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Do Couples Bunch More? Evidence from Partnered and Single Taxpayers in New Zealand*

Nazila Alinaghi, John Creedy and Norman Gemmell†

Abstract

Recent papers hypothesise that estimates of the elasticity of taxable income (ETI) for individuals may be biased where those individuals are taxed separately but are part of a couple family. This paper investigates that issue by applying the 'bunching at tax kinks' approach to estimate separate ETIs for partnered and single individuals. It shows that there are opportunities for, and constraints on, bunching specific to partnered individuals. Using administrative taxable income data for the New Zealand taxpayer population over the period, 2000 to 2017, individual taxpayers are matched to their partners using population census data. Results provide strong support for the hypotheses that ETIs are larger for individuals in couples than for single individuals, and for couples where both partners are located in the same income tax bracket. Self-employed individuals in couple families reveal especially large ETIs.

JEL Classification: H26; H31

Keywords: Elasticity of taxable income; bunching estimates; couples

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1 Introduction

The elasticity of taxable income, ETI, measures the responsiveness of taxable income to changes in the marginal net-of-tax rate, and is widely used in assessing behavioural responses to taxation because it summarises in one measure all the different types of response. These include labour supply, various forms of income shifting, and evasion.[1] In some countries, such as the US, couples are taxed jointly and income splitting occurs. Hence, both partners face a common marginal tax rate and empirical ETI studies treat the family as a single taxpaying unit. However, when obtaining ETI estimates for countries where individuals in couples are taxed separately, the possibility that some kind of joint decision process may be involved is generally ignored.[2] This is partly explained by the absence of taxable income data on partners within a household or family when income taxation is based on individual incomes. This can occur even where administrative tax return data are available, since partner information is not normally required to calculate the tax liability of each individual. However, Creedy and Gemmell (2019) show that, where couples maximise a joint utility function, ETI estimates obtained for individuals within couples can be expected to be biased downwards if intra-couple relationships are ignored. They conclude that the 'implications for empirical work on taxable income elasticities are therefore clear: at a minimum, different responses by couples and single individuals should be accommodated' (2019, p. 19).

The present paper uses a unique dataset for the population of New Zealand taxpayers, and reports results from matching individuals' tax return data within families over three periods around New Zealand census years when family-related information is available. Using an extensive matching exercise, it was possible to combine Inland Revenue Data with census data, by making use of the Integrated Data Infrastructure (IDI) maintained by Statistics New Zealand. This allows testing of the hypothesis that ETIs for individuals in couples are larger than those for single individuals, and also provides estimates for various family decompositions. For example, it is shown that tax incentives for income sharing can be expected to differ between members of couples where each partner is observed to earn income in a different tax bracket, compared with the case where partners are observed in the same bracket.

Estimation of the ETI gives rise to substantial challenges, because most estimation methods include a reliance on longitudinal information on income changes of individuals over time. They need to separate 'treated' from 'non-treated' groups, and must find suitable 'instru-

[1] For a survey of earlier empirical literature, see Saez *et al.* (2012).

[2] An exception is Gelber (2014), who adds terms involving changes in a married partner's income and tax rate to the standard ETI regression specification to examine within-couple responses, using data on Swedish married couples' taxable incomes.

ments' to deal with endogeneity (arising because the marginal tax rate and taxable income are jointly determined). The estimation method adopted here is the 'bunching estimator' proposed by Saez (2010) and Chetty *et al.* (2011). This circumvents some of the estimation challenges facing regression methods applied to longitudinal data, by exploiting the fact that taxpayers are often observed to bunch at income thresholds, or 'tax kinks', above which the marginal tax rate increases. Here, the 'kink' relates to the relevant budget constraint.[3] A particular advantage of this approach is that there is a direct proportional relationship between the value of the elasticity and the extent of observed bunching; see Kleven (2016) for a review. In addition, the bunching-based estimates can be obtained using only cross-sectional income distribution data and for a variety of income thresholds and years, rather than relying on periods when tax reforms took place.

Section 2 reviews the case of joint utility maximisation by couples and the implications for taxable income elasticities. The bunching method is described in Section 3. Following introduction to the New Zealand income tax structure and the special dataset in Section 4, empirical results are presented in Section 5. These results provide strong support for the hypotheses that partnered individuals display markedly higher elasticities than equivalent single individuals, and especially where both partners earn income in the same tax bracket. A range of robustness checks are reported in Section 6, and brief conclusions are in Section 7.

2 Elasticities for Individuals in Couples

The specification of the individual utility function that underlies the standard ETI approach for individuals is the quasi-linear form:

$$U = c - \left(\frac{1}{1+\frac{1}{\varepsilon}}\right)\left(\frac{z}{y}\right)^{1+\frac{1}{\varepsilon}} \tag{1}$$

Here z is taxable income, y is income in the absence of income taxation, and ε is a parameter. The utility-maximising solution for z yields the relationship between changes in $\log z$ and $\log(1-\tau)$ of:

$$d\log z = \varepsilon d\log(1-\tau) \tag{2}$$

[3] Applications of bunching methods to ETI estimation include le Maire and Schjerning (2013), Bastani and Selin (2013), Paetzold (2019), Bertanha *et al.* (2019), Bosch *et al.* (2019) and Gelber *et al.* (2019). However, bunching need not necessarily be observed when tax rates increase even when significant incentive effects are present; see, for example, Creedy and Scutella (2001). Further, Blomquist and Newey (2017) and Bertanha *et al.* (2019) have recently argued that identification of the taxable income elasticity using bunching methods depends crucially on the particular specification of preference heterogeneity and variations in budgets sets.

Hence the elasticity of taxable income, $\eta_{z,1-\tau}$, is constant and equal to ε.

Creedy and Gemmell (2019) extend this framework to two partnered individuals, with incomes z_1 and z_2, facing marginal tax rates, τ_1 and τ_2 respectively, where $z_1 > z_2$ and $\tau_1 > \tau_2$. The couple maximise the joint utility function:

$$U = c - \left(\frac{\varepsilon_1}{1+\varepsilon_1}\right)\left(\frac{z_1}{y_1}\right)^{1+\frac{1}{\varepsilon_1}}\left(\frac{\varepsilon_2}{1+\varepsilon_2}\right)\left(\frac{z_2}{y_2}\right)^{1+\frac{1}{\varepsilon_2}} \tag{3}$$

where ε_i $(i = 1, 2)$, are the elasticities for individuals in a couple. This leads to the following expression for the elasticity of taxable income for person 1 in the couple, $\eta_{z_1,1-\tau_1}$:

$$\eta_{z_1,1-\tau_1} = \varepsilon_1 \left[\frac{(1+\varepsilon_1)(1+\varepsilon_2)}{(1+\varepsilon_1)(1+\varepsilon_2) - (\varepsilon_1\varepsilon_2)^2}\right] \tag{4}$$

Hence, $\eta_{z_1,1-\tau_1} > \varepsilon_1$ due to the presence of the term $(\varepsilon_1\varepsilon_2)^2$ in the denominator on the right hand side of (4). A symmetric condition applies to $\eta_{z_2,1-\tau_2} > \varepsilon_2$.[4] In addition, conditional on person 2 not moving into a new tax bracket, the two taxable income elasticities are related as follows:

$$\eta_{z_2,1-\tau_1} = -\left(\frac{\varepsilon_1\varepsilon_2}{1+\varepsilon_1}\right)\eta_{z_1,1-\tau_1} \tag{5}$$

That is, $\eta_{z_2,1-\tau_1} < 0$, as person 2's taxable income increases in response to a fall in the partner's net-of-tax rate, $1-\tau_1$, reflecting the couple's utility gain from reallocating income from the more highly-taxed partner.

The result that $\eta_{z_i,1-\tau_i} > \varepsilon_i$, for $i = 1, 2$, suggests that empirical ETI estimates should allow for different responses by single individuals and members of couples especially where, in the absence of any intra-family income reallocation, each partner would be in a different tax bracket. Hence, when applying bunching methods, the extent of bunching at a given kink point can be expected to differ between coupled and non-coupled individuals, in addition to coordinated bunching by partners simultaneously at different tax kinks.[5]

3 The Bunching Method

Subsection 3.1 briefly describes the standard bunching method, which relies on the existence of a spike – or 'excess mass' – in the distribution of taxable income at, or around, an income threshold at which there is a discrete increase in the marginal tax rate. Subsection 3.2 considers the special characteristics of bunching in the context of couples.

[4] Gelber (2014, p.295) examines different responses by members of married couple households in Sweden (hence obtaining separate estimates of $\eta_{z_1,1-\tau_2}$, $\eta_{z_2,1-\tau_2}$ $\eta_{z_1,1-\tau_1}$ and $\eta_{z_2,1-\tau_1}$), but excludes non-married and single person households.

[5] In the case of regression methods applied to tax reforms, this suggests the need to allow for different responses for coupled versus non-coupled individuals, and to recognise that the 'treated' group of taxpayers when τ_1 changes may include partners in other tax brackets.

3.1 The Basic Approach

The foundation of the bunching approach is the result that the elasticity of taxable income is proportional to the 'excess mass' of the income density function around the income threshold, or kink point. Numerous formal derivations of this result are available, so only a brief description is given here.[6] Suppose the marginal rate over a given taxable income range is τ, and a new higher rate of τ_1 is introduced at the taxable income threshold of z_T, which is initially associated with a density of h_T. The proportion of people moving to z_T is denoted by the 'excess mass', B, measured as a proportion of the initial density, h_T; that is, $b = B/h_T$. The ETI, η, is obtained using:

$$\eta = \frac{B/h_T}{z_T \log\left(\frac{1-\tau_1}{1-\tau}\right)} \tag{6}$$

In practice, individuals for whom it is optimal to move to the threshold, z_T, cannot all be expected to locate precisely at the kink, given various frictions and optimisation errors. Observed spikes in the distribution of taxable income are often spread over a range of taxable incomes around each tax threshold. The range used to determine the values of B and h_T is typically selected visually, and may be symmetric or asymmetric around the threshold.

The remaining challenge is to determine the counterfactual densities over this range, since only the *ex post* distribution is observed. Following Chetty *et al.* (2011), a range of incomes either side of the income threshold is selected.[7] Individuals are grouped into income classes of equal size, and the relative frequency in each class, along with the associated arithmetic mean taxable incomes, are calculated. For convenience, the income values are transformed, by subtracting the threshold income and dividing by the income group width. Then, based on the resulting histogram, the range or 'window' defining the base of the spike is chosen. The counterfactual density function is obtained by fitting an n^{th} order polynomial to the observations, using a dummy variable to distinguish the base of the spike. The *ex ante* densities are obtained from the polynomial, by omitting the dummies, with an additional step to allow for the fact that the excess density in the spike has to come from the range of incomes to the right of the income threshold.[8] To achieve this last requirement, the predicted densities are adjusted such that the area contained by the counterfactual distribution is the same as that of the observed distribution. Finally, the excess density, b, is obtained as the difference between the counterfactual distribution and the actual distribution, over the

[6] For formal derivations see, for example, Saez (2010), Chetty *et al.* (2011) and Kleven (2016).

[7] Results are obtained using adaptations of the Stata code provided by Chetty *et al.* (2011) at http://www.rajchetty.com/papers-categorized/.

[8] In the case of some individuals in couples who would otherwise be in a different bracket from their partner, this is not necessarily true, as shown in the following subsection. However, this should not significantly affect the counterfactual density over the specified window.

chosen range of the spike.[9]

3.2 Bunching by Couples

There are potential opportunities for, and constraints on, bunching that are specific to individuals in couples. Consider, for example, the case of a couple with incomes in the absence of taxation of y_1 and y_2 where $y_1 > y_2$. Suppose a two-rate income tax is introduced with tax rates τ_1 and τ_2 applying respectively above, and below, a tax threshold, z_T, such that $y_1 > z_T > y_2$. Clearly, there is an incentive for the couple to share taxable income, z, by some combination of changes in real income earning and income shifting responses, such that $z_1 \leqslant z_T$. However, their ability to achieve this by reallocating income within the couple is constrained by the size of the income gap, $z_T - y_2$.

In particular, if $y_1 - z_T < z_T - y_2$, (or equivalently: $y_1 + y_2 < 2z_T$), it is possible for person 1 in the couple to shift taxable income to person 2 and locate exactly at $z_1 = z_T$. Person 2 remains below z_T with taxable income of $y_2 + y_1 - z_T$. Alternatively, if $y_1 - z_T > z_T - y_2$, the maximum reallocation, without person 2 shifting into the higher tax bracket, is $z_T - y_2$. That is, person 1 has an incentive to move to $z_1 = y_1 + y_2 - z_T$ instead of to z_T, while person 2's income increases to the threshold at z_T. Hence the location of any excess mass associated with the response of person 1 is determined by the partner's income, y_2, in relation to the threshold. In each of these cases, the elasticity for person 2 is negative, while for person 1 it is positive, as conventionally expected.

As with single individuals, the ability of a couple to reallocate income up to the maximum of $y_1 - z_T$ may be limited by various other frictions such as the nature of the tax law on income sharing, the extent of compliance enforcement, and the costs of coordinating taxable income-earning. However, for couples, the potential size of the income change associated with the location of the 'marginal buncher' is likely to be greater than for single individuals, due to the additional option to reallocate income to a lower income partner, while also generating an additional reason to bunch above z_T for person 1 in the couple; that is, giving rise to incomplete bunching. Furthermore, unlike the case for single individuals, there is an incentive for partners whose incomes would otherwise be below the tax threshold (with $y_2 < z_T$), to move up to the threshold such that $z_2 = z_T$.

It is also possible to observe both partners in a couple where $z_i > z_T$, who nevertheless benefit from the tax advantages of income shifting across partners. For example where, $y_1 > z_T > y_2$, such that there is a tax advantage to shifting $y_1 - z_T$ to person 2, legal

[9] When considering spikes at more than one kink, the elasticity at each threshold needs to be interpreted as conditional on the existence of the other thresholds which may influence the distribution over a range of incomes.

constraints on the shifting process may mean that this is achievable only by shifting more than $y_1 - z_T$ to person 2. Thus both partners are in the same tax bracket facing the higher marginal rate, τ_1.

Consider, for example, a couple whose labour earnings alone would put them in different tax brackets, but who also earn rental income. A common tax code requirement is that rental income must either be shared equally among partners (if the rental property is owned jointly) or by one partner only (if that partner is assigned sole ownership of the property). In this case, in order to reduce the couple's total tax liability, some rental income should be allocated to the otherwise lower-income person 2 (who would face τ_2 in the absence of any rental income). However, abiding by the tax code requires that either $z_2 > z_1$ or $z_1 > z_2$ may be observed, with more rental income allocated to person 2 than is strictly necessary to minimise their joint tax liability.

Hence, with a joint tax minimisation objective, individuals in couples may seek to bunch, but are observed to locate either in the same, or different, tax brackets. Income movements in response to the imposition of a (higher tax rate) income threshold could involve both decreases and increases in declared taxable incomes within the couple. In fact, as Table 1 shows, for the case of two individuals discussed above, where $y_1 > z_T > y_2$, bunching by both members of the couple in the same tax bracket is either a sufficient, or a necessary and sufficient, condition to achieve joint tax minimisation, depending on the size of both incomes, y_i, with respect to the threshold, z_T.[10]

Table 1: Conditions for Tax Minimisation

Income range	Tax min. condition	z_i: in same bracket?
$z_T < y_1 + y_2 < 2z_T$	$z_1 < z_T$; $z_2 \leqslant z_1$	necessary & sufficient
$y_1 + y_2 = 2z_T$	$z_1 = z_2 = z_T$	necessary & sufficient
$y_1 + y_2 > 2z_T$	$z_2 \geqslant z_T$; $z_1 \geqslant z_2$	sufficient

Table 1 shows that, as long as a couple's joint incomes are such that $y_1 + y_2 \leqslant 2z_T$, allocating individual taxable incomes, z_i $(i = 1, 2)$, such that both individuals are located in the same tax bracket, is a necessary and sufficient condition for tax minimisation by the couple. If $y_1 + y_2 > 2z_T$, being in the same bracket is sufficient but not necessary. However, in this latter case there is an incentive for the individual with lower income, y_2, to shift taxable income towards $z_2 = z_T$ from below. Increasing z_2 further such that $z_2 > z_T$ may also be tax minimising but is not necessary.

[10] As Creedy and Gemmell (2019) show, joint utility maximisation need not imply a tax minimisation strategy by the couple. However, where income shifting within the family is the easiest or least costly means of adjusting to a higher tax rate, such a tax minimising strategy provides a convenient approach to maximising post-tax incomes.

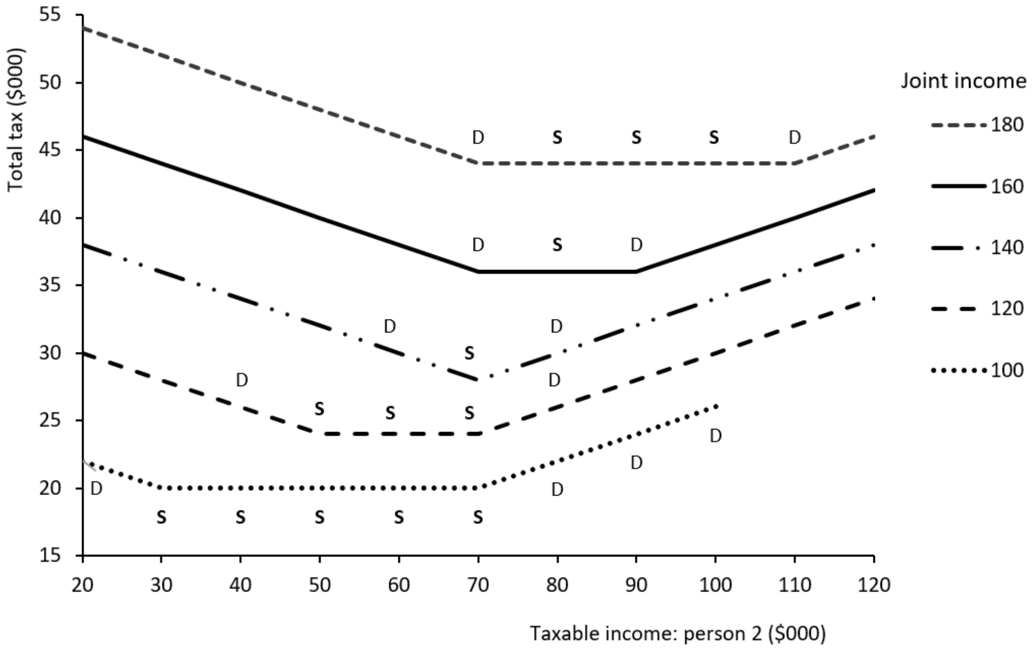

Figure 1: Tax-Minimising Taxable Income Allocation by Couples

These conditions are illustrated in Figure 1, in which there is a single threshold or tax kink at $z_T = \$70,000$, with marginal tax rates of 0.2 and 0.4 below and above the kink respectively. A combined income range, $y_1 + y_2$, from \$100,000 to \$180,000, is shown. Each profile in the figure represents a fixed combined income, with taxable income of the lower earner shown on the horizontal axis and total tax paid by the couple on the vertical axis. Labels 'S' and 'D' indicate whether the two individuals are in the same (S), or different (D), tax brackets. All points in the figure with no labels involve different tax brackets.

Figure 1 shows that, for combined incomes equal to or less than $\$140,000 = 2z_T$, tax minimisation requires both members of the couple to be in the same taxable income bracket. However, if combined income exceeds \$140,000 tax minimisation can also be achieved with some taxable income combinations involving different tax brackets. Nevertheless, to the extent that there is some uncertainty over future taxable incomes, a strategy that plans to locate both members in the same bracket reduces the risk that realised taxable incomes are not tax minimising, since this aims for each income at levels furthest from those that would lead to a higher tax liability. As Figure 1 shows, when locating in the same bracket is only sufficient for tax minimisation (for example, where $y_1 + y_2$ is \$160,000 or \$180,000), aiming for $z_1 = z_2$ (at \$80,000 and \$90,000 respectively) gives greatest scope for variations in z_i that nevertheless involve tax minimisation, but with z_1 and z_2 then located in different tax brackets.

These arguments suggest that, in addition to particular incentives for couples to bunch at the tax kink by suitable allocation of taxable income within the family, individuals in couples are most likely to bunch within the same tax bracket to the extent that, for a given joint income, they can reallocate taxable incomes. This further suggests that, in examining taxable income elasticities for couples, differences in the extent of bunching by couples observed in the same, or different, tax brackets could be expected. To the extent that there are constraints on income reallocation within the family (such as the legality, and monitoring, of income shifting, and differing income-earning abilities) this may limit the ability of couples to achieve taxable incomes within the same tax bracket. If those constraints are weak, greater observed bunching by couples where both individuals are in the same bracket may be expected, and *vice versa* when these constraints become binding. Before examining the empirical results, which allow for such a disaggregation, the following section introduces the New Zealand income tax structure and the dataset used.

4 The Income Tax Structure and Administrative Data

4.1 The NZ Income Tax

The New Zealand personal income tax system is relatively simple, with few deductions or allowances and no tax-free threshold. Individuals in couples are taxed separately, although social assistance is based on household income. Taxable income includes wage and salary earnings, self-employment income (shareholder salary, partnership), dividends, interest and rental income. Furthermore, pensions (including New Zealand superannuation payments) and other transfer payments are taxable. The income tax, like the Goods and Services Tax (GST), is characterised as having a broad base and relatively low rates.

Over the period of this study, 2000 to 2017, two significant reforms took effect, in 2001 and 2011, with a much smaller reform in 2009. The 2001 tax reform represented a substantial policy change after a few years of minor tax changes, and mainly involved the introduction of a new top marginal rate of 39 per cent applied to income above $60,000. The reform was announced on the 22nd December 1999, and the tax rate changes took effect in the 2001 tax year (1st April 2000 to 31st March 2001). As a result, taxpayers had some time between the announcement and implementation of the reform to adjust their incomes to some extent; see Claus *et al.* (2012) for discussion.

A further feature of the NZ tax system is the relative ease with which income taxpayers can legally shift income between the personal tax code, trusts, and the corporate income tax code. Since tax rates applicable to income earned in trusts or companies did not change with the 2001 reform (the relevant top rates remained at 33 per cent), this reform generated a particular incentive for higher personal income earners to shift income out of the personal income tax code.

Table 2 shows the pre- and post-reform tax rates and income thresholds. In 2001, the top tax rate, previously applied to individuals with taxable income above $38,000, was divided into two brackets with the 33 per cent rate applied to income between $38,001 and $60,000, and a new top rate of 39 percent for income above $60,000.These 2001 income thresholds and tax rates remain unchanged until the 2008 tax year (1st April 2007 to 31st March 2008).

A minor reform in 2009 raised the top rate threshold to $70,000, while reducing the marginal rate to 38 per cent for the 2010 tax year. The major tax reform in 2011, effective from 1st October 2010 (mid-way through the 2011 tax year), reduced all income tax rates and the company tax rate, raised the GST rate, and made numerous other small changes. The income tax rates imposed in 2011 were therefore composite rates reflecting an average of the two income tax regimes used during that year. The reformed tax structure has remained unchanged thereafter. A feature of the 2011 reform was that the top personal income tax rate, and the rate applied to income received through trusts, became aligned again at 33 per cent, but the company income tax rate was cut to 28 per cent. Hence, there remained tax advantages for income earned through companies.

Table 2: Marginal Tax Rates and Income Thresholds

2000 Tax Structure		2001 Tax Structure	
Income range	Marginal tax rate (%)	Income range	Marginal tax rate (%)
1–9,500	15	1–9,500	15
9,501–38,000	21	9,501–38,000	21
>38,000	33	38,001–60,000	33
		>60,000	39
2010 Tax Structure		2012 Tax Structure	
1–14,000	12.5	1–14,000	10.5
14,001–48,000	21	14,001–48,000	17.5
48,001–70,000	33	48,001–70,000	30
>70,000	38	>70,000	33

4.2 The Special Dataset

The data used here include tax register data for the full New Zealand population of taxpayers from the year, 2000 to 2017. They were extracted from Statistics New Zealand's large confidential research database, the Integrated Data Infrastructure (IDI). A number of administrative datasets within the IDI, including the Income Tax Register, were merged to form the final dataset employed in this study. The primary database covers the Inland

Revenue individual taxpayer population, containing detailed tax return information such as wage and salary earnings, self-employment income, pensions and capital income. Socioeconomic variables such as gender, age and ethnicity were then added to the primary dataset; see Appendix A for further details.

Largely due to the absence of joint income taxation in New Zealand, administrative data on taxable incomes are collected for individual taxpayers with no data on other family or household members' incomes. Thus the data cannot readily be matched within families or households.[11] However, within the IDI, census data on families which can be matched to individual taxable income data are available for only census year, 2013.[12] Censuses for 2001 and 2006 are stand-alone datasets available outside the IDI environment. The annual analyses below, for 2001 to 2017, use each census to match individuals to families for the three census years. For other years the nearest census is used. That is, 2001 is used to match data for 2001-03, 2006 is used for 2004-08, and 2013 is used for 2010 and 2012-17. While this probably imparts some inaccuracy for those non-census years, due to the formation and break-up of family relationships over the years prior to, and after, each census, the results below for excess mass and ETIs do not suggest values obtained for census years are systematically different from those obtained for non-census years. Robustness checks reported in Section 5 also consider the effect of using different census years (for example, using 2001 census relationship status to estimate ETIs for couples in 2004 and 2005).

The analyses reported below are restricted to individuals aged from 15 to 70, and cover the period 2001 to 2017. However, they exclude tax reform years 2009 and 2011 when composite tax rates applied due to mid-year tax changes.[13] Results for pooled samples are also reported for 2001-08 (before the 2009 reform) and for 2012-17 (after the 2011 reform). Empirical results relate to all individuals and separately for single individuals, those in couples and couples where the taxable incomes of both individuals put them in the same, or in different, tax brackets, reflecting the discussion in Sub-section 3.2. A further decomposition separates wage-earners from self-employed individuals, allowing testing of the hypothesis, supported in various other studies, that the self-employed display larger behavioural responses to taxation

[11]Some survey and administrative data in New Zealand, such as the 5-yearly census or annual Household Economic Survey, distinguish between families and households. The former involve familial relationships, such as parents and children, living in the same private dwelling; the latter involve independent individuals living at the same address, such as students or single professionals sharing accommodation. Thus a household may contain more than one family.

[12]New Zealand normally conducts censuses every five years. However due to the aftermath of the 2009 and 2010 Canterbury earthquakes, the 2011 census was postponed to 2013. Data from the next census in 2018 is not yet available in the IDI.

[13]Data for 2000 are not analysed since there was no tax kink at $60,000 in that year; the top tax kink was therefore at a lowly $38,000, at which marginal tax rates jumped from 24 per cent to a top rate of 33 per cent; see Table 2.

than employees.

Table 3 presents some summary statistics for the two pooled samples (2001-08 and 2012-17) of all individuals, and the two main decompositions: individuals in couples, and single individuals. There are a total of over 8 million observations in 2001-08, and 15 million in 2012-17; that is around 1 million observations per year during 2001-08 and 2.5 million per year during 2012-17. These represent a large fraction of the total NZ income taxpayers.

Table 3: Summary Statistics for the New Zealand Taxpayer Population

	2001–2008			2012–2017		
	All	Couples	Singles	All	Couples	Singles
Average taxable income ($)	31,846	39,317	24,955	45,584	55,555	36,954
Average age	41.8	46.7	37.3	42.2	46.0	38.9
Female (%)	52.0	50.1	53.8	50.0	50.1	49.9
Total observations[a] (millions)	8.348	4.006	4.343	15.027	6.971	8.055

a: Totals may not add exactly due to rounding.

Table 3 shows that average taxable income is generally substantially higher for individuals in couple families compared to single individuals. For example, in 2012-17, coupled individuals report around 50 per cent higher taxable incomes than singles. Coupled individuals are also around 6 to 7 years older on average than singles, and both groups are almost equally divided between males and females.

5 Bunching Estimates of Elasticities

This section presents bunching estimates of elasticities of taxable income at the top income tax threshold, or tax kink, over the period 2001 to 2017, with the years 2009 and 2011 omitted because of the complications explained in the previous Section. The two sub–periods, 2001 to 2008 and 2012 to 2017, follow the substantial top tax rate reforms, which initially raised the top rate from 33 per cent to 39 per cent, and then reversed the increase; see Table 2. The top threshold was set at $60,000 over 2001-2008 and at $70,000 over 2010-2017.

5.1 Excess Mass

Before turning to elasticity estimates, it is useful to consider the estimates of excess mass, b, because they display somewhat different patterns between the two periods, 2001-08 and 2012-17. Figure 2 summarises excess mass estimates for 2001-08 and 2012-17 for singles and couples. Details of the excess mass estimates are reported in Appendix B. The diagram plots average b values for all singles/couples, for the tax bracket-based couple decompositions, and

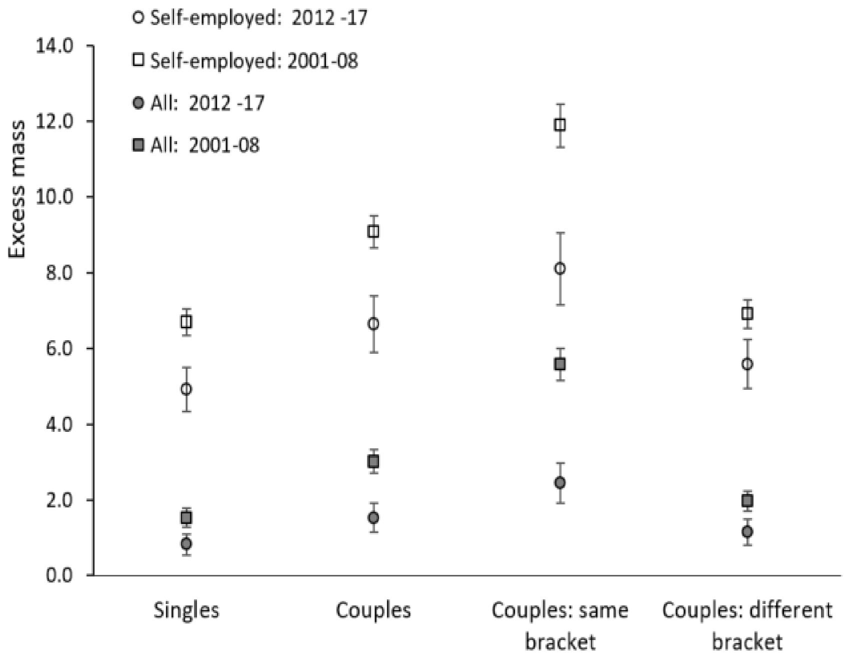

Figure 2: Excess Mass by Taxpayer Type, 2001-08 and 2012-17

equivalent values for the self-employed sub-samples. In each case, 95 per cent confidence intervals, based on bootstrap standard errors, are also shown. Unsurprisingly, given the sample sizes involved, these confidence intervals are generally small.

Recall that the values of b on the vertical axis represent the area (mass) of the observed distribution (in excess of the counterfactual distribution in the relevant window), as a ratio of the average mass of the counterfactual distribution within the window around the kink (in this case, $\pm$\$2,500). For example, for all single individuals in 2001-08 and 2012-17, Figure 2 and Appendix Table B.1 indicate values of b of 1.530 and 0.827; both are significantly different from zero. That is, excess mass is around 153 per cent and 83 per cent in the two periods respectively of the average counterfactual density around the kink.

A number of bunching features stand out in Figure 2. First, as expected the self-employed display larger excess mass values than those for all taxpayers. Second, b is significantly higher for coupled individuals compared to singles, and also for couples in the same tax bracket compared to those in different tax brackets.[14] Third, estimates of b are all smaller in 2012-17 compared to 2001-08. As shown below, this is a markedly different pattern from that

[14]Since these excess mass estimates relate to the top tax kink, coupled individuals in the same tax bracket who are both observed within the bunching region could either both be bunching just below the tax threshold or just above it. Couples in different tax brackets could also both be bunching, but each partner is observed just above, and just below, the kink. Of course, in either case (same or different brackets), only one member of the couple may be observed to bunch around the top kink while the other partner could be bunching at a lower kink or not bunching at all.

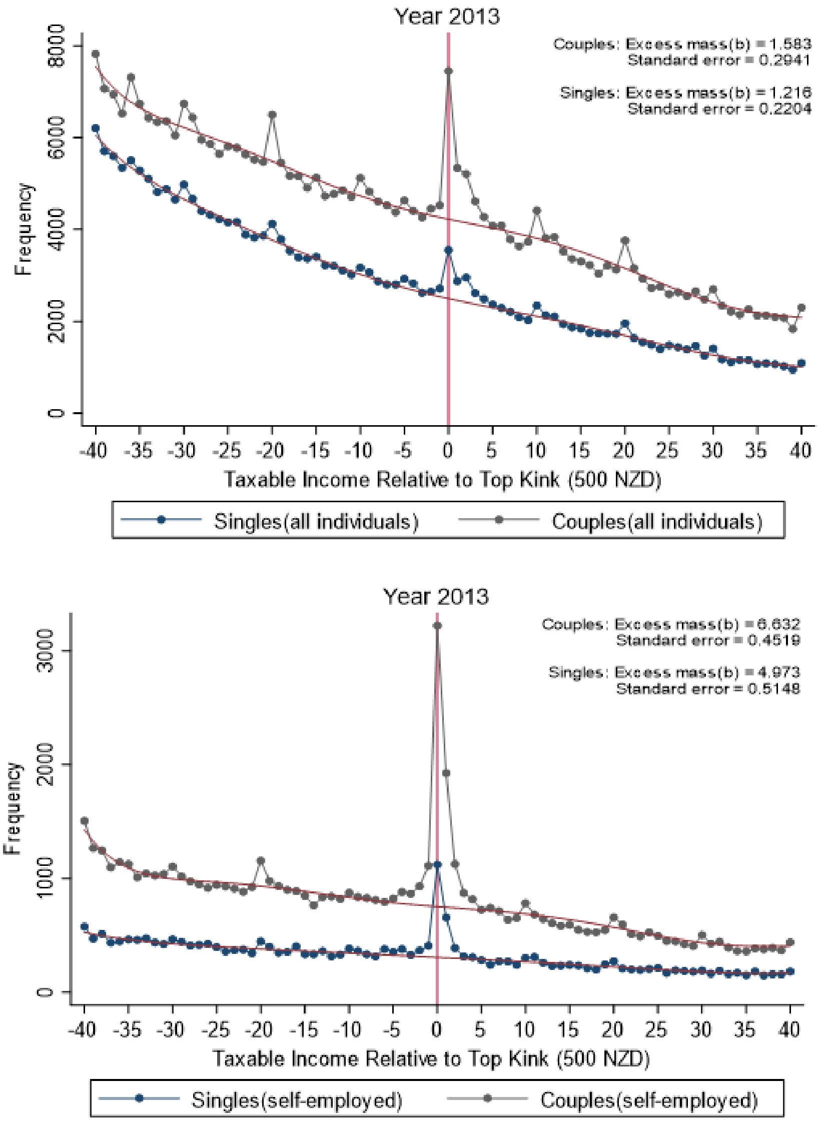

Figure 3: Bunching by Taxpayer Type, 2013

observed with ETI values. It would seem to indicate that, following the substantial reduction in the top marginal tax rate from 38 per cent to 33 per cent in 2011, bunching by all groups was much less than those before then.

The extent of bunching across different groups is illustrated in Figure 3 for 2013, the most recent year where census family relationship data yield an exact match with taxpayer data for the same year. This shows bunching by single and coupled individuals, across all taxpayers and for self-employed only. Two features again stand out. These are the larger relative bunching by couples compared to singles, and the larger bunching by the self-employed compared to all taxpayers combined (comparisons with wage-earners are discussed below when examining ETIs). A third feature of the figure is the evidence of round-number bunching, discussed by Kleven and Waseem (2013). That is, there is some evidence of small positive excess mass at ±10 (±\$5,000) intervals around the \$70,000 top tax kink.[15] This aspect, and its relevance for ETI estimates, is examined further in Section 6.

5.2 ETIs for All Taxpayers

Using the annual and pooled bunching results, the elasticity of taxable income in each case are derived using equation (6) which shows that the ETI is obtained by dividing the excess mass, $b = B/h_T$, by $z_T \log\left(\frac{1-\tau_1}{1-\tau}\right)$, where in this case τ_1 is the top tax rate with τ the rate immediately below. During 2001-2008, when the top threshold was set at \$60,000 and the top two marginal tax rates were 33 and 39 per cent, $z_T \log\left(\frac{1-\tau_1}{1-\tau}\right) \approx 11.3$[16] However, for 2012-17 the combination of the increased top threshold to \$70,000 and the reduced marginal tax rates to 30 and 33 per cent, yields $z_T \log\left(\frac{1-\tau_1}{1-\tau}\right) \approx 6.1$. That is, the denominator in the ETI expression almost halves between the two periods.

Resulting estimates for all single individuals and individuals in couples are shown in Table 4. For couples, results are also shown separately for those where both partners are observed to be in the same tax bracket, and for those in different tax brackets, in the relevant year.

Figures 4 and 5 respectively plot the elasticities over time for singles and couples, and for the couple decomposition. These results strongly confirm the *a priori* suggestion of higher elasticity values for coupled individuals compared to singles, and for couples with both partners in the same tax bracket. Figures 4 and 5 also indicate that, following the introduction of the higher top tax rate in 2001, ETI estimates increased over the next two to three years, reaching 0.368 for couples, and 0.274 for singles, in 2004. This increase

[15] With \$500 bins used here, the round number bunching observed at \$5,000 intervals (multiples of 10 on the horizontal axis) include reported taxable incomes within a ±\$250 range, such as from \$79,750 to \$80,250.

[16] This is obtained as $\log\left(\frac{1-\tau_1}{1-\tau}\right) = 0.094$, with $z_T = \$60,000$ divided by the \$500 income bin width ($= 120$).

Table 4: ETI Estimates for All Individuals

Year	Singles	Couples		
		All	Same bracket	Different brackets
2001	0.084	0.232	0.569	0.111
2002	0.071	0.312	0.596	0.196
2003	0.102	0.325	0.698	0.183
2004	0.274	0.368	0.665	0.257
2005	0.223	0.313	0.535	0.226
2006	0.143	0.254	0.442	0.179
2007	0.126	0.242	0.422	0.168
2008	0.069	0.153	0.293	0.091
Pooled (2001-08)	0.136	0.267	0.496	0.176
2010	0.098	0.137	0.247	0.099
2012	0.174	0.308	0.530	0.225
2013	0.198	0.258	0.454	0.183
2014	0.136	0.280	0.424	0.222
2015	0.114	0.229	0.350	0.178
2016	0.118	0.204	0.345	0.145
2017	0.096	0.225	0.331	0.178
Pooled (2012-17)	0.135	0.249	0.400	0.188

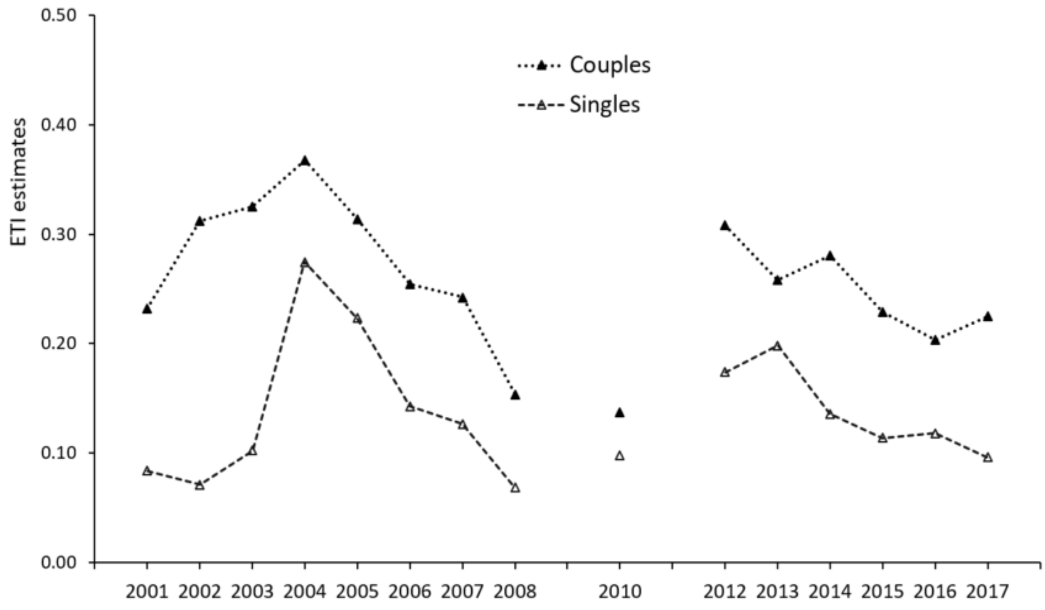

Figure 4: ETI Estimates for All Couples and Singles, 2001 to 2017

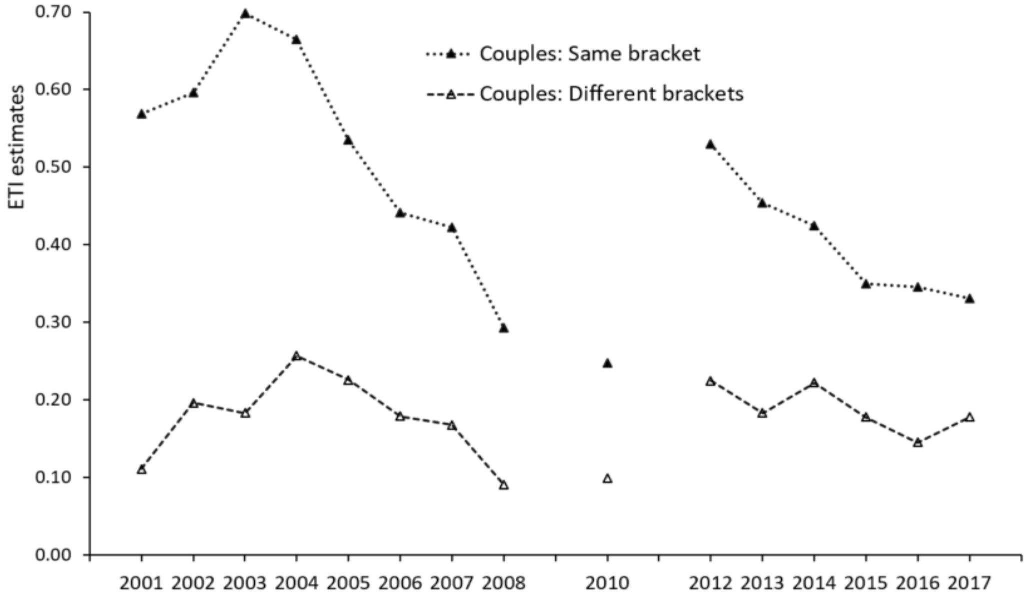

Figure 5: ETI Estimates for Couples by Tax Bracket, 2001 to 2017

probably reflects the relative ease with which personal income can legally be recharacterised in New Zealand, and the impact of the 2001 reform that is known to have led to a large diversion of income via an increase in incorporation by small firms and the self-employed, and a substantial growth in the use of family trusts.[17] Both companies and trusts were taxed at 33 per cent in this period, while the top personal rate was set at 39 per cent from 2001 to 2008.

After peaking in 2004, ETIs for both couples and singles appear to have fallen to 0.153 and 0.069 respectively by 2008. In the absence of major institutional or tax policy changes in this period, this trend may indicate that, following the large initial response induced by the 2001 tax reforms, ETIs became lower to some extent. During 2012-17, following the minor (2009) and major (2011) marginal tax rate reductions, annual ETI values for both couples and singles are higher than previously, unlike the patterns observed for excess mass estimates. This reflects the phenomenon noted above that the denominator in equation (6) fell from 11.3 during 2001-08 to 6.1 in 2012-17 in association with the reduced top marginal rate (and changed threshold). That is, less bunching at the top tax kink after 2012 was associated with a much smaller tax rate difference than previously, with the net effect increasing ETI estimates.

[17] See, for example, New Zealand Treasury (2009) and Buckle (2010) for discussion.

5.3 Self-Employed and Wage Earners

Table 5 reports elasticity values for self-employed and wage-earners separately, where the former are defined as personal income taxpayers with non-zero business income.[18] ETI values are set to zero where estimates of excess mass are negative, and estimates tagged with '#' are based on excess mass estimates that are insignificantly different from zero at the 5 per cent significance level. As can be seen from the table, both these properties are observed only for wage-earners. Figures 6 and 7 plot ETIs over 2001-17 for the self-employed.

As expected, ETIs are substantially higher for the self-employed, compared with wage-earners. For example, pooled 2012-17 values for singles and couples are 0.801 and 1.083 respectively for the self-employed, but are only 0.050 and 0.063 for wage-earning singles and couples respectively. Though these estimates are all based on excess mass values that are statistically different from zero (at the 5 per cent level), many annual ETI estimate for wage-earners are not significantly different from zero, especially during 2001-03 and from 2008 onwards. This is consistent with evidence from other countries suggesting that third-party reporting, tax withholding by employers, and other constraints on employees' ability to misreport taxable incomes, severely limit their behavioural responses; see, for example, Kleven *et al.* (2011), le Maire and Schjerning (2013), Kleven and Schultz (2014) and Kleven (2016).

ETI patterns over the period 2001-08 for both groups are similar to those found above for all taxpayers, rising to peaks around 2003, followed by declines to 2008. Furthermore, the ETI estimates for 2012-17 are higher than for the period 2001-08, though annual values over 2012 to 2017 are mostly declining. This suggests that the ETI value following the major reduction in the top marginal rate in 2011 may be lower than the initial response, as the reduced tax incentive towards bunching progressively took effect. This is particularly the case for couples, where tax incentives to locate in different tax brackets were much reduced after 2011. Nevertheless by 2017 all ETI values generally remain above their 2008 equivalents.

5.4 Summary of Results

The above results provide strong support for the two hypotheses that, first, ETIs are larger for individuals in couples compared with single individuals and, second, that ETIs are larger for couples where both partners are located in the same income tax bracket. Furthermore, self-employed individuals in couple families, who probably face fewer constraints on sharing income, reveal especially large ETIs. Table 6 summarises central ETI estimates, together

[18]This definition includes taxpayers with negative business income reflecting business losses in the year in question. Note that wage-earners can include partners of self-employed taxpayers who work in the family business and are paid only via wages.

Table 5: ETI Estimates: Self-employed and Wage Earners

Year	Singles	Couples		
		All	Same bracket	Different brackets
		ETI: Self-Employed		
2001	0.570	0.806	1.179	0.545
2002	0.646	0.993	1.206	0.816
2003	0.651	0.963	1.336	0.676
2004	0.738	0.896	1.215	0.667
2005	0.677	0.747	0.930	0.604
2006	0.542	0.721	0.915	0.570
2007	0.438	0.756	0.963	0.593
2008	0.534	0.675	0.890	0.494
Pooled (2001-08)	0.594	0.807	1.056	0.613
2010	0.486	0.501	0.754	0.356
2012	0.790	1.127	1.495	0.878
2013	0.811	1.081	1.407	0.856
2014	0.832	1.126	1.362	0.953
2015	0.825	1.076	1.259	0.944
2016	0.777	1.015	1.197	0.885
2017	0.777	1.074	1.240	0.948
Pooled (2012-17)	0.801	1.083	1.322	0.912
		ETI: Wage Earners		
2001	0.000	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000
2003	0.000	$0.043^{\#}$	0.095	$0.029^{\#}$
2004	0.170	0.158	0.230	0.137
2005	0.131	$0.151^{\#}$	0.240	0.124
2006	0.076	0.100	0.148	0.085
2007	0.075	0.085	0.124	0.072
2008	$0.007^{\#}$	$0.001^{\#}$	0.000	$0.004^{\#}$
Pooled (2001-08)	0.048	0.069	0.101	0.059
2010	$0.039^{\#}$	0.057	$0.070^{\#}$	0.053
2012	0.083	0.119	0.157	0.107
2013	0.112	0.080	0.114	$0.069^{\#}$
2014	$0.044^{\#}$	0.089	$0.076^{\#}$	0.094
2015	$0.025^{\#}$	$0.044^{\#}$	$0.039^{\#}$	$0.045^{\#}$
2016	$0.042^{\#}$	$0.025^{\#}$	$0.048^{\#}$	$0.016^{\#}$
2017	$0.018^{\#}$	$0.031^{\#}$	$0.005^{\#}$	$0.041^{\#}$
Pooled (2012-17)	0.050	0.063	$0.069^{\#}$	0.061

Notes: ETIs are set to zero where estimated $b < 0$.

$^{\#}$ indicates $b > 0$ not significance at 5% level.

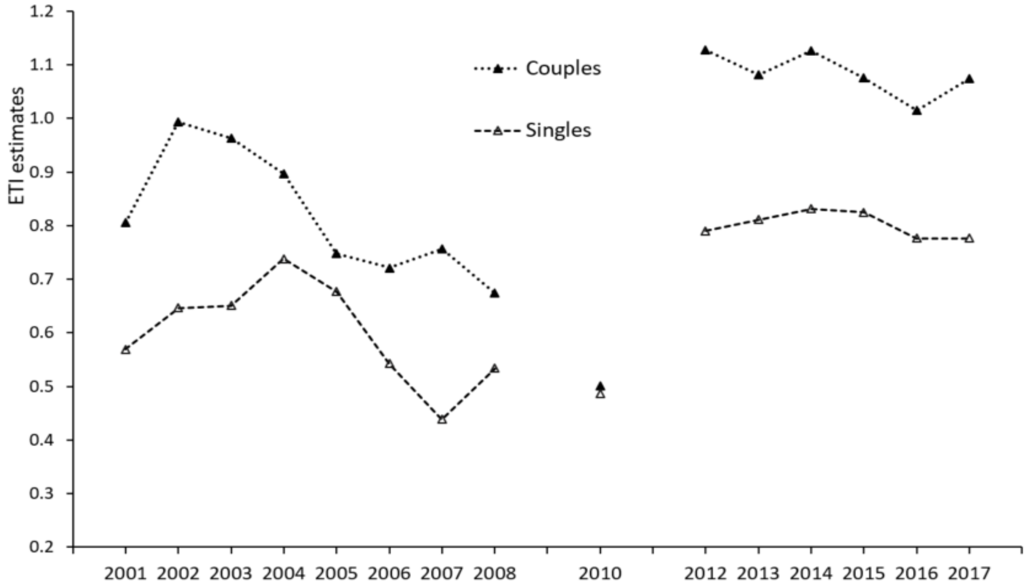

Figure 6: ETI Estimates for Self-Employed Couples and Singles, 2001 to 2017

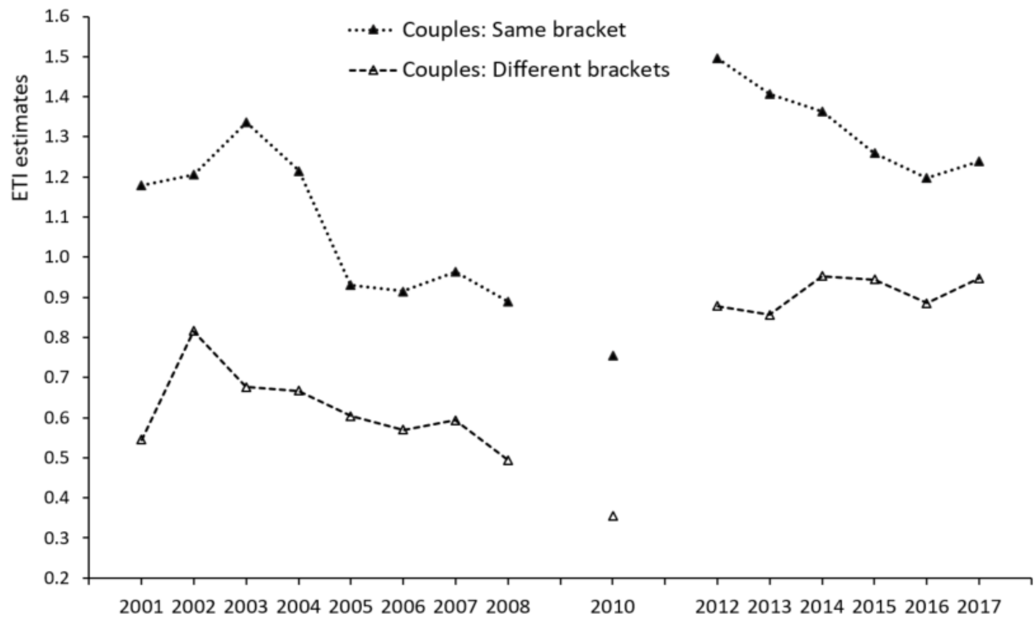

Figure 7: ETI Estimates for Self-Employed Couples by Tax Bracket, 2001 to 2017

with 95 per cent confidence intervals, for the four family groupings in the post-2011 period. Across all taxpayers these yield ETI estimates within the range of values commonly found in studies for other countries, namely around 0.14 to 0.4; see, for example, the survey by Saez *et al.* (2012). Similarly, ETI estimates for wage-earners are small across all four single and couple taxpayer groups, at around 0.06.

Table 6: Summary: ETI Pooled Estimates 2012-17

	Singles	Couples		
		All	Same bracket	Different brackets
All Individuals	0.135	0.249	0.400	0.188
(95% CI)	(0.090, 0.179)	(0.186, 0.313)	(0.314, 0.487)	(0.133, 0.243)
Self-employed	0.801	1.083	1.322	0.912
(95% CI)	(0.707, 0.896)	(0.960, 1.205)	(1.165, 1.478)	(0.806, 1.017)
Wage-earners	0.050	0.063	0.069	0.061
(95% CI)	(0.008, 0.091)	(0.008, 0.118)	(-0.003, 0.141)	(0.012, 0.111)

Estimates here for self-employed individuals suggest relatively high elasticities at 0.801 and 1.083 for both single and coupled individuals respectively. As hypothesised, these appear to be especially high for self-employed individuals where partners are observed to earn income in the same tax bracket, with an ETI point estimate of 1.322. ETI point estimates for couples where partners earn income in different tax brackets are also notably higher than similar single individuals (0.912 compared with 0.801); the difference in the underlying excess mass values is statistically significant.

These results for the self-employed are also consistent with evidence from the broader tax compliance literature that has tended to find much higher elasticities where there are both higher incentives and opportunities to evade or avoid tax; see, for example, Slemrod (2007), Kleven *et al.* (2011). They are also compatible with the known characteristics of the New Zealand income tax system whereby switching income between tax codes and across partners can be undertaken at relatively low cost, and where small (self-employment) businesses form a large fraction of personal taxpayers; see, for example, Alinaghi *et al.* (2019), Cabral *et al.* (2019). As a result the relatively high estimated ETI values are plausible in this context, and especially for couples given the known mechanisms which can be used to share income among partners in order to reduce their combined tax liability.

6 Robustness Testing

This section undertakes a number of robustness checks. These tests consider whether estimates, and differences among single and couple groups, are sensitive to the use of census relationship data for taxpayers based on a neighbouring year (where same-year census information is not available); whether the size of the bunching window selected affects results; and whether some observed top-threshold bunching reflects round-number bunching that is unrelated to the presence of a tax kink.

6.1 Census year sensitivity

As discussed earlier, with only three census years during the period of investigation in 2001, 2006 and 2013, it has been necessary to identify coupled individuals in each year during 2001-17 using the nearest available census. To test sensitivity to this assumption, equivalent bunching estimates were obtained using the nearest *prior* census to identify coupled individuals. That is, the 2001 census is used for ETI estimates in 2001-05; the 2006 census is used for 2006-12 and the 2013 census is used for 2013-17. The tax years affected by this change are 2004, 2005, 2010 and consequently, the two multi-year pooled estimates, 2001-2008 and 2012-2017.

Table 7 shows both sets of estimates for the four single and couple groups. It is clear that these are not sensitive to the choice of census year: the alternative estimates are almost always within 0.05 of previous estimates. Similar results (not shown) are obtained when the samples are restricted to self-employed taxpayers. Importantly, these alternative estimates do not change conclusions regarding the relative sizes of ETIs for singles versus couples, or among couple types.

Table 7: Testing Sensitivity to Census Years

Year	Singles	Couples		
		All	Same bracket	Different brackets
Previous ETI estimates (Table 4):				
2004	0.274	0.368	0.665	0.257
2005	0.223	0.313	0.535	0.226
2010	0.098	0.137	0.247	0.099
2012	0.174	0.308	0.530	0.225
Pooled (2001-2008)	0.136	0.267	0.496	0.176
Pooled (2012-2017)	0.135	0.249	0.400	0.188
Alternative ETI estimates:				
2004	0.253	0.407	0.705	0.292
2005	0.216	0.359	0.605	0.259
2010	0.065	0.145	0.291	0.096
2012	0.188	0.334	0.549	0.253
Pooled (2001-2008)	0.131	0.270	0.500	0.177
Pooled (2012-2017)	0.133	0.245	0.389	0.186

6.2 Bunching specification sensitivity

This subsection examines the sensitivity of the results provided earlier to three aspects of the excess mass calculation: the size of income groups chosen, the size of the bunching window adopted around the tax kink, and the degree of the polynomial selected to specify the counterfactual income distribution.

Table 8 first considers the effects of reducing the width of the income groups from $500 to $250, thereby doubling the number of discrete observations of the actual and counterfactual income distributions. To save space only estimates for the pooled datasets, 2001-2008 and 2012-2017 are reported; results for annual estimates are similar.[19]

Firstly, the change in the income group size, which doubles the number of income groups, is shown to have a negligible impact on ETI estimates. Secondly, Table 8 reports the effect of changing the bunching window to $[\pm4; \pm6]$. Again, ETIs appear to be robust to those changes in parameter size. Unsurprisingly, point estimates are slightly lower when a narrower bunching window is used, and slightly higher for a larger window; for example, ETI = 0.122 for 2012-2017 using the $[\pm4]$ window, while ETI = 0.141 when $[\pm6]$ window is used (ETI = 0.135 in the baseline case). Thirdly, using a potentially less flexible 6^{th}-order polynomial instead of 7^{th} has almost no effect on the ETI estimates. The table also confirms that reducing the order further to five leads to slightly lower estimates.

Table 8: Testing Sensitivity to Bunching Specifications

	Singles	Couples		
		All	Same bracket	Different brackets
2001-2008				
Baseline§	0.136	0.267	0.496	0.176
Income class width: $250	0.138	0.272	0.499	0.181
Bunching window: [-4,+4]	0.129	0.260	0.483	0.170
Bunching window: [-6,+6]	0.142	0.273	0.503	0.181
Order of polynomial: 5	0.126	0.263	0.493	0.171
Order of polynomial: 6	0.135	0.267	0.497	0.175
2012-2017				
Baseline§	0.135	0.249	0.400	0.188
Income class width: $250	0.142	0.262	0.421	0.197
Bunching window: [-4,+4]	0.122	0.234	0.378	0.175
Bunching window: [-6,+6]	0.141	0.257	0.403	0.197
Order of polynomial: 5	0.109	0.203	0.398	0.150
Order of polynomial: 6	0.134	0.248	0.333	0.187

§Baseline: income class width: $500; bunching window: [-5,+5]; polynomial degree:7.

[19] Annual results are available from the authors on request.

6.3 Round number bunching

A characteristic of bunching at the top kink, shown in Figure 3, is a tendency for some positive excess mass to exist at \$5,000 taxable income differences from the \$70,000 tax kink. This seems likely to be associated with the round-number bunching phenomenon stressed by Kleven and Waseem (2013), particularly for the self-employed. They suggest that this may be, ‘a side-effect of poor record keeping’ (p. 693).[20]

To quantify the impact of round number bunching, the present exercise focuses on the 2013 tax year. Excess mass at \$5,000 intervals around the top tax kink are obtained using the actual and counterfactual distributions illustrated in Figure 3.[21] These excess mass values capture individuals within the narrower interval $\pm\$250$ around each \$5,000 taxable income round number, as distinct from the larger $\pm\$2,500$ window within which excess mass associated with tax kink bunching was estimated above.

The results are illustrated in Figure 8. This shows excess mass values on the vertical axis and nine taxable income round number values, -40 to $+40$, (equal to $-\$20,000$ to $+\$20,000$ around the \$70,000 tax kink) on the horizontal axis. The excess masses shown at zero capture the portion, within the single group between \$69,750 and \$70,250, of the total excess mass previously estimated at the tax kink. For example, the top panel of Figure 8 shows excess mass at zero for coupled, self-employed taxpayers of 3.27, which is around half of the total excess mass around the tax kink of 6.632 shown in Table B.2. Compared to either of these tax kink excess mass values, the top panel of Figure 8 shows that bunching by the self-employed at round numbers either side of the kink is small: all values lie in the range 0.05 to 0.24. It therefore seems unlikely that round number bunching could account for more than a tiny fraction of the observed excess mass at zero (\$70,000).

However, for wage-earners in the lower panel of Figure 8, results are quite different. Recognising the difference in scale on the vertical axis, excess mass values either side of the kink range from 0.02 to 0.20, while the values at the kink are 0.11 for singles and 0.22 for couples. These latter values compare with total excess mass for wage-earners at the kink in 2013 of 0.680 for singles and 0.491 for couples; see Table B.2. Thus, for wage-earners, bunching precisely at $\$70,000 \pm \$250$ seems to be quite similar, if also small, to that observed at other salient, taxable income round numbers. Furthermore, in this case, round number bunching appears to account for a larger fraction, perhaps up to a half, of the observed

[20] See Kleven and Waseem (2013, pp. 693-694) for further discussion. In New Zealand’s case this record keeping explanation seems less likely to be important compared to Pakistan.

[21] Kleven and Waseem (2013) adopt a more sophiosticated method to separate round number bunching from tax notch bunching, using polynomial regressions that include dummies for each round number. This is more relevant in their case where there is considerable, systematic fluctuation at numerous data points in the actual taxable income distribution between many tax notches; See Kleven and Waseem (2013, pp.698-701.)

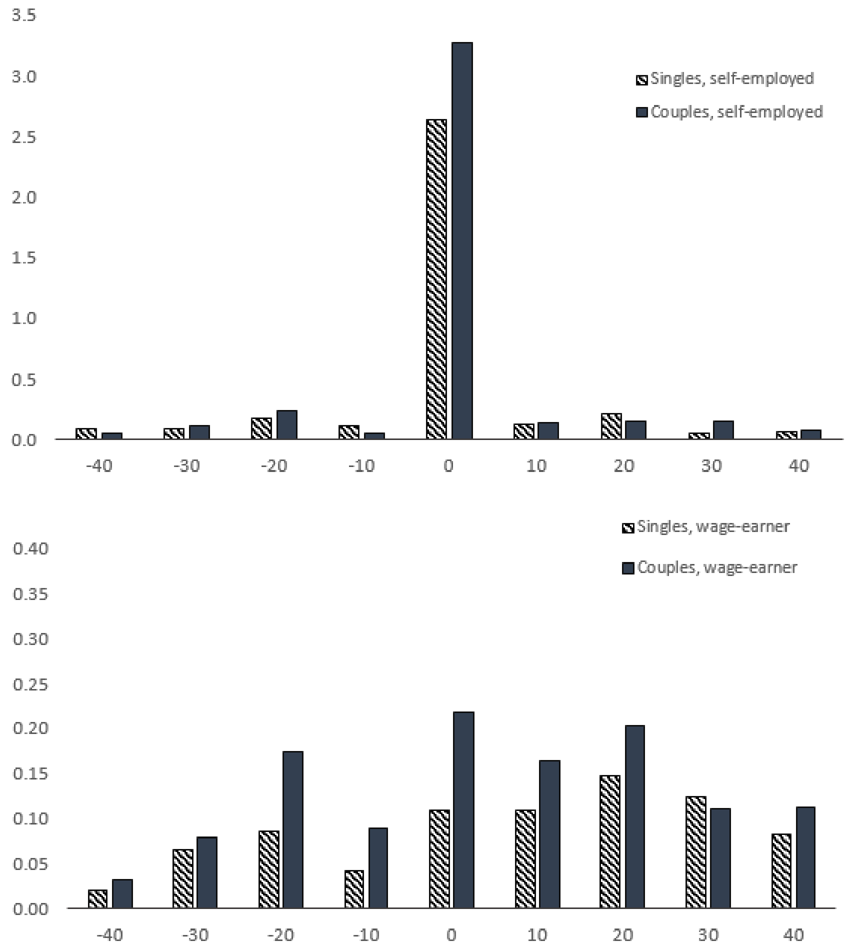

Figure 8: Excess Mass: Round Number Bunching

bunching by wage-earners at the tax kink.

Again, this is consistent with evidence from other studies which have found that wage-earners are much less able to adjust behaviour by engaging in bunching at or below tax kinks. However, unlike Kleven and Waseem (2013), who found evidence of much less round-number bunching by wage-earners compared with the self-employed in Pakistan, the evidence here suggests quite similar round-number bunching (apart from at the tax kink) by both types of taxpayer.[22] Nevertheless, these results suggest caution interpreting estimates of excess mass and ETIs for *employees* at tax kinks, without also considering the extent of round number bunching in the neighbourhood of those kinks.

7 Conclusions

Recent papers hypothesise that estimates of the elasticity of taxable income (ETI) for individuals may be biased where those individuals are taxed separately but some taxpayers are part of couple families. This was investigated here by applying the 'bunching at tax kinks' approach to estimate separate ETIs for partnered and single individuals, in association with the top marginal income tax rate. It was argued that there are specific opportunities for, and constraints on, bunching that are specific to individuals in couples. To test these hypotheses, administrative taxable income records for the New Zealand taxpayer population were matched to their partners using population census data. Excess mass and elasticity estimates were then obtained for various decompositions of single and coupled taxpayers.

The results provide strong evidence that ETIs are larger for partnered individuals compared with single individuals. It was also argued that where constraints on income sharing among partners are relatively weak, larger elasticities can be expected for couples where both partners are observed in the same income tax bracket. The evidence here again strongly supports this argument and appears to be consistent with known characteristics of the New Zealand income tax system that imposes relatively few constraints on intra-family income sharing. Self-employed individuals in couple families, who probably face fewer constraints on sharing income than partnered employees, reveal especially large ETIs.

When considering all taxpayers combined, the ETI estimates are within the range of values commonly found in studies for other countries, of around 0.14 to 0.4. Similarly, ETI estimates for wage-earners are small across all four single and couple taxpayer groups, at around 0.06. This also conforms with previous estimates for wage-earners subject to withholding tax

[22] Possible reasons for non-trivial round number bunching by employees in New Zealand may include a larger fraction of wage-earning employees working in family businesses with taxable income levels determined in conjunction with their self-employed partners, and/or institutional arrangements which disporportionately set annual salary levels (as distinct from hourly wage rates) at salient, round numbers.

and/or third-party reporting. Estimates here for self-employed individuals suggest relatively high elasticities at 0.80 and 1.08 for both single and coupled individuals respectively. Furthermore, as hypothesised, these appear to be especially high for self-employed individuals where partners are observed to earn income in the same tax bracket, with an ETI point estimate of 1.32. Nevertheless, ETI point estimates for couples where partners earn income in different tax brackets are only slightly higher than similar single individuals (0.912 compared with 0.801).

Again, these results for the self-employed are consistent with evidence from the broader tax compliance literature that has tended to find higher elasticities where there are both higher incentives and opportunities to evade or avoid tax. The relatively high estimated ETI values reported here are plausible, especially for couples given the known mechanisms which can be used to share income among partners and minimise tax. Finally, these large differences in estimated ETI values for singles and couples suggest that in attempting to understand the mechanisms, opportunities for, and constraints on, taxpayers' behavioural responses to tax kinks, it may be crucial to consider family structures and the ease with which incomes of family members can be earned and allocated within the family. This is also likely to be important for choices over the size and allocation of compliance enforcement activity and resources by tax authorities.

Appendix A: The New Zealand Couples Dataset

The database used for this study is the Integrated Data Infrastructure (IDI), maintained by Statistics New Zealand (SNZ). It is constructed by linking administrative and survey data sources at the individual level through a central 'spine'; see Statistics New Zealand (2014). It provides a large, anonymised, longitudinal database covering a wide range of data sources, including the Income Tax Register, since 1999.

Income tax liabilities in New Zealand are based on individuals, so household and family-level income variables are not collected for tax purposes. However, all main benefits are income and asset tested, for which the household information is required and collected.[23] The proportion of the working-age population receiving main benefits is about 9 to 10 per cent, and is obviously not representative of the overall national population. The IDI also includes several linked survey data sources such as the Household Labour Force Survey (HLFS) and the Survey of Families, Income, and Employment (SoFIE).[24] These datasets can be used to construct longitudinal family and household level income variables but cover small samples of the New Zealand population.

Some information on the relationships between individuals within households can be found in sources including New Zealand registrations of births, marriages, and civil unions from the Department of Internal Affairs; benefits information from the Ministry of Social Development; tax credit information from Working for Families; visa information from the Ministry of Business, Innovation and Employment; and Summary tables compiled from various administrative sources. However, these sources provide either formal relationships or at best a fraction of informal relationships.[25] According to a NZ government report, around one in five New Zealanders who are living in a relationship have chosen not to marry (336,591 people identified themselves as having a partner but not legally married in Census 2001).[26]

Census data provide a rich source of information on the characteristics of the population.[27] However, the only census linked to the IDI is 2013. This means that any change in household or family composition over time cannot be traced. Since the first year of income data in the IDI is 1999, the only two censuses available prior to 2013 and after 1999 are 2001 and 2006,

[23] The main benefits in New Zealand include, but not limited to, Jobseeker Support (JS), Sole Parent Support (SPS), and Supported Living Payment (SLP).

[24] Household Economic Survey (HES) also includes family/household level information but it provides cross-sectional data.

[25] While formal relationship includes legally registered marriage or civil union, informal relationship consists of de facto partnership, cohabitation, etc.

[26] For the full report see: https://www.beehive.govt.nz/release/questions-and-answers-civil-union-and-relationships-statutory-references-bills.

[27] In New Zealand, census are usually held every five years but the census scheduled for March 2011 was postponed for two years due mainly to the Christchurch earthquake in September 2010 and February 2011.

none of which is linked to the IDI.[28] The main problem with these datasets is that the date of birth, including year and month of birth, is not reported but instead an age variable is reported. This makes the linking process difficult, if not impossible. Two shortened versions of these datasets, including the date of birth, are provided by Statistics NZ.[29] The dates of birth are then added to the existing stand-alone censuses. Given that these datasets are anonymised, the main linking variables are date of birth (including year and month of birth), gender, and usual residence (meshblock code).[30]

The number of individuals in Census 2001 and 2006, after dropping duplicate records, are 3,769,257 and 4,083,147, respectively. The records with missing values for the main linking variables also needed to be excluded from the dataset. This includes records with missing dates of birth (year and month of birth) and records without residential information. Therefore, the number of records for the Census 2001 and 2006 decrease to 3,547,311 and 3,916,803, accordingly. The final step before linking is to check whether these records are unique with respect to the linking variables. After this step, the number of records is 3,230,085 and 3,525,789 for the 2001 and 2006 Census.

In the IDI, address information for each individual is collected from various sources such as Ministry of Health (PHO and NHI registers), Ministry of Social Development, Ministry of Education, ACC (Accident Compensation Corporation), and Inland Revenue.[31] As a result, an individual may appear several times in the address table if the residential address is recorded differently on different sources.[32] In order to be able to compare the area classification over time, a meshblock concordance table is used for mapping. Finally, personal details such as date of birth and gender are added to the residential address.

The Census data derived from the earlier steps are then linked to the administrative data (IDI spine) using the linking variables. However, it is possible that one Census record is linked to more than one IDI record due to the similarity in linking variables such as sex, date of birth and address.[33] These records are therefore excluded from the final datasets and the number of linked individuals for Census 2001 and 2006 become 1,920,474 and 2,296,980.

The next step is to identify (among those linked) couples with both spouses linked to

[28] These are available as stand-alone datasets and Statistics NZ will provide access upon request.

[29] Statistics NZ agreed to provide a shortened version of censuses including the date of birth (this does not include the day in the date of birth) along with 17 other requested variables such as sex, ethnicity, family role, legal and social marital status, qualification, income and occupation.

[30] Meshblocks are the smallest geographical areas in NZ standard geographical classification, representing roughly 30 to 60 dwellings and/or 60 to 120 residents.

[31] PHO and NHI refer to Primary Health Organisation and National Health Index, accordingly.

[32] For the 2001 Census, the residential addresses with notification date prior to 1st January 2006 are collected. The date corresponding to 2006 Census is 1st January 2007.

[33] The existence of the name and day in the date of birth may improve the linking substantially but these are not provided due mainly to the confidentiality concerns.

Table 9: Role within Family Group

Code	Role
00	Not in a Family Group
01	Parent or Partner/Spouse
02	Child
03	Grandparent in Parent Role
11	Other Person in Parent Role
12	Child not with Real Parent
50	Unable to Code

the administrative data. In order to be able to compare the elasticity of taxable income for this group of individuals with their single counterparts, the identification of both groups are required. To do so, a variable containing information on the role within the family group is used: see Table 9. There are 305,688 couples (611,376 individuals) and 1,044,969 singles, based on the 2001 Census, who are successfully linked to the administrative data. According to the 2006 Census, the number of couples is 384,330 (786,660 individuals) and 1,259,556 singles in 2006.

Appendix B: Further Details of Excess Bunching

This Appendix provides more detail on annual and pooled estimates of the extent of bunching by various taxpayer groups over the 2001 to 2017 period, for which it is possible to match individual taxpayers within the same family.

Estimates of excess mass for all taxpayers combined, together with associated standard errors, are reported in Table B.1 (all taxpayers) and in Table B.2 (self-employed taxpayers). These estimates provide more detail than those shown in Figure 2 for the two pooled sub-samples for 2001-08 and 2012-17. Figures B.1 and B.2 plot the annual estimates together with 95 per cent confidence intervals respectively for singles and couples and for the two couple types; Figures B.3 and B.4 plot equivalent estimates for the self-employed.

Table B.1: Excess Mass Estimates: All Individuals

Year	Singles		Couples					
			All		Same bracket		Different brackets	
	Excess mass	s.e.	Excess mass	s.e.	Excess mass	s.e.	Excess mass	s.e.
2001	0.944	0.398	2.612	0.328	6.406	0.679	1.246	0.273
2002	0.802	0.376	3.515	0.297	6.715	0.475	2.207	0.280
2003	1.152	0.299	3.656	0.300	7.859	0.573	2.059	0.280
2004	3.090	0.326	4.139	0.285	7.487	0.591	2.888	0.239
2005	2.514	0.260	3.529	0.267	6.026	0.405	2.539	0.290
2006	1.605	0.247	2.862	0.229	4.975	0.397	2.016	0.205
2007	1.422	0.212	2.728	0.221	4.754	0.323	1.890	0.216
2008	0.772	0.198	1.724	0.221	3.296	0.306	1.024	0.219
Pooled (2001–08)	1.530	0.155	3.011	0.185	5.583	0.256	1.978	0.166
2010	1.064	0.303	1.487	0.358	2.685	0.544	1.077	0.312
2012	1.066	0.264	1.891	0.297	3.250	0.432	1.380	0.266
2013	1.216	0.220	1.583	0.294	2.782	0.389	1.121	0.269
2014	0.832	0.216	1.719	0.265	2.603	0.367	1.360	0.245
2015	0.697	0.173	1.402	0.244	2.146	0.347	1.092	0.215
2016	0.723	0.172	1.249	0.227	2.117	0.345	0.892	0.198
2017	0.590	0.173	1.379	0.249	2.029	0.365	1.092	0.219
Pooled (2012 -17)	0.827	0.167	1.529	0.237	2.454	0.323	1.153	0.205

Note: t-ratios for all excess mass estimates exceed 2.

The evidence in Figures B.1 and B.3 suggest consistently that excess mass estimates for coupled individuals are greater than for single individuals and, as the vertical scales in the two figures reveal, for both taxpayer types excess mass values for the self-employed are much larger than for all taxpayers combined. The two Figures also indicate that, following the introduction of the higher top tax rate in 2001, excess mass estimates generally increased over

Table B.2: Excess Mass Estimates: Self-employed and Wage Earners

Year	Singles		Couples					
			All		Same bracket		Different brackets	
	Excess mass	s.e.	Excess mass	s.e.	Excess mass	s.e.	Excess mass	s.e.
				Self-Employed				
2001	6.413	0.558	9.077	0.362	13.270	0.694	6.140	0.381
2002	7.277	0.492	11.180	0.371	13.580	0.806	9.189	0.408
2003	7.329	0.532	10.840	0.480	15.040	0.906	7.612	0.545
2004	8.309	0.558	10.090	0.482	13.680	0.823	7.512	0.433
2005	7.618	0.518	8.414	0.412	10.470	0.571	6.799	0.443
2006	6.107	0.584	8.119	0.402	10.300	0.649	6.416	0.413
2007	4.935	0.439	8.512	0.425	10.840	0.625	6.675	0.455
2008	6.010	0.488	7.594	0.451	10.020	0.579	5.558	0.461
Pooled (2001-08)	6.692	0.215	9.089	0.256	11.890	0.351	6.905	0.232
2010	5.280	0.532	5.443	0.515	8.192	0.871	3.861	0.417
2012	4.846	0.509	6.914	0.477	9.169	0.735	5.385	0.460
2013	4.973	0.515	6.632	0.452	8.626	0.659	5.251	0.434
2014	5.100	0.475	6.904	0.531	8.353	0.675	5.843	0.493
2015	5.057	0.450	6.596	0.510	7.723	0.678	5.791	0.458
2016	4.763	0.473	6.226	0.476	7.340	0.626	5.427	0.471
2017	4.763	0.415	6.588	0.550	7.602	0.786	5.811	0.525
Pooled (2012-17)	4.915	0.354	6.641	0.458	8.104	0.585	5.591	0.394
				Wage-earners				
2001	-0.592$^{\#}$	0.468	-0.678$^{\#}$	0.373	-1.175$^{\#}$	0.777	-0.556$^{\#}$	0.315
2002	-0.867	0.430	-0.166$^{\#}$	0.340	-0.434$^{\#}$	0.568	-0.092$^{\#}$	0.313
2003	-0.314$^{\#}$	0.318	0.487$^{\#}$	0.330	1.073$^{\#}$	0.653	0.331$^{\#}$	0.287
2004	1.913	0.346	1.779	0.265	2.584	0.554	1.548	0.237
2005	1.478	0.271	1.696$^{\#}$	2.788	2.707	0.469	1.394	0.295
2006	0.852	0.252	1.125	0.236	1.661	0.395	0.956	0.224
2007	0.844	0.225	0.955	0.218	1.401	0.360	0.805	0.209
2008	0.074$^{\#}$	0.200	0.006$^{\#}$	0.208	-0.103$^{\#}$	0.284	0.045$^{\#}$	0.213
Pooled (2001-08)	0.538	0.158	0.776	0.184	1.139	0.261	0.662	0.166
2010	0.426$^{\#}$	0.299	0.620$^{\#}$	0.342	0.757$^{\#}$	0.491	0.577	0.310
2012	0.508$^{\#}$	0.257	0.731	0.281	0.961	0.402	0.655	0.256
2013	0.684	0.216	0.491$^{\#}$	0.281	0.701$^{\#}$	0.364	0.420$^{\#}$	0.262
2014	0.267$^{\#}$	0.209	0.548	0.237	0.466$^{\#}$	0.321	0.575	0.227
2015	0.154$^{\#}$	0.160	0.268$^{\#}$	0.212	0.241$^{\#}$	0.296	0.277$^{\#}$	0.196
2016	0.255$^{\#}$	0.171	0.151$^{\#}$	0.211	0.294$^{\#}$	0.336	0.100$^{\#}$	0.183
2017	0.112$^{\#}$	0.167	0.193$^{\#}$	0.221	0.033$^{\#}$	0.325	0.254$^{\#}$	0.197
Pooled (2012 -17)	0.304$^{\#}$	0.155	0.388$^{\#}$	0.206	0.422$^{\#}$	0.269	0.376	0.185

Note: t-ratios for excess mass estimates exceed 2 except those marked with $^{\#}$.

the next three to four years. For self-employed coupled individuals in Figure B.3, this seems to have occurred relatively quickly with the highest excess mass value, 11.2, in 2002 before a gradual decline to 7.6 in 2008. For singles, however, whether self-employed or all singles combined, excess mass values reach a peak in 2004 before declining similarly to 2008. This may reflect greater difficulties experienced by singles, and especially single employees, setting up suitable income shifting arrangements from 2001, compared to self-employed couples for whom income sharing within the household was relatively low cost following the top marginal rate rise.

Interestingly, during 2012-17, following the minor (2009) and major (2011) marginal tax rate reductions, annual excess mass values for all taxpayer types remain lower and relatively stable. For the self-employed, all excess mass values appear lower than their values during 2001-08. This provides some vindication for the 2011 reforms. These were designed in part to improve tax compliance by top rate taxpayers via reductions in the top personal marginal rate and alignment of that rate with the rate applicable to family trusts, which had been a common destination for diverted income; see Buckle (2010).

Figures B.2 (all individuals) and B.4 (self-employed individuals) distinguish bunching estimates for partners who are observed in the same, or different, tax brackets, with full details in Tables B.1 and B.2. It can be seen that, as with the distinction between singles and couples in general, within couple families there are big differences in each year between those with partners in the same or different brackets. Like the pooled evidence in Figure 2, there is strong support for the hypothesis that couples where both partners earn income in the same bracket have substantially higher excess mass values. Indeed, for all taxpayers, values for coupled individuals in different tax brackets in Figure B.2 are quite similar to those for equivalent single individuals in Figure B.1.

It is also clear, however, especially from Figures B.1 and B.2, that the large differences which emerge soon after the 2001 top tax rate increase, tend to diminish during 2003-08, and after the 2011 reform excess mass values are more similar between the two couple types, though differences in annual excess mass estimates remain statistically different. Figure B.4 reveals a similar pattern for self-employed couples, though differences in the scale of the vertical axis again confirm that the value of the excess mass is much larger for self-employed couples, almost certainly reflecting the relative ease with which such coupled individuals can reallocate taxable income within the family in response to tax rate differences.

Though these figures do not show separate excess mass estimates for wage-earners, these are given in Table B.2, which confirms that excess mass for wage-earners is not generally significantly different from zero, especially during 2012-17. However, some wage-earner excess mass estimates display positive, significant values mainly during 2004-07, the years when

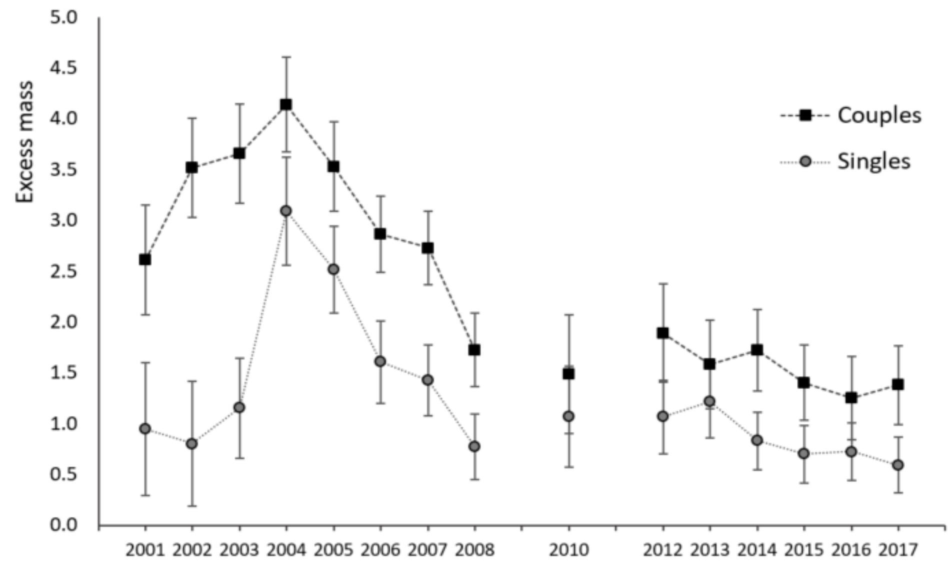

Figure B.1: Excess Mass for All Couples and Singles, 2001 to 2017

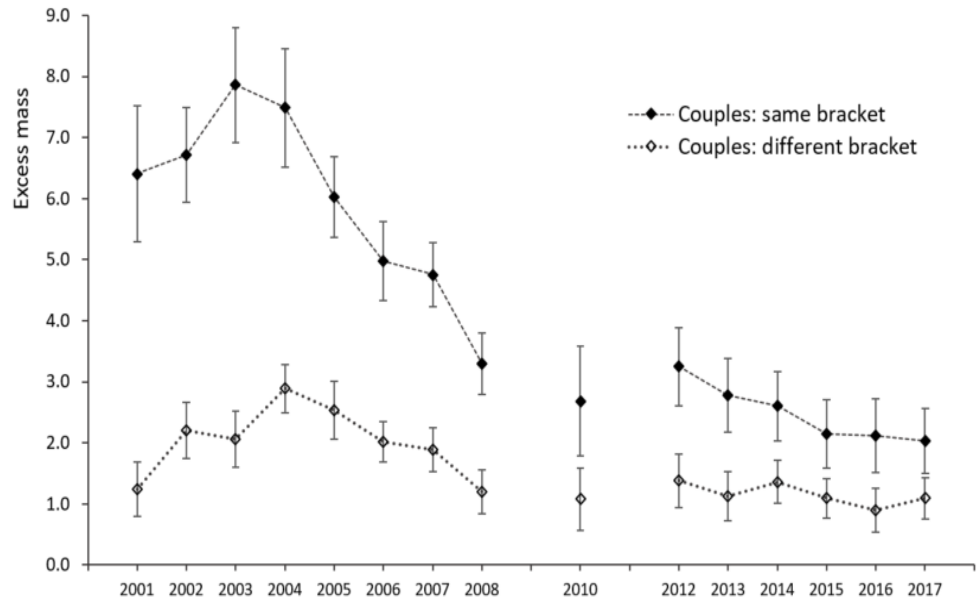

Figure B.2: Excess Mass for All Couples by Tax Bracket, 2001 to 2017

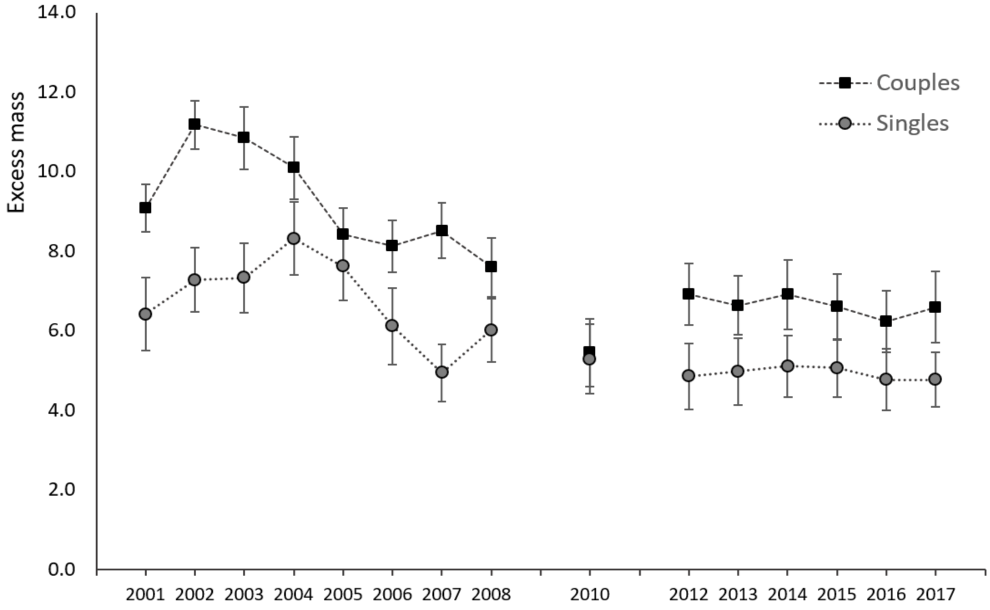

Figure B.3: Excess Mass for Self-Employed Couples and Singles, 2001 to 2017

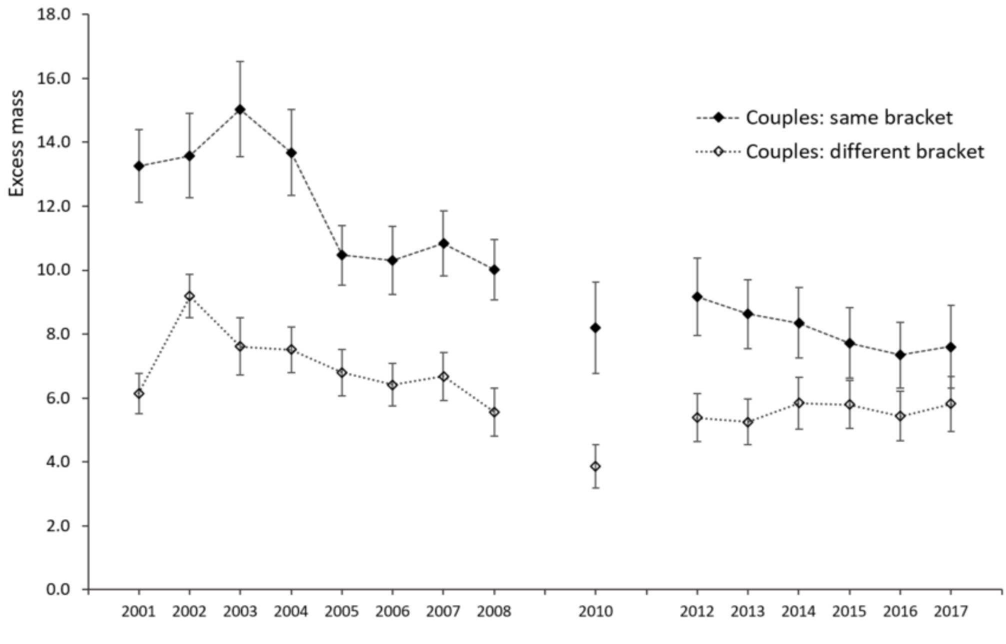

Figure B.4: Excess Mass for Self-Employed Couples by Tax Bracket, 2001 to 2017 there is evidence of larger excess masses for taxpayers in general. This may partly reflect the fact that where self-employed taxpayers pay themselves and/or their partners a wage, they can appear within the wage-earner category if they do not also receive non-zero business income. This phenomenon was most likely to occur during the immediate post-2001 reform period when avoidance efforts associated with the increased top marginal tax rate were greatest, as described by New Zealand Treasury (2009), Buckle (2010).

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