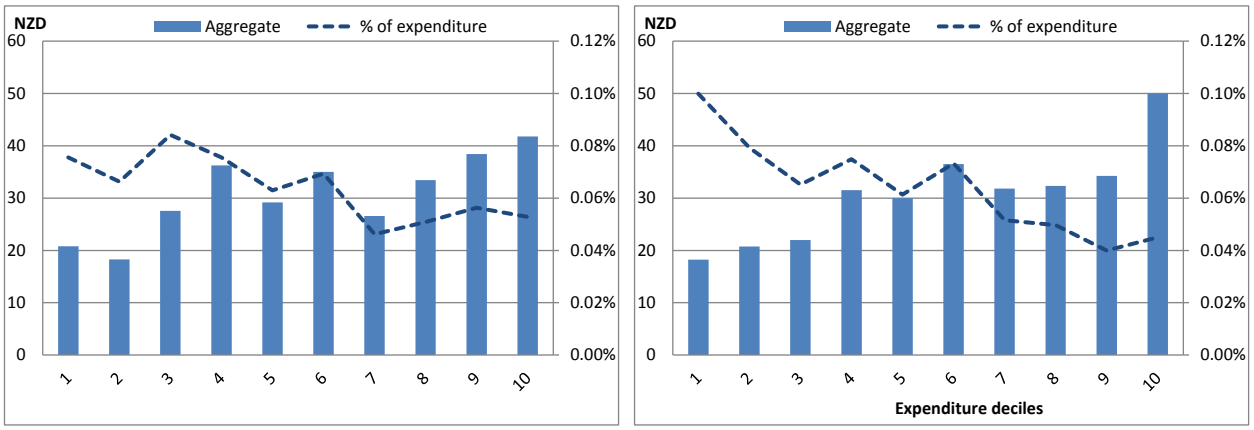


Reduced rates on public utilities and energy

Reduced rates and/or exemptions on what, at least historically, were public utilities are common across European GST/VAT systems, and are indeed present in the UK system. In the UK, this includes zero rates on water supply and public transport, and reduced rates on energy products. While the rationale for these concessions may not originally have been specifically to support the poor, this is often their predominant purpose in countries now.

Figure 15 presents the average household tax reduction from the zero rate on water supply. Compared to the previous expenditure categories, the distribution of the aggregate tax reduction for water supply is flatter across both income and expenditure deciles. Nevertheless, top decile households still receive around twice the tax reduction that bottom decile households receive. As a percentage of expenditure, water supply shows a similar progressive pattern, with poorer households benefiting more than richer households.

Figure 15: Average tax expenditure per household from zero rate on water supply



Figures 16-18 present tax reductions for energy products – electricity, (solid and liquid) heating fuels, and natural gas which are subject to the reduced rate of 5% under the shift to the UK's rate structure. Results vary across the three categories. Electricity and heating fuels show relatively similar aggregate tax expenditures across both income and expenditure distributions. Unsurprisingly, this leads to poor households benefiting considerably more than rich households as a proportion of expenditure. In contrast, aggregate tax expenditures exhibit a strongly increasing pattern for natural gas. Nevertheless, rich and poor

households still tend to benefit to relatively similar degrees across the income distribution, while poor households tend to benefit to a slightly greater degree than the rich across the expenditure distribution.

The magnitudes of the tax reductions from the reduced rate on electricity are far greater than for the other energy products (with only the zero rate for food providing greater tax reductions across the board). This illustrates New Zealand households' strong dependence on electricity for domestic heating and cooking purposes as compared to natural gas and heating fuels.

Figure 16: Average tax expenditure per household from reduced rate on electricity

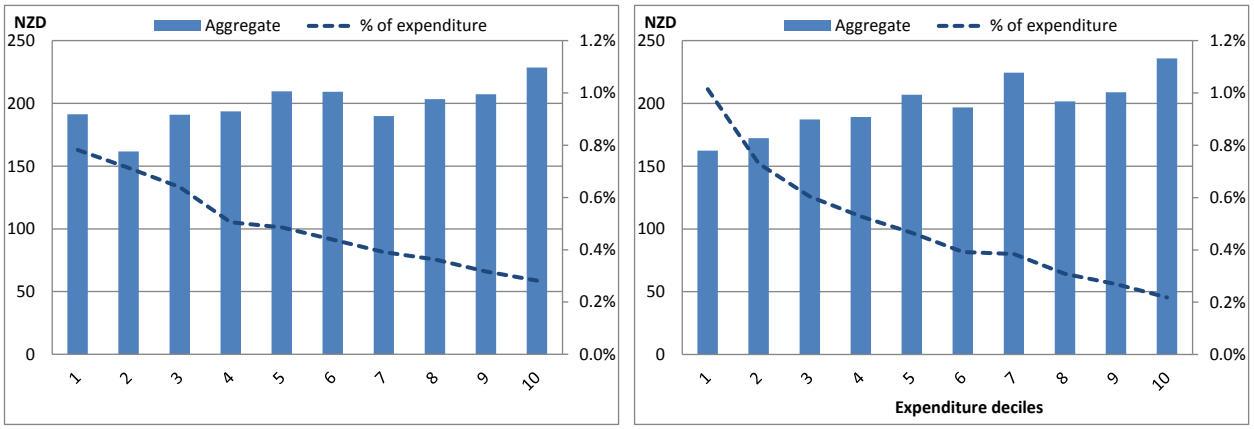


Figure 17: Average tax expenditure per household from reduced rate on solid and liquid heating fuels

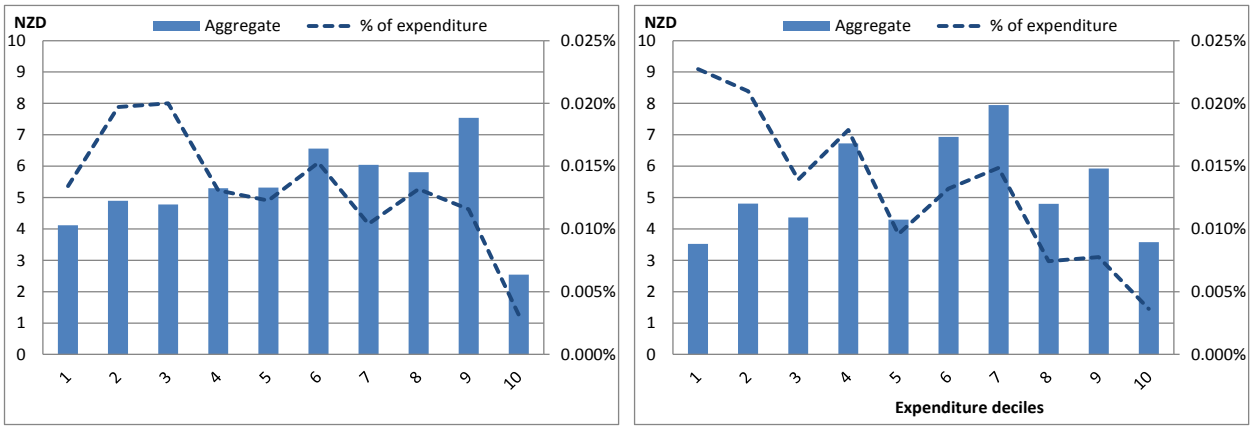
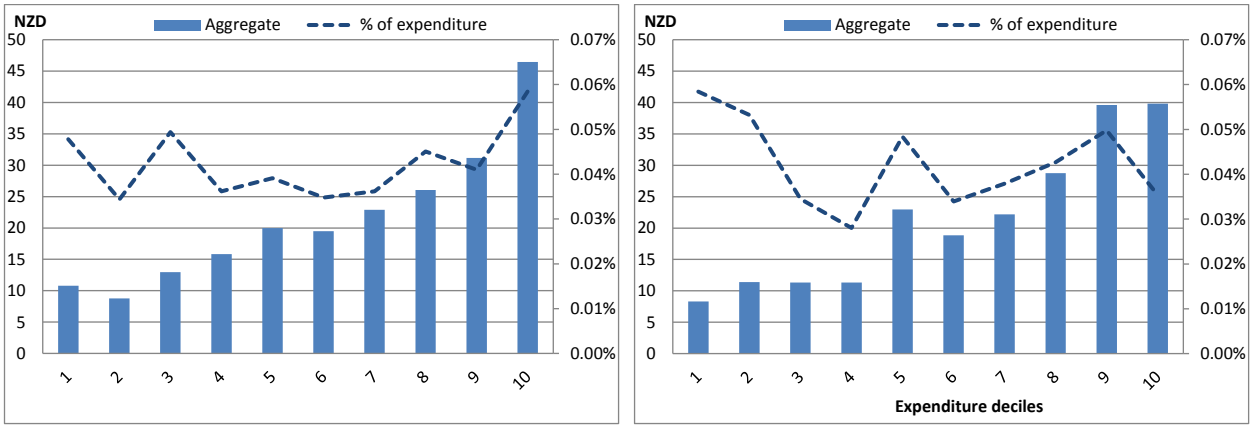
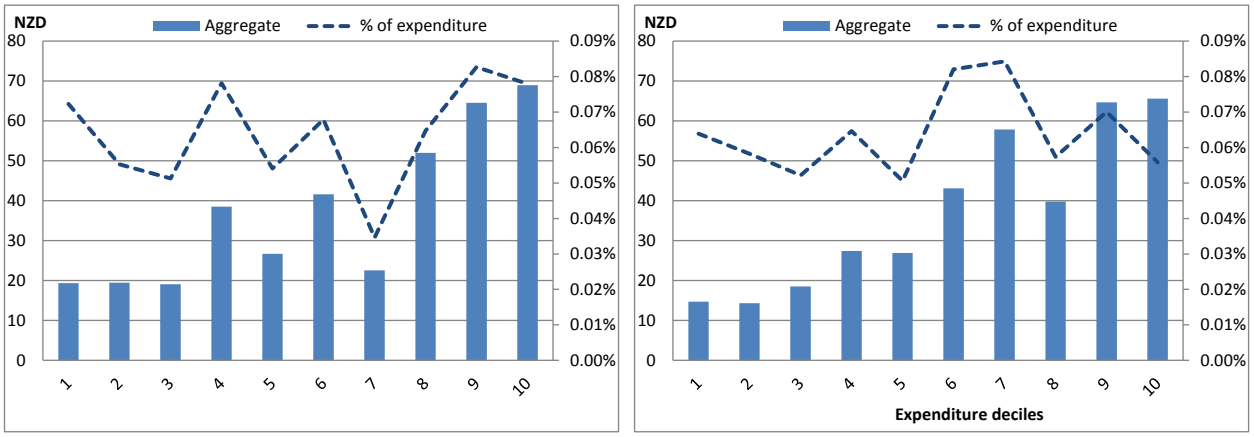


Figure 18: Average tax expenditure per household from reduced rate on natural gas



Similar to natural gas, the zero rate on road and rail public transport (Figure 19) provides significantly greater aggregate tax reductions to rich households over poor households, but roughly proportional tax reductions as a percentage of expenditure (though with considerable variability).

Figure 19: Average tax expenditure per household from zero rate on road and rail transport



Reduced rates introduced for cultural, social and other non-distributional purposes

As well as specifically targeting the poor with the above zero and reduced rates, the UK also provides reduced rates for books, newspapers and magazines – arguably on the basis that increased consumption of these goods has broader social benefits. Additionally, domestic and international air transport are zero rated. The reduced rate for international air transport is part of a worldwide response to the difficulty of assigning taxation rights to a service that may occur across multiple countries. While international air transport is also zero rated in New Zealand (and hence does not affect the overall reform results), we present the tax expenditure results to illustrate the distribution of the tax reduction from this zero rate already present in the current New Zealand system.

Figures 20 and 21 present the average household tax expenditures from the zero rates on books, and on newspapers and magazines, respectively. For books, the zero rate strongly favours richer households, not just in aggregate terms but also as a proportion of expenditure (though not monotonically). This regressive effect is in strong contrast to the reduced rates on the previously presented expenditure items which had either a progressive or roughly proportional effect on the overall tax burden. The regressive impact is particularly strong when examined across expenditure deciles where bottom decile households receive almost no benefit at all from the zero rate – as they spend almost no money on books. Interestingly, across income deciles it is the seventh decile that receives the greatest aggregate and proportional benefit from the reduced rate rather than the top decile, while the third expenditure decile also benefits disproportionately relative to the overall regressive pattern.

Turning to newspapers and magazines, we see instead that the aggregate tax reduction is spread far more evenly across both income and expenditure distributions than for books. While richer households still tend to benefit more than poorer households in aggregate terms, they now benefit by less in proportionate terms.

Figure 20: Average tax expenditure per household from zero rate on books

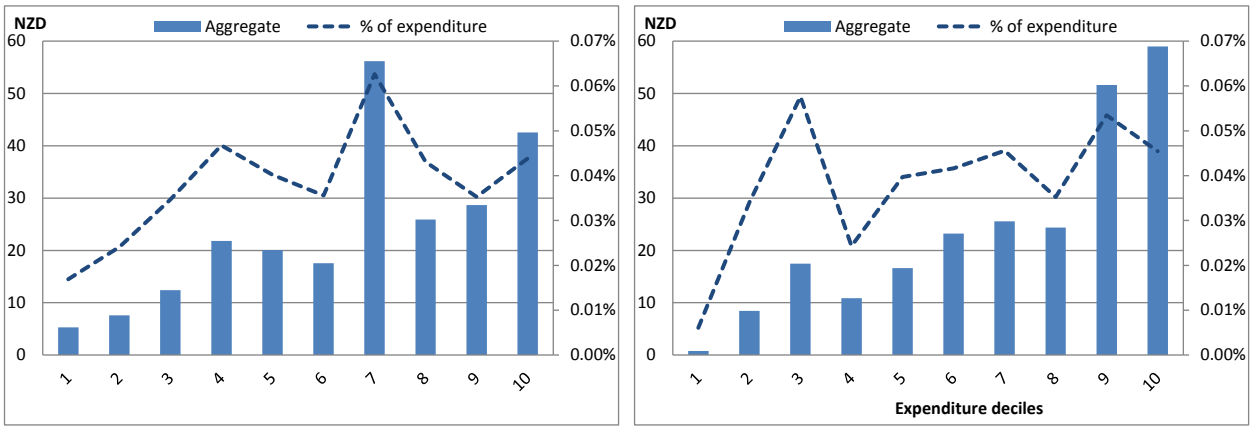
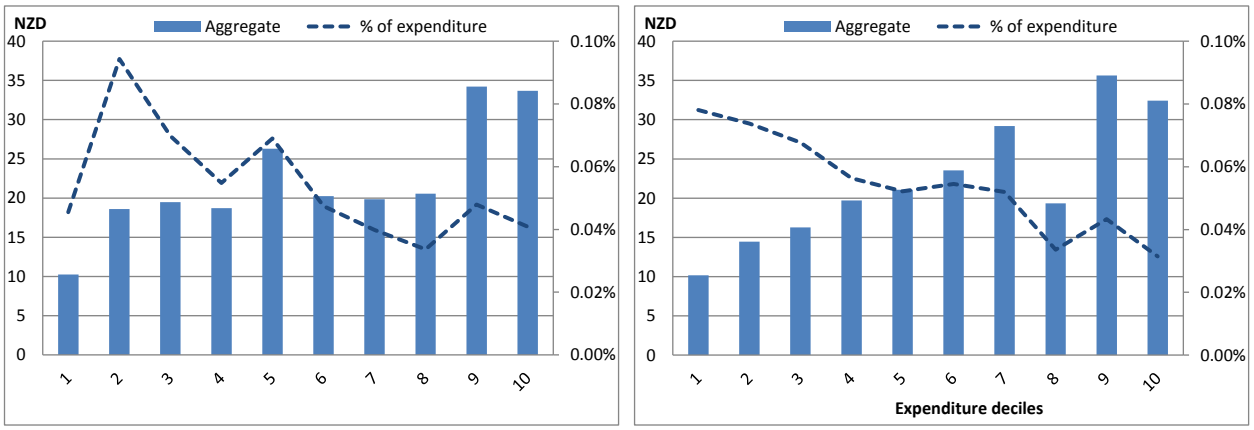


Figure 21: Average tax expenditure per household from zero rate on newspapers and magazines



Finally, the zero rates on domestic and international air transport (Figures 22 and 23) can be seen to benefit the rich vastly more than the poor in aggregate terms, leading to similarly larger tax reductions for the rich in proportionate terms. Furthermore, the magnitudes of the reductions gained by rich households are very substantive. For international air travel they correspond roughly with the amount gained by rich households from the reduced rate on fresh fruit and vegetables – but in this case the poor receive very little benefit at all. This result is not unexpected given that poor households are less likely to undertake international travel. Surprisingly, the average benefit gained by the top earning households is greater than that gained by the top spending households for international air travel. This contrasts with the results for other expenditure items, and suggests that international travel is less likely to be funded by borrowing than other expenditure.

Overall, the results in this section clearly show that reduced GST rates are an extremely inefficient way of targeting support to poor households. At best, rich households gain similar amounts to the poor. At worst, rich households gain vastly more. Furthermore in some cases, rich households benefit by so much more than poor households that they even benefit more when measured as a proportion of their expenditure. That is, not only are reduced GST rates poorly targeted at the poor, in some cases they can actually be regressive.

Figure 22: Average tax expenditure per household from zero rate on domestic air transport

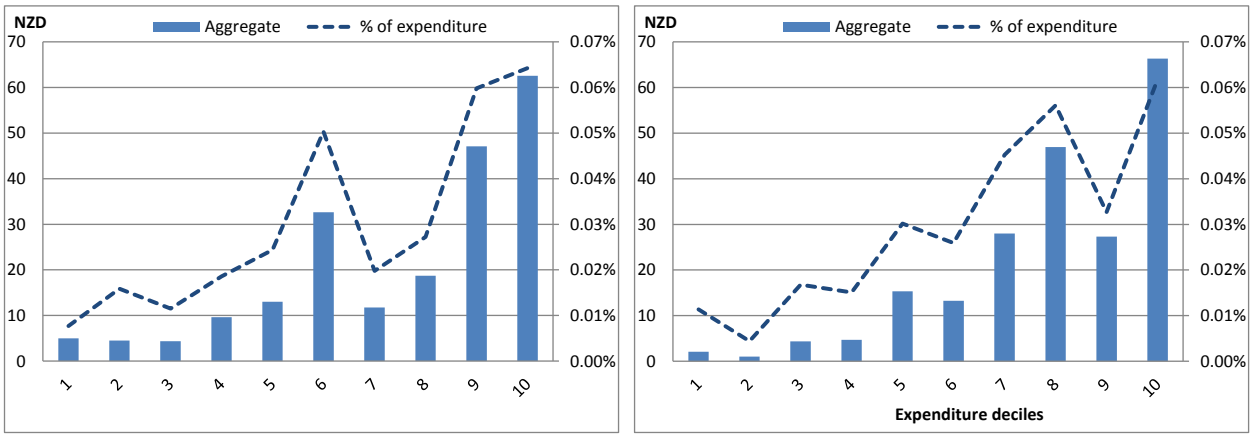
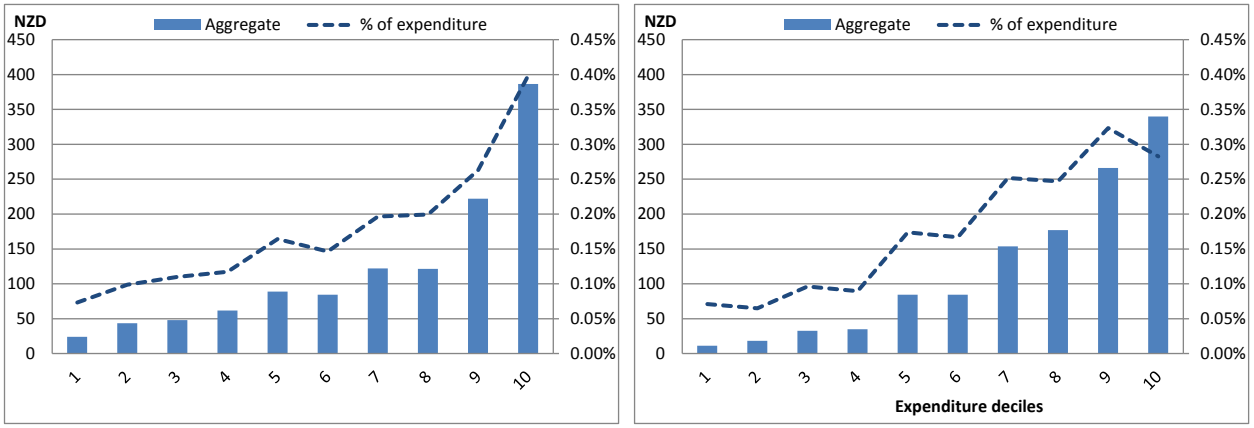


Figure 23: Average tax expenditure per household from zero rate on international air transport



7. Concluding comments

This paper has examined the distributional effects of consumption taxes in New Zealand using a microsimulation model based on 2012-13 household expenditure data. Consistent with recent European studies, and with previous work with New Zealand data, we find that the GST in New Zealand is highly regressive when measured as a percentage of current income across the income distribution, but roughly proportional when measured as a percentage of expenditure. Reflecting the fact that higher spending households spend a greater proportion of their total expenditure on the few items in the New Zealand system that are untaxed or exempt, we find the GST to be slightly regressive when measured as a proportion of expenditure across the expenditure distribution.

The paper argues that expenditure provides a better measure of the lifetime distributional effect of a consumption tax, and therefore concludes that the lifetime impact of the GST is either proportional or at worst slightly regressive – suggesting that public concerns regarding a highly regressive GST are unwarranted. Excise taxes are also found to be slightly regressive, though they are of far smaller magnitude than GST burdens.

The paper also examines the merits of a move to a multi-rate GST system by simulating the UK's VAT rate structure on the New Zealand data. Results show that a move to such a European-style system with a narrow base (compared to New Zealand's current base) would have a progressive effect, lowering GST burdens proportionately more for poor households than for rich households. However, any progressivity gains are shown to come at a high fiscal cost as not only do rich households also gain from

the reform, but they gain substantially more than the poor in aggregate terms. In other words, reduced GST rates are shown to be a highly inefficient way of targeting support to poor households. Furthermore, the introduction of reduced GST rates would significantly increase the compliance and administrative costs associated with the tax.

Looking in more detail at the effects of reduced rates on specific expenditure items shows some reduced rates to be worse than others at providing support to the poor. Reduced rates typically introduced to support the poor – such as on food, water supply, electricity and heating fuels – would have a progressive impact on GST burdens if introduced in New Zealand, providing a proportionately greater benefit to poor households than to rich households. However, they would still be a very poorly targeted way of providing this support. At best they would provide at least as much benefit in aggregate terms to the rich as to the poor, but in general they would provide more – often significantly more – aggregate benefit to the rich than the poor. Some reduced rates – such as on natural gas and public transport – would be even less effective, providing only a roughly proportional, rather than progressive, impact. Meanwhile, reduced rates often introduced for non-distributional reasons, such as books and air travel would provide vastly more benefit to the rich, to the extent that they would actually have a regressive impact on GST burdens.

Given it is the overall progressivity of the tax system that matters, New Zealand's current approach of providing targeted support to poor households via the Working for Families (WFF) tax credit package can be seen as a far more cost effective way of supporting poor households than the introduction of reduced GST rates for specific expenditure items. Not only does the income-tested nature of the WFF package ensure better targeting of support to poorer households, it ensures a fairer distribution of support amongst those households based on income and family type, rather than based on potentially arbitrary consumption patterns.

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ANNEX A

GST AND EXCISE BURDEN RESULTS

Table A1: Average GST burdens as a percentage of disposable income and pre-tax expenditure: income deciles (LHS); expenditure deciles (RHS).

	GST / income	GST / expenditure
Poorest	11.5%	10.7%
2	10.5%	11.9%
3	10.3%	11.0%
4	9.2%	11.1%
5	9.6%	11.1%
6	9.2%	11.5%
7	8.1%	11.4%
8	7.6%	11.2%
9	7.3%	11.0%
Richest	5.9%	11.4%

	GST / income	GST / expenditure
Poorest	6.0%	12.1%
2	8.0%	11.7%
3	8.5%	11.5%
4	8.7%	10.7%
5	9.4%	11.4%
6	9.4%	11.5%
7	9.4%	11.2%
8	9.0%	10.6%
9	10.1%	10.8%
Richest	10.9%	10.7%

Table A2: Average excise tax burdens as a percentage of disposable income and pre-tax expenditure: income deciles (LHS); expenditure deciles (RHS).

	Excise / income	Excise / expenditure
Poorest	2.7%	2.6%
2	1.8%	2.1%
3	2.1%	2.4%
4	2.2%	2.8%
5	1.9%	2.4%
6	1.7%	2.3%
7	1.6%	2.4%
8	1.6%	2.5%
9	1.3%	2.1%
Richest	0.9%	1.8%

	Excise / income	Excise / expenditure
Poorest	1.5%	2.8%
2	2.0%	2.9%
3	2.0%	2.7%
4	2.0%	2.6%
5	1.9%	2.4%
6	1.9%	2.4%
7	1.9%	2.4%
8	1.7%	2.0%
9	1.6%	1.7%
Richest	1.5%	1.5%

Table A3: Average total consumption tax burdens as a percentage of disposable income and pre-tax expenditure across household type

	Tax / income	Tax / expenditure
1adult	11.2%	14.1%
2adults	11.0%	14.2%
>2adults	10.1%	14.3%
1adult+ch	9.4%	10.6%
2adults+ch	10.7%	12.9%
>2adults+ch	10.1%	13.4%

Table A4: Average total consumption tax burdens as a percentage of disposable income and pre-tax expenditure across age (of household head).

	Tax / income	Tax / expenditure
20-29	10.0%	11.5%
30-39	9.7%	11.7%
40-49	10.2%	13.0%
50-59	10.9%	14.5%
60-69	11.8%	14.9%
70+	11.8%	15.7%

Table A5: Average total consumption tax burdens as a percentage of disposable income and pre-tax expenditure for smokers vs non-smokers.

	Tax / income	Tax / expenditure
non-smoker	10.3%	12.8%
smoker	12.8%	16.9%

ANNEX B

UK RATE STRUCTURE REFORM RESULTS

Table B1: Average GST burdens under the UK VAT rate structure as a percentage of pre-tax expenditure: income deciles (LHS); expenditure deciles (RHS).

	UK VAT / expenditure
Poorest	6.7%
2	7.5%
3	7.8%
4	8.0%
5	8.1%
6	8.5%
7	8.6%
8	8.3%
9	8.4%
Richest	8.8%

	UK VAT / expenditure
Poorest	7.0%
2	7.6%
3	7.7%
4	7.7%
5	8.4%
6	8.6%
7	8.1%
8	8.1%
9	8.5%
Richest	8.8%

ANNEX C

GST TAX EXPENDITURE RESULTS

Table C1: Average tax expenditure per household from all reduced rates: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	1,175 (4.3)
2	1,165 (4.5)
3	1,422 (4.4)
4	1,527 (3.6)
5	1,744 (3.8)
6	1,926 (3.6)
7	1,948 (3.4)
8	2,182 (3.4)
9	2,412 (3.4)
Richest	3,007 (3.5)

Poorest	854 (5.2)
2	1,083 (4.6)
3	1,341 (4.3)
4	1,431 (3.8)
5	1,722 (3.7)
6	1,815 (3.5)
7	2,091 (3.4)
8	2,204 (3.3)
9	2,666 (3.3)
Richest	3,302 (2.9)

Table C2: Average tax expenditure per household from zero rate on all food: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	722 (2.5)
2	628 (2.3)
3	770 (2.3)
4	865 (2.0)
5	963 (2.0)
6	1,017 (1.8)
7	1,041 (1.8)
8	1,155 (1.7)
9	1,097 (1.5)
Richest	1,181 (1.4)

Poorest	471 (2.6)
2	613 (2.5)
3	767 (2.4)
4	856 (2.2)
5	954 (2.0)
6	983 (1.9)
7	1,057 (1.7)
8	1,071 (1.5)
9	1,217 (1.5)
Richest	1,454 (1.3)

Table C3: Average tax expenditure per household from zero rate on fresh fruit and vegetables: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	130 (0.46)
2	129 (0.48)
3	147 (0.45)
4	156 (0.35)
5	159 (0.36)
6	184 (0.35)
7	190 (0.35)
8	225 (0.33)
9	209 (0.31)
Richest	243 (0.29)

Poorest	82 (0.48)
2	121 (0.50)
3	149 (0.48)
4	154 (0.40)
5	174 (0.37)
6	193 (0.36)
7	207 (0.33)
8	185 (0.27)
9	229 (0.28)
Richest	276 (0.25)

Table C4: Average tax expenditure per household from zero rate on pharmaceuticals: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	24 (0.080)
2	42 (0.158)
3	47 (0.166)
4	44 (0.104)
5	53 (0.108)
6	63 (0.110)
7	63 (0.108)
8	58 (0.094)
9	62 (0.088)
Richest	86 (0.103)

Poorest	14 (0.094)
2	36 (0.159)
3	47 (0.156)
4	34 (0.092)
5	59 (0.128)
6	57 (0.116)
7	68 (0.105)
8	57 (0.083)
9	75 (0.094)
Richest	96 (0.094)

Table C5: Average tax expenditure per household from zero rate on children's clothing and shoes: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	7 (0.014)
2	8 (0.019)
3	17 (0.036)
4	17 (0.038)
5	18 (0.033)
6	25 (0.040)
7	17 (0.024)
8	30 (0.037)
9	19 (0.027)
Richest	15 (0.016)

Poorest	3 (0.013)
2	4 (0.014)
3	10 (0.025)
4	14 (0.034)
5	18 (0.037)
6	24 (0.043)
7	22 (0.033)
8	34 (0.046)
9	17 (0.019)
Richest	27 (0.019)

Table C6: Average tax expenditure per household from reduced rate on water supply: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	21 (0.076)
2	18 (0.066)
3	28 (0.084)
4	36 (0.076)
5	29 (0.063)
6	35 (0.069)
7	27 (0.046)
8	33 (0.051)
9	38 (0.056)
Richest	42 (0.053)

Poorest	18 (0.100)
2	21 (0.079)
3	22 (0.065)
4	32 (0.075)
5	30 (0.061)
6	37 (0.073)
7	32 (0.052)
8	32 (0.050)
9	34 (0.040)
Richest	50 (0.045)

Table C7: Average tax expenditure per household from reduced rate on electricity: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	191 (0.78)	Poorest	162 (1.01)
2	162 (0.71)	2	172 (0.73)
3	191 (0.64)	3	187 (0.60)
4	194 (0.50)	4	189 (0.53)
5	210 (0.49)	5	207 (0.47)
6	209 (0.44)	6	197 (0.39)
7	190 (0.39)	7	225 (0.38)
8	203 (0.36)	8	202 (0.31)
9	207 (0.32)	9	209 (0.27)
Richest	229 (0.28)	Richest	236 (0.22)

Table C8: Average tax expenditure per household from reduced rate on solid and liquid heating fuels: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	4 (0.013)	Poorest	4 (0.023)
2	5 (0.020)	2	5 (0.021)
3	5 (0.020)	3	4 (0.014)
4	5 (0.013)	4	7 (0.018)
5	5 (0.012)	5	4 (0.010)
6	7 (0.015)	6	7 (0.013)
7	6 (0.010)	7	8 (0.015)
8	6 (0.013)	8	5 (0.007)
9	8 (0.012)	9	6 (0.008)
Richest	3 (0.003)	Richest	4 (0.004)

Table C9: Average tax expenditure per household from reduced rate on natural gas: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	11 (0.048)	Poorest	8 (0.058)
2	9 (0.034)	2	11 (0.053)
3	13 (0.049)	3	11 (0.035)
4	16 (0.036)	4	11 (0.028)
5	20 (0.039)	5	23 (0.048)
6	19 (0.035)	6	19 (0.034)
7	23 (0.036)	7	22 (0.038)
8	26 (0.045)	8	29 (0.043)
9	31 (0.041)	9	40 (0.050)
Richest	46 (0.058)	Richest	40 (0.035)

Table C10: Average tax expenditure per household from zero rate on road and rail transport: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	19 (0.072)
2	19 (0.055)
3	19 (0.051)
4	39 (0.078)
5	27 (0.054)
6	42 (0.068)
7	23 (0.035)
8	52 (0.065)
9	65 (0.083)
Richest	69 (0.078)

Poorest	15 (0.064)
2	14 (0.058)
3	19 (0.052)
4	27 (0.065)
5	27 (0.051)
6	43 (0.082)
7	58 (0.084)
8	40 (0.057)
9	65 (0.070)
Richest	66 (0.056)

Table C11: Average tax expenditure per household from zero rate on books: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	5 (0.017)
2	8 (0.024)
3	12 (0.035)
4	22 (0.047)
5	20 (0.040)
6	18 (0.036)
7	56 (0.063)
8	26 (0.043)
9	29 (0.035)
Richest	43 (0.044)

Poorest	1 (0.006)
2	8 (0.034)
3	17 (0.058)
4	11 (0.024)
5	17 (0.040)
6	23 (0.042)
7	26 (0.046)
8	24 (0.035)
9	52 (0.053)
Richest	59 (0.045)

Table C12: Average tax expenditure per household from zero rate on newspapers and magazines: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	10 (0.045)
2	19 (0.094)
3	19 (0.070)
4	19 (0.055)
5	26 (0.069)
6	20 (0.047)
7	20 (0.040)
8	21 (0.034)
9	34 (0.048)
Richest	34 (0.041)

Poorest	10 (0.078)
2	14 (0.074)
3	16 (0.068)
4	20 (0.056)
5	21 (0.052)
6	24 (0.055)
7	29 (0.052)
8	19 (0.034)
9	36 (0.043)
Richest	32 (0.031)

Table C13: Average tax expenditure per household from zero rate on domestic air transport: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	5 (0.008)
2	5 (0.016)
3	4 (0.012)
4	10 (0.019)
5	13 (0.024)
6	33 (0.050)
7	12 (0.020)
8	19 (0.027)
9	47 (0.060)
Richest	63 (0.064)

Poorest	2 (0.011)
2	1 (0.004)
3	4 (0.017)
4	5 (0.015)
5	15 (0.030)
6	13 (0.026)
7	28 (0.045)
8	47 (0.056)
9	27 (0.033)
Richest	66 (0.062)

Table C14: Average tax expenditure per household from zero rate on international air transport: income deciles (LHS); expenditure deciles (RHS)

(% of expenditure in parentheses)

Poorest	24 (0.07)
2	43 (0.10)
3	48 (0.11)
4	62 (0.12)
5	89 (0.16)
6	85 (0.15)
7	122 (0.20)
8	122 (0.20)
9	222 (0.26)
Richest	386 (0.40)

Poorest	11 (0.07)
2	18 (0.06)
3	33 (0.10)
4	35 (0.09)
5	84 (0.17)
6	84 (0.17)
7	154 (0.25)
8	177 (0.25)
9	266 (0.32)
Richest	340 (0.28)

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