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Elasticity of reported donations: Bunching evidence from New Zealand*

Amy Cruickshank†

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ELASTICITY OF REPORTED DONATIONS:
BUNCHING EVIDENCE FROM NEW ZEALAND

Abstract

This study analyses the effects of donation tax credits on individual donation decisions using a New Zealand donation tax credit scheme and population-wide New Zealand administrative data. The scheme provides taxpayers with a tax credit for donations up to a set ceiling. Reforms to the scheme increased the ceiling in 2003 and then removed the ceiling in 2009. The study obtains two main results. First, we observe substantial bunching of reported donations at the ceiling for donation tax credits. This translates into an elasticity of reported donations of around -0.7 to -0.4 with respect to 1 minus the donation tax credit rate. Second, we find compelling evidence that some of the observed bunching is due to reporting effects rather than a real change in donations behaviour. This implies estimated elasticities provide an upper boundary on the actual donation response, as reporting effects will only increase the estimated elasticity. The absolute value of the estimated elasticity is less than 1, indicating the tax credit is not 'Treasury efficient' - the increase in donations due to the tax credit is less than foregone tax revenue of the government.

ELASTICITY OF REPORTED DONATIONS: BUNCHING EVIDENCE FROM NEW ZEALAND

1. Introduction

Almost all governments provide tax incentives for charitable giving (see OECD, 2020 for a survey of donation tax incentives in OECD and selected countries).[1] By foregoing tax revenue to encourage charitable giving governments are extending an indirect form of support to charities so that they can provide goods and services that are beneficial for society. The effectiveness of tax incentives in stimulating charitable giving remains an important and unresolved public policy question. The elasticity of charitable giving measures the responsiveness of donations to changes in the marginal price of giving and is widely used in assessing behavioural responses to donation tax incentives, where the marginal price of giving $1 from after-tax income is defined as one minus the donation tax credit or deduction rate. Tax incentives can generally be considered 'Treasury efficient' where the price elasticity is greater than one in absolute value (where the increase in donations due to the tax incentive is less then foregone tax revenue of the government).

The literature is yet to come to a consensus as to whether donation tax incentives are an efficient way for the government to support the funding of charities. Earlier U.S. studies using cross-sectional data typically obtained elasticities greater than one in absolute value, implying tax incentives were Treasury efficient, whereas recent studies using panel data and studying tax incentive schemes outside of the U.S. have tended to obtain lower price elasticities. The contribution of this study is to shed light on this question using quasi-experimental variation in the price of giving created by a New Zealand donation tax credit scheme.

Cross-country evidence suggests that New Zealand is one of the most generous countries in the world. New Zealanders donate an estimated 0.79% of Gross Domestic Product (GDP) to charity, second only to the United States. More than half of New Zealanders surveyed in 2020 reported that they donated money in the previous month, ranking New Zealand 9th out of the 114 countries surveyed (Charities Aid Foundation, 2016, 2021).[2]

[1] All OECD and select participating countries surveyed for the report provide some form of tax incentives to encourage charitable giving. Donation tax deductions and credits are the most common forms of tax incentive. Matching schemes are less common (where the government tops up the donation amount). Ceilings on tax incentives are generally set as a fixed amount, and/or as a percentage of taxable income. For countries offering tax credits, the tax credit rate ranges from 25% of the amount donated (Sweden, Portugal, Columbia) to 66% (France).

[2] There are many factors that have been found to influence how much individuals donate to charity, asides from tax incentives. This includes an individual's preferences for giving (altruism, the 'warm glow' from giving, and religiously motivated giving), an individual's resources (income and wealth), and their social environment and interactions (exposure to fundraising campaigns, workplace support, and community norms) (Andreoni & Payne, 2013).

The New Zealand donation tax credit scheme provides taxpayers with a tax credit for donations made to charities and other eligible organisations. Under the scheme, individuals receive a 33.3333% tax credit for donation amounts made from after-tax income, up to a set ceiling. The donation tax credit rate is the same for all taxpayers irrespective of their taxable income. The fixed ceiling for donations eligible for tax credits was increased in 2003, and then removed in 2009.[3]

The scheme generates sharp quasi-experimental variation in the price of giving as the marginal price of donating from after-tax income increases from 1-t to 1 for donations above the ceiling, where t is the donation tax credit rate. Hence, it provides a powerful way of identifying the effect of tax incentives on the amount donated using bunching methods. The amount of bunching at policy threshold indicates how responsive individuals are to the change in the price of giving at the threshold and is used to estimate the elasticity of donations. The bunching approach is described in section 5.

The New Zealand donation tax credit scheme presents two important advantages when identifying donations elasticities compared to the schemes previously studied. Firstly, the tax credit is a fixed rate, irrespective of an individual's taxable income. This means that there is not the same potential to conflate price and income effects as with schemes offering a tax deduction for charitable giving, as in US or Australia, where the donation tax deduction is larger and the price of giving therefore lower, for taxpayers with higher taxable incomes.

Secondly, this study has the advantage of using the distribution of reported donations following the removal of the fixed ceiling to estimate the counterfactual case. Previous studies have estimated the counterfactual case using donations data during periods when a binding ceiling is in place throughout (see for example Fack and Landais, 2016). The bunching method compares the actual empirical distribution of reported donations around a policy threshold where the marginal price of giving changes, to an estimated counterfactual, where the marginal price of giving is unchanged. The 2009 reform of the New Zealand donation tax credit scheme removed the fixed ceiling for donations eligible for tax credits. This reform meant that for most taxpayers the marginal price of giving became 1-t for all donation amounts. The distribution of donations following the 2009 reform reveals where reported donations would locate in the absence of the policy cut-off, and so provides an ideal setting to estimate the counterfactual case.

For this analysis we have obtained access to administrative data for the full population of New Zealand donation tax credit claimants since 2000. The data includes information on the amount donated, annual taxable income of the donor, and demographic variables (age and gender).

[3] The fixed NZ$1,500 ceiling for donations eligible for tax credits was increased to NZ$1,890 in 2003, and then removed in 2009. From 2009 donation amounts up to an individual's annual taxable income became eligible for tax credits. NZ$1≈$US0.67.

Our analysis of the New Zealand donation tax credit scheme yields two main empirical results. First, reported donations are observed to locate ('bunch') at the ceiling of donations eligible for tax credits. This suggests that for a fraction of individuals the reported donation amount responds to the change in the marginal price of giving at the cut-off point. The observed bunching of reported donations translates into an elasticity (responsiveness) of reported donations of around -0.7 to -0.4 with respect to 1 minus the donation tax credit rate.

Secondly, we find compelling evidence that some of the observed bunching is caused by taxpayers under-reporting donations to the tax authorities when the fixed ceiling was in place. Although taxpayers are asked by the tax authorities to report "the total amount paid in donations to approved charities" during the tax year, as taxpayers obtain no tax credit benefit from reporting true donation amounts more than the ceiling, there is a strong theoretical argument to expect that some taxpayers will only report the donation amount that is eligible for tax credits.

When examining the distribution of reported donations, we observe that the far-right tail of the donation distribution is thinner when the ceiling was in place than after the ceiling is removed, suggesting that taxpayers located to the cut-off from the far-right of the donation distribution. If bunching was only caused by a change in actual donations behaviour, then we would expect the change in the marginal price of giving at the ceiling to only effect donations of taxpayers within a narrow window of the ceiling.

Lastly, we observe that there was a one-off upward adjustment (+25% increase) in donations reported to the tax authorities following the 2009 reform, whereas donations received by major charities appear to continue following the previous trend. If the increase in donations reported to the tax authority was mostly due to an actual increase in donations, then we would expect to see a similar upward-adjustment in the donations that charities receive.

The estimated elasticity of reported donations provides an upper boundary on the elasticity of actual donations since reporting effects will only increase the amount of bunching and the estimated elasticity. As the upper bound of the estimated elasticity of actual donations is less than 1 in absolute value, this indicates the tax credit is not Treasury efficient as the increase in donations due to the tax credit is less than foregone tax revenue of the government. This means that when considering the reduced cost of the donation because of the tax credit, donors will on average keep some of the saving and give some away in the form of a larger donation amount.

The study finds that the reported donations of younger taxpayers (less than 25 years old) and prime aged taxpayers (25- to 55-year-old) are more responsive to the price of giving than older taxpayers (55+ years). There is no difference in the elasticity of reported donations by taxable income decile or by gender. Examining donations behaviour following the 2003 and 2009 reforms of donation tax credits, taxpayers reported donations were slow to adjust to the 2003 reform that increased the fixed ceiling for donations eligible for tax credits, and this had the effect of lowering slightly the excess mass at the new threshold. By contrast, taxpayers reported donations responded almost immediately to the major 2009 reform that removed the fixed ceiling for donations eligible for tax credits.

The structure of this study is as follows: Section 2 reviews the previous literature. Section 3 describes the New Zealand donation tax credit scheme. Section 4 describes the administrative data we use and presents summary statistics for the population of New Zealand donation tax credit claimants. Section 5 lays out a conceptual framework. Section 6 describes the empirical method. Section 7 presents the main results, and actual and reporting effects are discussed in section 8. Further results are presented in Section 9. Section 10 concludes.

2. Literature Review

Although a large body of empirical literature has studied donations responses to tax incentives, the literature has yet to come to a clear consensus. Earlier studies from the United States used cross-sectional data and took advantage of the contemporaneous variation in the tax price of giving between individuals paying different marginal income tax rates to estimate the elasticity of donations. Because the tax price and income are jointly determined, these studies often suffered from identification problems. These studies may also be subject to omitted variable bias, if there are unobserved factors that affect individual donation decisions, for example moral and social beliefs, that are correlated with other regressors. Cross-sectional studies typically estimated price elasticities of -1.5 on average (see for example, Feldstein and Taylor, 1976, and Clotfelter, 1985).

Since then, studies using panel data have tended to find smaller price elasticities. Panel data studies have the advantage of examining changes in the price of giving over time, as the result of changes in tax policy, which is more independent of income. Studies can also use individual fixed effects to help control for time-invariant unobserved factors that may affect individual donation decisions. The standard panel data model estimated is:

$$\ln(donations_{it}) = \alpha_i + \alpha_t + \beta_0 \boldsymbol{X}_{it} + \beta_1 \ln P_{it} + \beta_2 \ln Y_{it} + \varepsilon_{it} \qquad (1)$$

Where i indexes individuals or households, t indexes years. The dependent variable ln $(donations)_{it}$ is the log of charitable donations plus $1 to deal with the taxpayers that do not claim tax credits. $\ln P_{it}$ is the log of the price of donations, and $\ln Y_{it}$ is the log of income, after-tax and before donations. To control for unobserved influences on donations that differ across individuals but are constant over time, fixed effects are included for each taxpayer (α_i). To control for influences on donations that change in the same way over time for everyone, year effects are included (α_t). The primary variables of interest in (1) are the log of the price of donations, and the log of after-tax income. β_1 can be interpreted as the price elasticity of demand of charitable donations. β_2 can be interpreted as the income elasticity of demand of charitable donations. X is a vector of control variables.[4]

In countries that offer tax deductions for charitable donations, and have a progressive income tax regime, a larger donation amount may push a donor into a lower marginal income tax bracket, and therefore reduce the value of the tax deduction. Studies deal with this endogeneity issue by defining the price of giving as the first dollar price of giving, rather than the marginal price. The first dollar price of giving is close to the marginal price in most cases and is independent of the donation decision (Feldstein, 1975). The Peloza and Steel (2005) meta-analysis of four decades of studies finds the mean elasticity from studies using panel data is -1.0.

Bakija and Heim (2011) use a panel of US tax return data from 1979-2006 to estimate the elasticity of donations. The study includes taxpayers in states that face a different price of giving due to different state level tax regimes (as well as the usual differences due to differences in taxable incomes). The study introduces lagged and future changes in the log price of donations as regressors in (1), so that β_1 can be interpreted as the effect of an increase in the price of giving, holding previous and future changes in the price of giving constant. The study finds an elasticity of donations in response to a persistent change in the price of giving of more than -1.0 in absolute value.

Several studies have utilized a difference-in-differences approach to estimate the elasticity of donations by comparing the change in donations of two groups of taxpayers that are thought to have similar observable and non-observable characteristics, but where a ‘treatment’ group of taxpayers faces a change in the marginal price of giving and a ‘control’ group of taxpayers does not. Under the assumption that the two groups would have experienced parallel trends in donations in the absence of the tax price change, the approach removes the common time trend and recovers the average effect of the price change on the treatment group (the average treatment effect on the treated).

Fack and Landais (2010) compares a treatment group of French households that experienced a decrease in the tax price of giving (due to legislated increases in the donation tax credit rate in 2003 and 2005) to a control group of households whose tax price of giving is unchanged (price equal to 1, as household is just below the taxable threshold due to family size). The two groups of households have similar income, but different tax status due to family size. The study obtains elasticity estimates of between -0.2 and -0.6. The study discusses the potential concern about the accuracy of reported donations of households with no taxable income as these households have no financial incentive to report their donations to the tax authority. Fack and Landais find a substantial number of non-taxable households

[4] Studies generally use data either from individual tax returns or surveys. Tax return data is generally considered to more accurately reflect donations made by individuals (survey responses may overstate donations) but provides less information on donor characteristics. Where available, studies have included socio-demographic (marital status, presence of children, age, gender, education, religious attendance, volunteering), economic (employment status) and regional control variables.

still report donations (12% of non-taxable households compared to 20% of taxable households). They also note that the identification strategy does not require that all donations are reported, merely that the same fraction of donations are reported over time.

Almunia,et al., (2020) compares recorded donations of United Kingdom taxpayers that faced a decrease in the tax price of giving in 2010, due to changes in marginal tax rates, to taxpayers whose marginal tax rate was unchanged. The United Kingdom system is economically equivalent to a tax deduction for charitable donations, but the charity and in certain cases, the individual taxpayer, claims the tax incentive (called 'matching' or 'gift aid').[5] The study estimates separately the effect of the price of giving on taxpayers' decisions to donate (the extensive margin) and the amount donated (the intensive margin) and finds an extensive margin elasticity of about -0.1 and an intensive margin elasticity of -0.2, yielding a total elasticity of about -0.3.[6]

Fack and Landais (2016) is one of the few studies to use a bunching approach to estimate the elasticity of donations. Their study examines the 1975 to 1988 period in France when donations eligible for tax deduction were capped at 1% of taxable income. The eligibility threshold created a kink in the budget set due to the marginal price of donations jumping from 1-t to 1 for donations above 1% of taxable income (where t is the marginal tax rate faced by the taxpayer). The study is primarily concerned with examining how the level of tax enforcement affects donations elasticities. The study compares the period 1975 to 1979 when taxpayers were required to hold onto donation receipts for audit purposes, to the period 1984 to 1988 when taxpayers were required to submit donation receipts to claim the donation tax deduction. The study finds that the requirement to submit donation receipts resulted in a substantial drop in the amount of donations reported to the tax authorities, as well as a decline in the elasticity of donations, which is estimated at -0.282 during the pre-reform period and -0.042 during the post-reform period. The study argues that it is more likely that donations were over-reported to the tax authorities prior to the reform than were under-reported after the reform (due to additional reporting costs), since the fraction of taxpayers that reported small donations increased after the reform and the fraction that reported large donations declined, whereas reporting costs would be expected to stymie small donations more than large donations.

The standard modelling approach outlined in equation (1) is not suitable given the New Zealand policy context. The marginal price of giving is endogenous in New Zealand, as larger donation amounts above

[5] Eckel and Grossman (2003) use a dictator game experiment to examine the influence that the framing of the donation subsidy has on the amount that an individual chose to contribute. The study finds that when the equivalent subsidy is framed as a match (as in the United Kingdom) donations subsidies result in larger contributions (1.2 to 2 times larger) compared to when the subsidy if framed as a rebate.

[6] The study estimates the intensive-margin response using an equation like (1) for taxpayers with strictly positive donations and including in the sample a 'treatment' group of taxpayers that were affected by the 2010 reform and a 'control group' that were not. The extensive-margin response is estimated with an equation like (1) except that the dependent variable is a dummy that takes on the value of one if positive donations are observed, and zero otherwise.

the cut-off for tax credits attract a higher marginal price of giving. However, the first dollar price of giving cannot substitute for the marginal price of giving, as it is the same for all taxpayers with taxable income.[7]

This study is the first study to estimate the elasticity of donations using the New Zealand donation tax credit scheme. It is also one of the first studies to use a bunching approach to estimate the elasticity of donations. The New Zealand donation tax credit scheme imposes a ceiling on donations eligible for tax credits, which creates a large discrete change in the marginal price of giving at the policy threshold. Reported donation amounts are observed to locate ('bunch') around the ceiling. The amount of bunching at policy threshold indicates how responsive individuals are to the change in the price of giving at the threshold and so this study uses the observed bunching to estimate the elasticity of donations.[8]

3. Institutional Background

In this section I describe the tax incentives for charitable giving in New Zealand. Note that income is taxed at the individual level in New Zealand, and the tax year starts on April 1st and ends on March 31st of the following year. For simplicity, I refer to the tax year 1999/2000 as 2000, and similarly for the other years.

The New Zealand donation tax credit scheme provides individual taxpayers with a tax credit of 33.3333 cents for every $1 of eligible cash donations made from their after-tax income. To be eligible for tax credits, donations must be of $5 or more and less than a set ceiling. The ceiling is the lower of the individual's annual taxable income, or a specified fixed ceiling.

The fixed ceiling for donations eligible for tax credits was $1,500 in the year 2000 and increased to $1,890 in 2003. The fixed ceiling for donations eligible for tax credits was removed in 2009. From 2009 onwards, donations up to an individual's annual taxable income were eligible for tax credits. Except for a small fraction of taxpayers wanting to donate more than their annual taxable income, the 2009 reform

[7] Work is underway to use a difference-in-differences identification approach to examine the effect of the 2009 donation tax credit reform on reported donations in New Zealand. This will involve comparing the change in the donation amount of taxpayers that faced a decline in the marginal price of giving because of the 2009 donation tax credit reform (those donating narrowly above the cut-off for donations eligible for tax credits prior to the reform), to taxpayers that were largely unaffected by the reform (those donating narrowly below the cut-off prior to the reform).

[8] The bunching approach was originally developed by Saez (2010) and Chetty, Friedman and Pistaferri (2011) to examine the responsiveness of taxable income to changes in marginal income tax rates. The bunching approach also has application in other areas and settings where a policy results in a discrete change in the slope of budget sets at certain policy thresholds (Kleven, 2016).

had the effect of removing the ceiling for donations eligible for tax credits. Table 1 summarizes the donation tax credit structures in place over the study period.

Table 1: Donation tax credit rates[1] (NZ dollars)

2000-2002 donation tax credit structure		2003-2008 donation tax credit structure	
Donation range	Donation tax credit rate (%)	Donation range	Donation tax credit rate (%)
5-1,500	33.333333	5-1,890	33.333333
>1,500	0	>1,890	0
2009-present donation tax credit structure			
>5	33.3333		

Source: Inland Revenue Department.

Note: (1) Rates for eligible donations less than an individual taxpayer's total taxable income.

The process for individuals to claim donation tax credits was largely unchanged over the study period. Individual taxpayers apply for tax credits by submitting a tax credit claim form to the tax authorities, and reporting "the total amount paid in donations to approved charities" during the tax year. Claimants are required to attach the original donation receipt(s) either in their own name, or the name of their spouse/partner. Receipts must be issued by an eligible organisation. Most eligible organisations are registered charities, but other organisations also qualify, such as most schools. Taxpayers have up to four years to claim donation tax credits.[9]

Tax credit claims are assessed by the tax authorities at the end of the tax year once the individual's annual taxable income is known. Donation tax credits are then paid by the tax authorities into the individual's nominated bank account.

From January 2010, the government introduced another way for individuals to claim donation tax credits, by allowing individuals to make donations through workplace payroll giving schemes and have their 'pay as you earn' tax obligation immediately reduced by the tax credit amount.[10] Payroll giving is not a focus of this study because it had not yet been introduced when the fixed ceiling for donations

[9] Donation tax credit claims are assessed against an individual's taxable income in the tax year during which the donation is made.

[10] PAYE (pay as you earn) withhold tax scheme makes regular income tax deductions from an individual's paycheck before it is received by the individual. Payroll giving reduces the PAYE tax obligation by the donation tax credit amount.

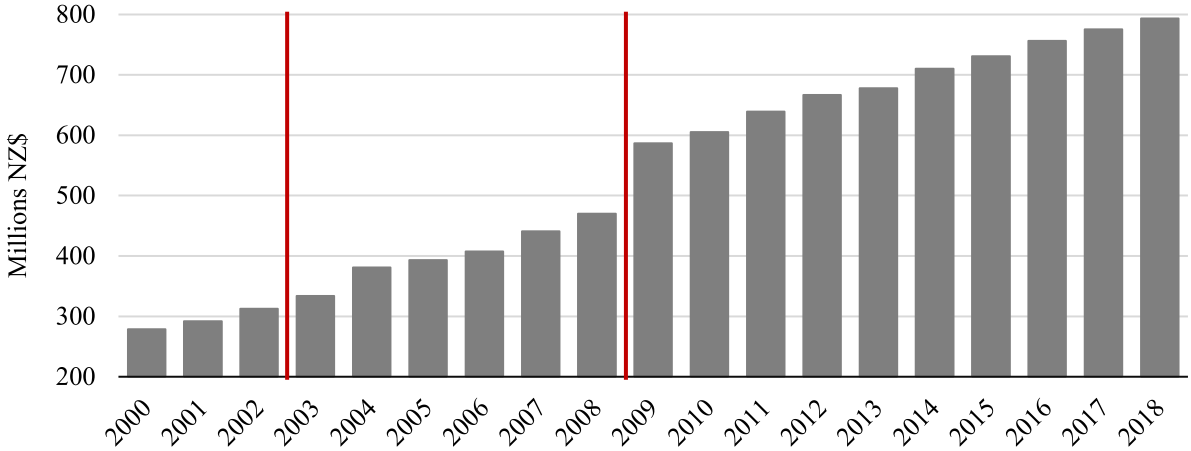
eligible for tax credits was in place, and it only represents around 2 percent of donation tax credit claims and less than 1 percent of reported donations.[11]

4. Data and Summary Statistics

This study utilizes data on the full population of New Zealand donation tax credit claimants over the period 2000-18, obtained from New Zealand Inland Revenue. Data are available on claimant's total donation amount, annual taxable income, and demographic characteristics (age and gender).[12]

Figure 1 shows the total donation amount reported to the tax authorities by year. The fixed ceiling on donations eligible for tax credits was lifted to \$1,890 from \$1,500 in 2003 and then removed in 2009. The amount of reported donations increased following the reforms by 6.8% in 2003 (14.2% in 2004) and 24.8% in 2009.[13]

Figure 1: Total donations reported on tax credit claim forms



Note: Total donation amount reported to the New Zealand tax authorities in millions of NZ\$. Data is obtained from tax credit claim forms and payroll giving (NZ\$1≈US\$0.67). The 2003 reform increased the fixed ceiling for donations eligible for tax credits to NZ\$1,890 from NZ\$1,500, and the 2009 reform removed the NZ\$1,890 ceiling (reform periods demarcated by vertical red lines).

Source: Inland Revenue Department, author calculations.

[11] From 1 April 2019 individuals can apply for donation tax credits by submitting receipts to the tax authority online. Receipts can be submitted during the year. Tax credits are paid after the end of the tax year once an individual's annual taxable income for the year is known.

[12] Analysis is undertaken at an individual level, as tax credits are implemented at an individual level, and there is insufficient data to identify individuals as part of households. Over the study period, there is no data available on which entities or types of organisations individuals donate to.

[13] In inflation-adjusted terms (base period 2017), reported donations increased by 4.0% in 2003 (12.5% in 2004) and 20.1% in 2009.

Table 2 presents summary statistics for the population of New Zealand tax credit claimants. Over the study period 11 to 13 percent of taxpayers claim donation tax credits each year. The mean reported donation amount was $1,101 during the period 2000-02, $1,319 during the period 2003-08 and increased to $1,890 in the post-2009 reform period.

Taxable income of donation tax credit claimants is higher on average than for taxpayers that do not claim donation tax credits.[14] Donation tax credit claimants donated 2.0% of their income on average 2000-02, 2.4% 2003-08 and 3.0% 2009-18.

Donation tax credit claimants are around 10 years older on average than taxpayers that do not claim donation tax credits. The average age of claimants increased over the study period, as existing claimants aged, and were not supplemented by new younger taxpayer-donors sufficiently to maintain the average age. The average age of a donation tax credit claimants increased from 52.1 years 2000-02, to 52.7 years 2003-08 and 54.9 years 2009-18. Female taxpayers are more likely than males to claim donation tax credits.

Table 2: Summary statistics for population of New Zealand donation tax credit claimants

Variables	**2000-2002**	**2003-2008**	**2009-2018**
% Taxpayers that claim	12.7%	11.9%	11.0%
Average reported donation (NZ$)	$1.101	$1,319	$1,890
Average taxable income (NZ$)	$55,428	$55,997	$63,119
Average reported donation as share of average taxable income (%)	2.0%	2.4%	3.0%
Average age	52.1	52.7	54.9
Percent female	54.2%	55.3%	55.6%
Average #obs per year	380,792	388,680	388,906

Note: NZ dollar values in real NZ$, base period 2017.

Source: Inland Revenue Department, Statistics New Zealand, author calculations.

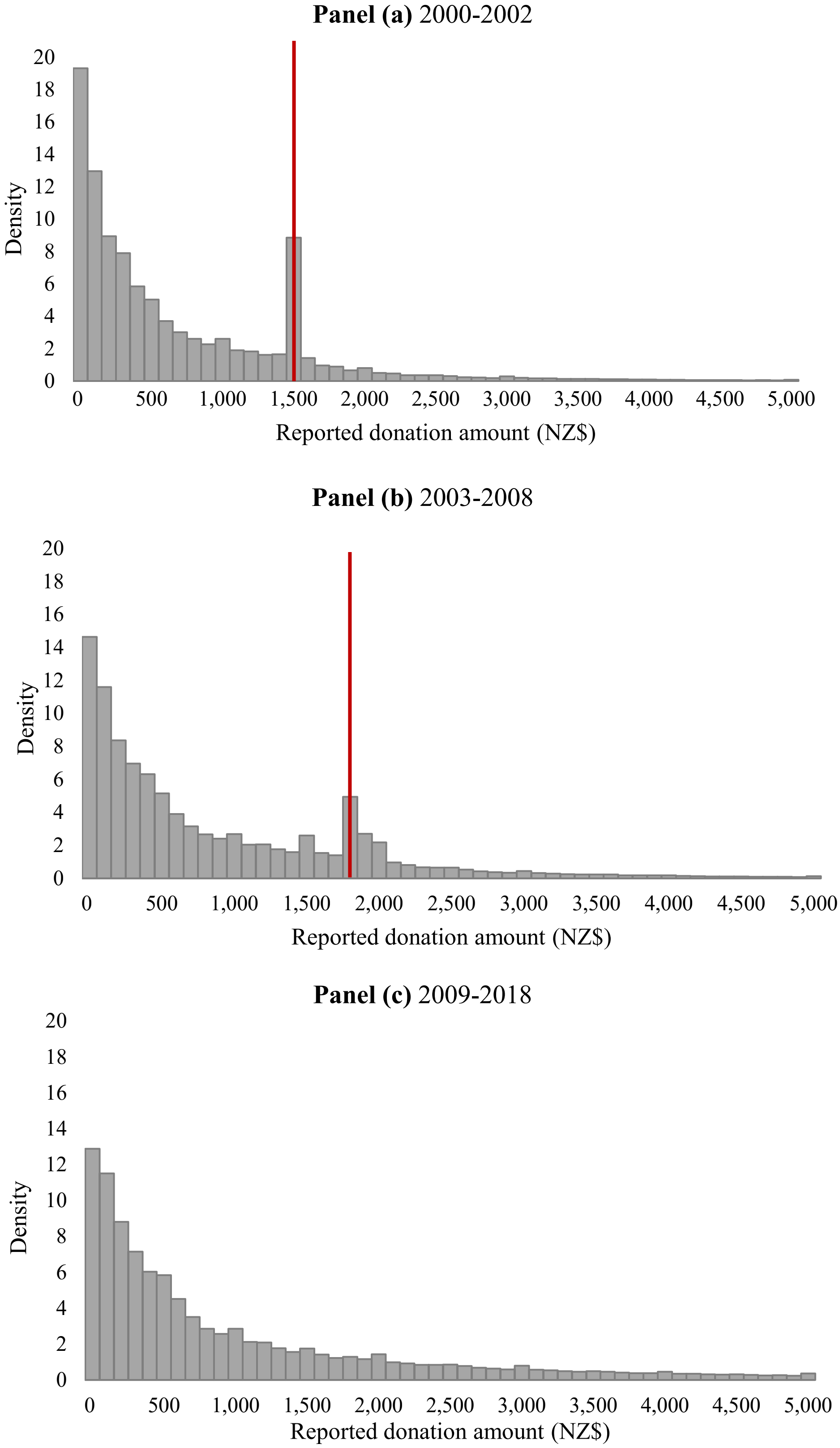
Panel (a) of Figure 2 shows the distribution of reported donations pooled over the period 2000-02 when the ceiling for donations eligible for tax credits was $1,500. There is a spike in reported donations at the $1,500 ceiling. Across the distribution of donations, the frequency of reported donations is observed to generally decline in the reported donation amount. There is also a tendency for donations to be reported in round numbers, such as $1,000, $2,000 etc.

[14] Taxable income of donation tax credit claimants is 58% higher on average than taxpayers that do not claim donation tax credits over the period 2000-18, based on 2% sample of natural person taxpayers.

Panel (b) shows the distribution of reported donations pooled over the 2003-08 period, when the government increased the dollar cut-off for donations eligible for tax credits to $1,890 from $1,500. There is a spike in reported donations at the $1,890 ceiling. The excess density around the ceiling is more spread out than over the 2000-02 period. A fraction of individuals continues to report donations at the previous $1,500 ceiling.

Panel (c) shows the distribution of reported donations over the 2009-18 period, when the fixed ceiling donations eligible for tax credits was removed. The spike in reported donations at the previous tax-credit cut-offs disappear following the 2009 policy reform. The right tail of the distribution of reported donations is thicker than it was during the previous two regime periods, indicating that taxpayers locating at the kink point previously, would locate to the right of the kink point when the ceiling is not in place.

Figure 2: Distribution of reported donations



Note: Panel (a) shows the distribution of reported donations over the 2000-02 period when the fixed ceiling for donations eligible for tax credits was $1,500 (demarcated by the vertical red line). Panel (b) shows the distribution of reported donations over the 2003-08 period when the fixed ceiling for donations eligible for tax credits was $1,890. Panel (c) shows the distribution of reported donations over the 2009-2018 period when there was no fixed ceiling and donations eligible for tax credits were capped at an individual's total taxable income.

5. Conceptual Framework

The New Zealand donation tax credit scheme imposes a ceiling on donations eligible for tax credits, which creates a large discrete change in the marginal price of giving at the policy threshold. Reported donation amounts are observed to locate ('bunch') around the ceiling. The amount of bunching at policy threshold indicates how responsive individuals are to the change in the price of giving at the threshold and is used to estimate the elasticity of donations.

The graphical intuition behind the bunching method is illustrated in Figure 3 and is adapted from figures in Kleven (2016). Panel (a) shows the budget set of an individual that can choose between spending their after-tax income on consumption (c) or donations (z). The government provides a tax credit (t) for donations below a threshold of z*. This has the effect of introducing a small kink in the budget set by increasing the marginal price of giving from after-tax income from 1-t to 1 at donation level z*. Now imagine the counterfactual world where there is no cut-off point for donations eligible for tax credits. The counterfactual budget set is shown by the solid blue line to the left of z* and the dashed grey line to the right of z*.

The individual furthest away from z* that subsequently bunches at z* when the budget set is kinked is the 'marginal buncher'. In the counterfactual world with no kink the marginal buncher choses to donate z*+Δz* as their indifference curve is tangent to the counterfactual budget set at point (A). The indifference curve is the curved grey line showing the combination of consumption and donations that provide equal satisfaction to the individual. With the kink, the individual choses to donate at z* as their indifference curve is tangent to the counterfactual budget set at point (B). Other individuals donating amounts between z*+Δz* in the counterfactual world will also relocate to the kink. Individuals donating less than z* are not affected by the kink.

Panel (b) show the effect of introducing the kink in the budget set on the distribution of reported donations. Without the kink point, the density is smooth at z*. With the kink, individuals with donations between z* and z*+ Δz* bunch at z*, creating an excess mass in the distribution of reported donations. Intuitively, the fraction of individuals 'bunching' at the kink point is informative of how responsive taxpayers are to the change in the price of giving at the cut-off point.

The responsiveness of individual taxpayers the change in the price of giving at the ceiling for donation tax credits captures a local price elasticity – how much individuals near the threshold adjust their reported donations to changes in the price of giving at the cut-off. When the kink Δt is small, the elasticity of reported donations (e) can be inferred from the response of the marginal buncher (Δz*):

$$e = \frac{\Delta z^*/z^*}{\Delta(1-t)/(1-t)} \quad (2)$$

Where z* is the cut-off point for donations eligible for tax credits, and t is the donation tax credit rate.[15] Because the kink doesn't change the marginal tax credit rate for donations of less than z*, it does not produce a material income effect over the bunching window (z*, z*+ Δ z*), and so e represents a compensated elasticity.

The donations response of the marginal buncher (Δz^*) is proportional to the amount of excess mass at the kink point which can be estimated empirically. Excess mass over the bunching window (b_n) is:

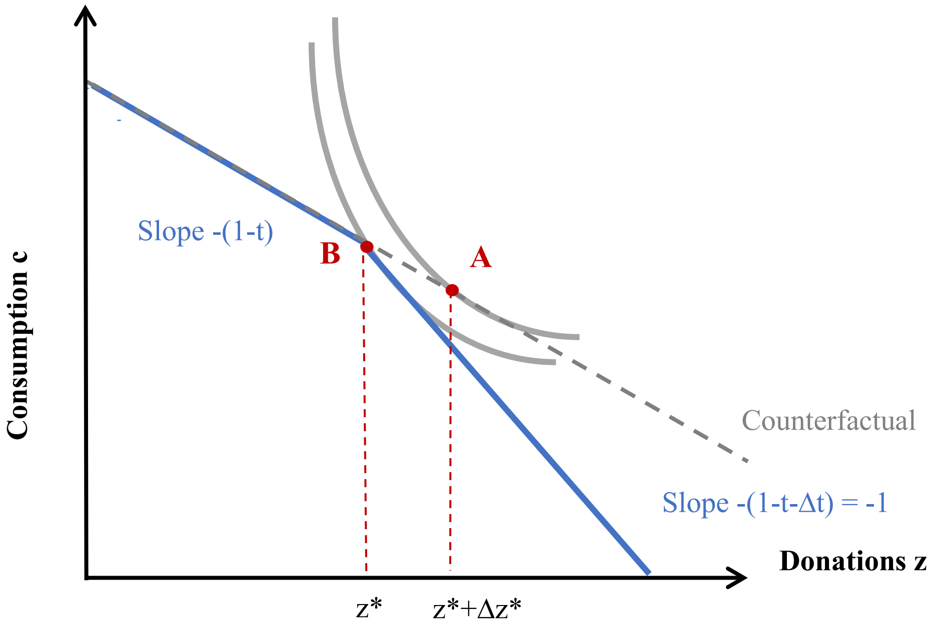
$$b_n = \int_{z^*}^{z^*+\Delta z^*} h_0(z)dz \approx h_0(z*)\Delta z^* \quad (3)$$

Where $h_0(z*)$ is the counterfactual density at z*. The approximation in the formula assumes the counterfactual density is constant over the bunching window. When estimated empirically, curvature is allowed in the estimated counterfactual distribution. We can see from equations (2) and (3) that as z* and t are observed and b_n and $h_0(z*)$ can be estimated empirically an elasticity of reported donations (e) can be obtained.

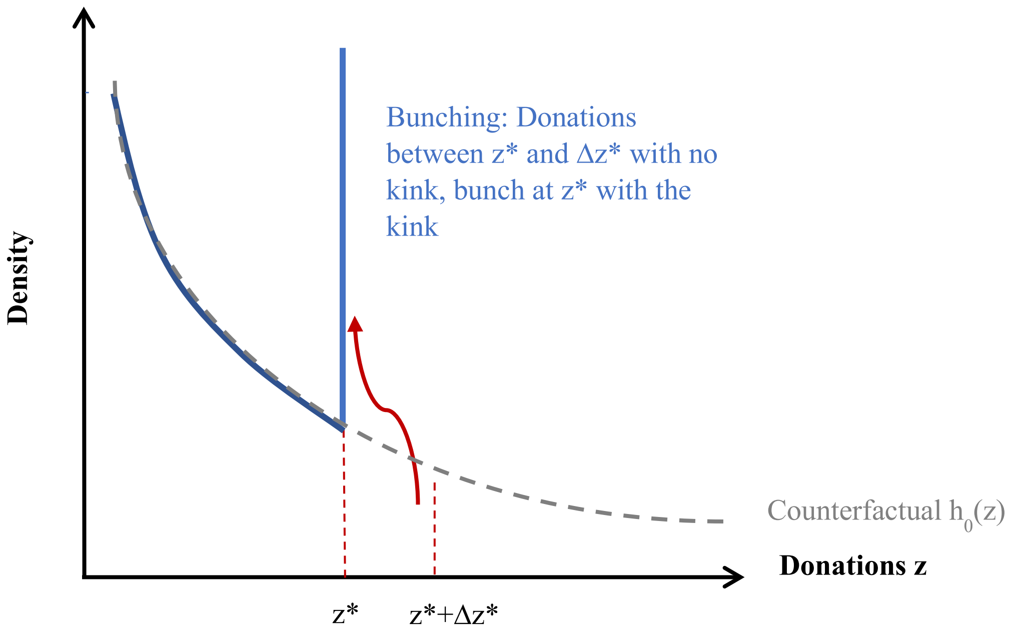
[15] Although in the presence of large kinks, it is necessary to specify preferences parametrically to obtain exact elasticities (see Kleven, 2016, pp. 441), for simplicity this study uses the elasticity formula (2).

Figure 3: Bunching of reported donations

Panel (a) Budget set and indifference curves



Panel (b) Distribution of reported donations



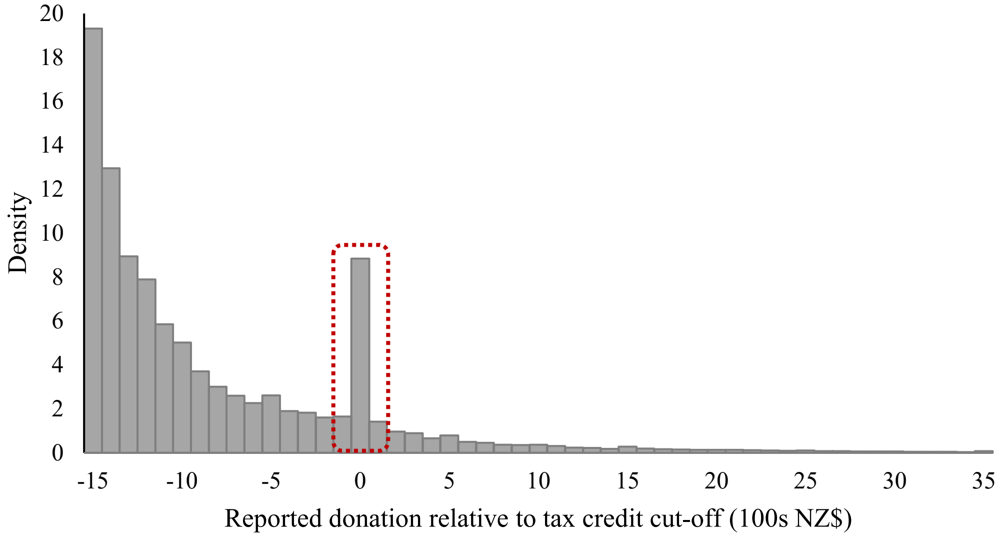
Note: Panel (a) shows the effect on donation choices of introducing a small kink in the budget set by increasing the marginal price of giving from after-tax income from 1-t to 1 at donation level z*. Where t is the donation tax credit rate. The 'marginal buncher' that would choose to donate z*+Δz* in the counterfactual world with no kink (A) choses to donate at z* with the kink (B). Individuals donating less than z* are not affected by the kink. Panel (b) show the effects of introducing the kink in the budget set on the distribution of reported donations. Without the kink point, the density is smooth at z*. With the kink, individuals with donations between z* and z*+ Δz* bunch at z*, creating an excess mass in the donation density.

6. Empirical Method

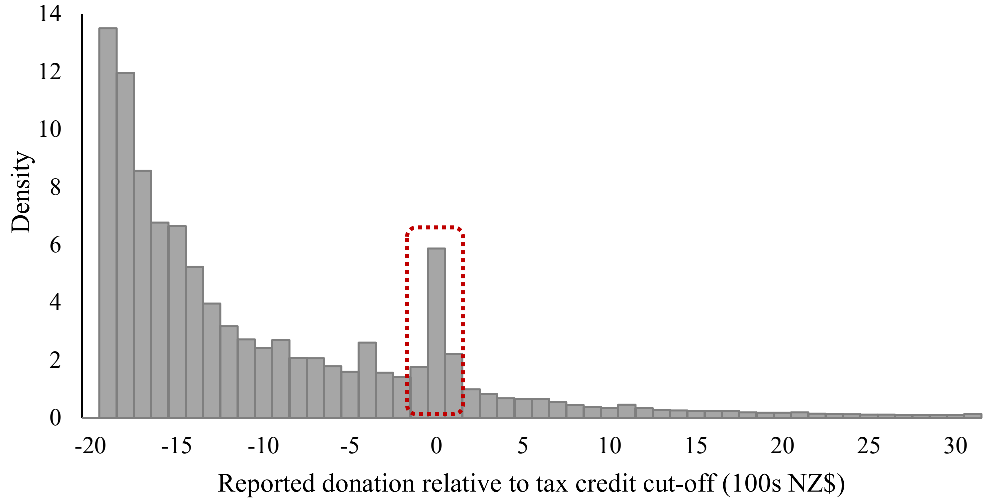
I begin by analysing bunching around the fixed ceiling for donations eligible for tax credits. Figure 4 plots the empirical distribution of reported donations for all donation tax credit claimants in New Zealand from 2000-02 and 2003-08. To construct this histogram, I transform the reported donation amounts by subtracting the ceiling for donations eligible for tax credits and grouping individuals into $100 donations groups (e.g., $100 to $200, $200 to $300, and so on) using the recentred donations data. I then plot the count of taxpayers within each $100 interval around the tax credit cut-off.

Figure 4: Distribution of reported donations recentred on tax credit cut-off

Panel (a) 2000-02



Panel (b) 2003-08



Note: Figure 4 shows the frequency of reported donations in $100 intervals around the policy threshold. The policy threshold was $1,500 over the 2000-02 period shown in panel (a) and $1,890 over the 2003-08 period shown in panel (b). Visual inspection shows excess mass one bin either side of the tax credit cut-off.

Panel (a) and (b) of Figure 4 show a sharp spike at the policy threshold in the otherwise smooth and regularly declining donations distribution. Individuals who reduce their reported donations in response to the policy threshold will not always locate exactly at the threshold. Individuals may not precisely track the amount donated during the tax year relative to the prevailing ceiling, or they may choose to donate a round number amount around the policy threshold (e.g., $1,800, $1,900 or $2,000 when the ceiling is $1890). Taxpayers may also round the reported donation amount in their self-reported donation tax credit claim form. 'Round number bunching' is an acknowledged phenomenon in the elasticity of taxable income bunching literature. Kleven & Waseem (2013) find Pakistani taxpayers tend to report taxable income round numbers, especially the self-employed, which they attribute to poor record keeping. In the New Zealand context, Alinaghi et al. (2021) find some modest round number bunching of taxable income, especially for wage earners.

As a result of imprecise bunching, excess mass is spread over a range of donation amounts around the policy threshold. The interval that is used to determine the amount of bunching and estimated elasticity is identified visually from the distribution of reported donations around the kink. In the baseline case I define the interval over which bunching is observed as one bin either side of the policy threshold [-1,1].

To accurately estimate the amount of bunching, we estimate the counterfactual distribution of reported donations in the absence of the ceiling. I utilize two methods to estimate the counterfactual distribution. The first method involves for each year (or pooled years) fitting a polynomial curve to the distribution of reported donations, omitting data over the bunching window.[16] I do this by estimating a regression of the form:

$$C_j = \sum_{i=0}^{q} \beta_i^0 \cdot (Z_j)^i + \sum_{i=-R}^{R} \gamma_i^0 \cdot 1[Z_j = i] + \varepsilon_j^0 \qquad (4)$$

where C_j is the number of individuals in donations bin j, Z_j is recorded donation relative to kink in intervals of *d* dollars (e.g., -15, … 35), $[-R, R]$ is the bunching window, *q* is the order of the polynomial. I obtain an initial estimate of the counterfactual distribution by attaining predicted values from regression (4) omitting the dummy variables over the bunching window:

$$\hat{C}_j^0 = \sum_{i=0}^{q} \hat{\beta}_i^0 \cdot (Z_j)^i \qquad (5)$$

I find an initial estimate of excess mass by calculating the difference in the number of individuals over the bunching window in the actual empirical distribution over-and-above the estimated counterfactual:

$$\hat{b}_n^0 = \sum_{j=-R}^{R} C_j - \hat{C}_j^0 = \sum_{i=-R}^{R} \hat{\gamma}_i^0 \qquad (6)$$

[16] The approach is described in detail in Chetty et al. (2011).

Since individuals locating over the bunching window in the actual empirical distribution will locate to the right of the bunching window in the counterfactual case, I adjust the counterfactual distribution to the right of the bunching window upwards until the area under the counterfactual distribution equals the area under the actual empirical distribution. I do this by estimating a regression of the form:

$$C_j \cdot \left(1 + 1[j > R]\frac{\hat{b}_n}{\sum_{j=R+1}^{\infty} C_j}\right) = \sum_{i=0}^{q} \beta_i^0 \cdot (Z_j)^i + \sum_{i=-R}^{R} \gamma_i^0 \cdot 1[Z_j = i] + \varepsilon_j^0 \qquad (7)$$

Because $\hat{b}_n$ is a function of $\tilde{\beta}_i^0$, (7) is obtained by iteration. I obtain the counterfactual distribution of reported donations by attaining the fitted values from regression (7) omitting dummy variables over the bunching window:

$$\hat{C}_j = \sum_{i=0}^{q} \hat{\beta}_i \cdot (Z_j)^i \qquad (8)$$

This is the standard approach adapted from the elasticity of taxable income literature (see for example Chetty, et al., 2011; Kleven, 2016).

I follow the previous literature by identifying the bunching window$[-R, R]$ in equation (7) visually (Fack & Landais 2016 in the donations elasticity literature, and Saez 2010, Chetty et. al, 2011 and most subsequent studies in the elasticity of taxable income literature). As a robustness check I use a data-driven method to identify the bunching window developed by Bosch et. al, (2020), to minimize arbitrariness and potential biases in the selection of the bunching window. The method involves fitting a polynomial curve to the grouped donations data excluding the donations group (bin) at the policy threshold, computing a confidence interval around the prediction, and defining the lower-most (upper-most) contiguous observations around the threshold that lie outside of the confidence interval as the lower (upper) bound of the bunching window. This step is then repeated for all other possible excluded regions around the policy threshold to obtain a distribution of upper and lower bounds of the bunching window. The mode of each distribution is defined as the final bunching window.

The second method to estimate the counterfactual distribution uses the actual empirical distribution of reported donations after the fixed ceiling for donations eligible for tax credits is increased in 2003 and then removed in 2009. Ideally, we want to measure the excess mass around the ceiling relative to the true counterfactual distribution given a constant marginal donation tax credit rate and no cut-off for donations eligible for tax credits. Using the post-reform distribution of reported donations as a counterfactual for the pre-reform distribution therefore comes close to the ideal setting for estimating the counterfactual case.

The 2009 donation tax reform coincided with the 2008/09 global financial crisis. This raises a potential concern that the post-2008 donations distribution would be a biased estimate of the pre-reform 'no ceiling' counterfactual if the GFC would have independently affected the donations distribution. This concern is mitigated by there being 10-years of data available after the 2009 reform, and the GFC having a modest and short-lived effect on taxpayer incomes in New Zealand. Mean real taxable incomes of donation tax credit claimants increased by 1.2% in 2009, declined by -0.8% in 2010, and -1.1% in 2011, before recovering to pre-GFC levels by 2012.

To implement the second approach, I estimate equation (4) on both the pre- and post-reform donations distributions, i.e., with two bin counts for each interval of reported donations. The counterfactual distribution of reported donations is estimated by obtaining predicted values from regression (4) omitting the dummy variables over the bunching window during the pre- and/or post-reform, as in equation (5). In this case, I do not iteratively adjust the counterfactual distribution, as the post-reform donations distribution reflects where reported donations to the right of the ceiling would locate in the absence of the cut-off.[17]

Excess mass represents the additional number of taxpayers reporting donations over the bunching window in response to the kink relative to the counterfactual case where there is no kink in the budget set, and is calculated as the difference between the actual and counterfactual bin counts over the bunching window:

$$\hat{b}_n = \sum_{j=-R}^{R} C_j - \hat{C}_j \qquad (9)$$

Where [-R, R] is the bunching window, C_j is the number of individuals in the actual empirical distribution, and $\hat{C}_j$ is the number of individuals in the estimated counterfactual distribution.

The normalized bunching mass ($\hat{b}$) expresses the estimated bunching mass ($\hat{b}_n$) relative to the average density of the counterfactual distribution over the bunching window:

$$\hat{b} = \frac{\hat{b}_n}{\sum_{j=-R}^{R} \hat{C}_j/(2R+1)} \qquad (10)$$

Where [-R, R] is the bunching window, $\hat{C}_j$is the number of individuals in the counterfactual distribution, and 2R+1 is number of bins over the bunching window. The normalized bunching mass is substituted into the elasticity formula (2) to obtain an empirically estimable expression for the elasticity of reported donations.

[17] This approach follows Søgaard (2019) which estimates elasticity of taxable income using the distribution of taxable income before and after the threshold to qualify for student benefits in Denmark was increased. The study does not iteratively adjust the counterfactual distribution, stating that the bunching estimator relies on the counterfactual density being correct locally around the kink point (rather than globally), and the missing mass does not necessarily bias the elasticity estimates significantly. Fack and Landais (2016) estimates the elasticity of donations in France using the bunching approach and does not iteratively adjust the counterfactual distribution, as the study is not sure if excess mass is only coming from above the kink due to reporting effects, since taxpayers may have been over-reporting donations to the tax authority during the period when there was no requirement to submit donation receipts.

The elasticity of reported donations reflects how responsive taxpayers are to the change in the price of giving at the ceiling for donations eligible for tax credits. An empirically estimable formula for the elasticity of reported donations (e) is obtained by substituting expression (10) for the normalized bunching mass into the elasticity equation (2) and using the approximation $\Delta(1-t)/(1-t) = ln\left(\frac{1-t_1}{1-t_2}\right)$ to obtain:

$$e = \frac{\hat{b}}{z^{*} \cdot \ln\left(\frac{1-t_1}{1-t_2}\right)} \qquad (11)$$

Where $\hat{b}$ is the normalized bunching mass, $1-t_1$ is the marginal price of giving to the left of the cut-off, and $1-t_2$ is the marginal price of giving to the right of the cut-off and z* is the cut-off for donations eligible for tax credits expressed in units of bin-width d. Intuitively, the elasticity of reported donations is proportional to the excess tax credit claimants locating at the kink, and inversely proportional to the change in the price of giving at the kink point.

With a $1,890 policy threshold for donations eligible for tax credits, $100 bin-width and 33.33333% donation tax credit rate, this implies a normalized bunching mass of $\hat{b}$ <7.663 is consistent with an absolute value of the donations elasticity of less than one: |e|<1. A narrower bin-width or a larger change in the price of giving will result in a smaller elasticity, for any given amount of bunching mass.

Bootstrap standard errors are calculated to measure the precision of the estimated normalized bunching mass ($\hat{b}$) and donations elasticity (e). I draw the estimated vector of errors in (4) or (7) with replacement to generate k new vectors of errors, which are used to calculate k new bin counts, and apply the above technique to generate new estimates of $\hat{b}^k$ and $\hat{e}^k$. I define the standard error of $\hat{b}$ and $\hat{e}$ as the standard deviations of $\hat{b}^k$ and $\hat{e}^k$ respectively. In this research context, the standard error is due to the misspecification of the counterfactual distribution, rather than sampling error as the data is for the full population of donation tax credit claimants (Chetty et al., 2011 provides a similar interpretation in their research context).

The identifying assumptions underlying causal inference about the effect of donation tax credits on reported donations are that the behavioural response is: (i) one-sided, i.e., individuals will only relocate to the policy threshold from above the threshold, (ii) bounded, i.e., only affects behaviour within a window around the policy threshold, and (iii) is well-behaved, i.e., takes the form of a curve which is smooth across the bunching window.[18] The assumption that the behavioural response to the ceiling is one-sided is supported in our case as the economic incentive is for individuals to shift from above the

[18] Estimating the counterfactual distribution using the distribution of reported donations when the fixed ceiling is in place, relies on fitting a curve to the distribution of reported donations of those far enough away from the ceiling (to the left and right of the bunching window) that they do not manipulate their reported donations. And then adjusting upwards the counterfactual distribution to the right of the bunching window to reflect where bunchers would have located if there had been no ceiling on donations eligible for tax credits.

policy threshold to the threshold due to the change in the marginal price of giving at the threshold. Those that would donate below the threshold in the counterfactual case are not affected. The requirement to submit original donation receipts to the tax authorities to claim tax credits is in place over the whole study period, and so it is unlikely that many taxpayers over-report donations to the tax authorities.

In our case, individuals may locate to the bunching window from far away from the policy threshold, i.e., make a large donation amount, and only report to the tax authority the donation amount that is eligible for tax credits.[19] Therefore estimating the counterfactual distribution using the distribution of reported donations when the ceiling is in place may result in the far-right tail of the estimated counterfactual distribution being thinner than the true counterfactual case. The feature of this study that provides confidence in the estimates, is that we have the benefit of observing the distribution of reported donations following the increase in the fixed ceiling in 2003 and the removal of the fixed ceiling in 2009 and use this post-reform distribution of donations to estimate the counterfactual case.

Lastly, the assumption that the counterfactual distribution of reported donations is 'well-behaved' and takes the form of a curve that is smooth over the bunching window appears reasonably well-justified by reference to the post-2009 distribution of reported donations which is relatively smooth other than for slight bunching of reported donations at round numbers, such as $1,000, $2,000 etc. The distribution of reported donations 2009-18 is shown in Panel (c) of Figure 2.

7. Empirical Evidence

The visual examination of the distribution of reported donations in Section 6 provides strong prima facie evidence that reported donations bunch at thresholds for donation tax credits. This section quantifies the amount of bunching, and reports estimated elasticities across all claimants locating around the policy threshold. Subsection 7.1 presents estimates relating to the 2000-02 period when the tax credit cut-off was $1,500. Subsection 7.2 presents estimates relating to the 2003-08 period when the tax credit cut-off was increased to $1,890.

7.1 2000-2002 period

I first consider the 2000-02 period when the ceiling for donations eligible for tax credits was set at $1,500. As a result of the ceiling, the marginal price of giving from after-tax income increased by 50%

[19] The donation tax credit claim form asks taxpayers to report "the total amount paid in donations to approved charities" during the tax year, but knowledge of the policy thresholds may result in taxpayers reporting to the tax authority only the eligible donation amount, or the receipt amount that brings the reported donation amount up to the policy threshold.

at the threshold from 66.6667 cents to $1. I obtain estimates of normalized bunching mass around the $1,500 policy threshold and the implied donations elasticities (with associated bootstrapped standard errors) following the method outlined in section 6. I conduct this exercise both on annual data as well as pooled over the 2000-02 period.

Figure 5 illustrates the estimates using the pooled 2000-02 dataset. Panel (a) presents estimates using the standard cross-sectional approach to estimate the counterfactual case. Panel (b) presents estimates utilizing the pre- and post-reform donations distribution to estimate the counterfactual case.

Panel (a) denotes the $1,500 cut-off for donations eligible for tax credits by the vertical red line at 0. The series with blue dots plots the histogram of reported donations relative to the kink point. Each point shows the number of observations in 100 NZ$ bins. The solid red line represents the polynomial (curve) fitted to the donation's distribution when the window around the kink is omitted. In this case, the bunching window around the kink is [-$100 to $100] and a 7th order polynomial is fitted.[20] The shaded region is estimated excess mass over the bunching window. The counterfactual distribution to the right of the bunching window is iteratively adjusted until the area under the counterfactual distribution equals that of the actual empirical distribution, to account for where bunchers would have located in the counterfactual case.

The chart reveals a clear spike in the distribution of reported donations at the policy threshold in an otherwise regularly declining donations distribution. The estimated excess mass is $\hat{b} = 3.391$ (with standard error SE=0.452). This means at the excess mass is 339% of the average mass of the counterfactual distribution within +/- $100 of the kink. This results in an implied donations elasticity of $\hat{e} = -0.558$ for all individuals locating around the policy threshold (with SE=0.074 and confidence interval -0.704 to -0.412).

The iterative adjustment to relocate bunchers to the right of the bunching window causes a slight concavity in the counterfactual distribution around the bunching window due to the thin tail of the estimated counterfactual distribution. The thin right tail is because some individuals may locate to the cut-off from far to the right of the donation distribution, if they make a large donation and only report to the tax authority the eligible donation amount. This has the effect of reducing slightly the estimated bunching mass.

There is some evidence in Figure 5 of modest 'round number bunching' (at +/- 5 intervals around the $1,500 cut off), and so some of the observed mass at the $1,500 cut-off could be attributed to this non-tax aspect, but it is likely to be small.

[20] The bunching literature generally fits a 7th order polynomial to the observations to estimate the counterfactual distribution (see Chetty et. al., 2011, Alinaghia, et. al., 2021). Fack and Landais (2016) fit a 5th order polynomial, and Søgaard (2019) fits a 6th order polynomial. The robustness tests presented in Table 8 show that using a more or less flexible polynomial has no effect on the bunching mass or elasticity estimates.

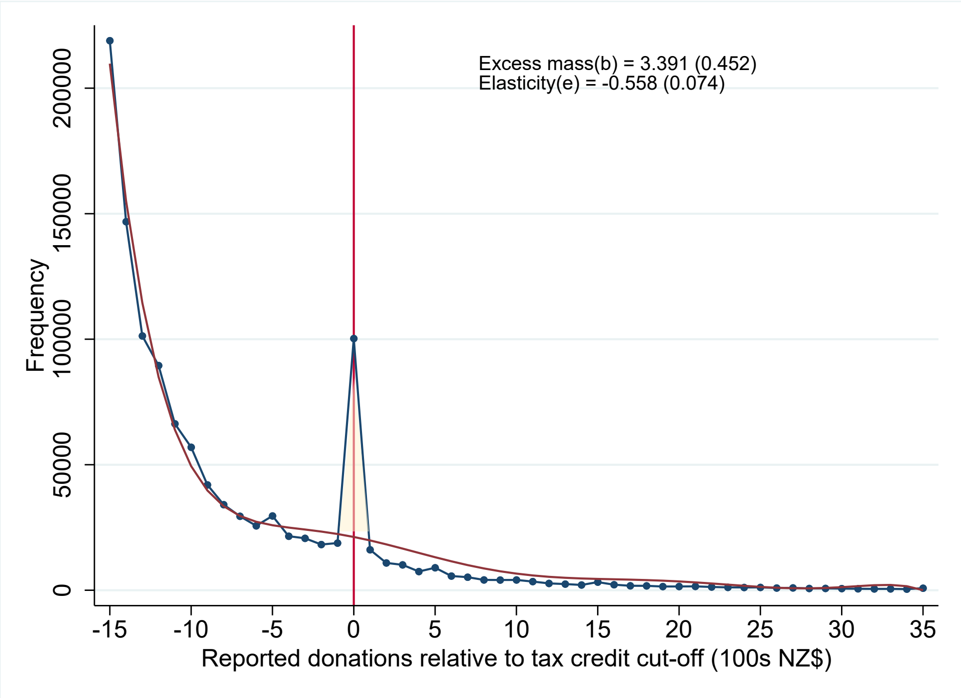
The series with blue dots in panel (b) plots the histogram of reported donations relative to the kink point over the 2000-02 period (pre-reform), and the black dots plot the histogram of reported donations over the 2003-08 period (post-reform) when the cut-off for donations eligible for tax credits was increased to $1,890 from $1,500. As there are 3 years in the pre-reform period and 6 years in the post-reform period, the frequencies represent annual averages. The solid red line represents the curve fitted to the pre-and post- reform donations distributions when observations over the bunching windows are omitted. The bunching window around the kink is [-$100 to $100] in the pre-reform period and [$300 to $500] in the post-reform period and a 7th order polynomial is fitted.

I do not iteratively adjust the counterfactual distribution to relocate the bunchers, on the basis that the post-reform donations distribution reflects where reported donations to the right of the ceiling would locate in the absence of the cut-off. The estimated excess mass is $\hat{b} = 4.408$ (with standard error SE=0.480); that is, the excess mass is 441% of the average mass of the counterfactual distribution within +/- $100 of the kink. This results in an implied donations elasticity of $\hat{e} = -0.725$ for all individuals locating around the policy threshold (with SE=0.079 and 95% confidence interval -0.879 to -0.570).

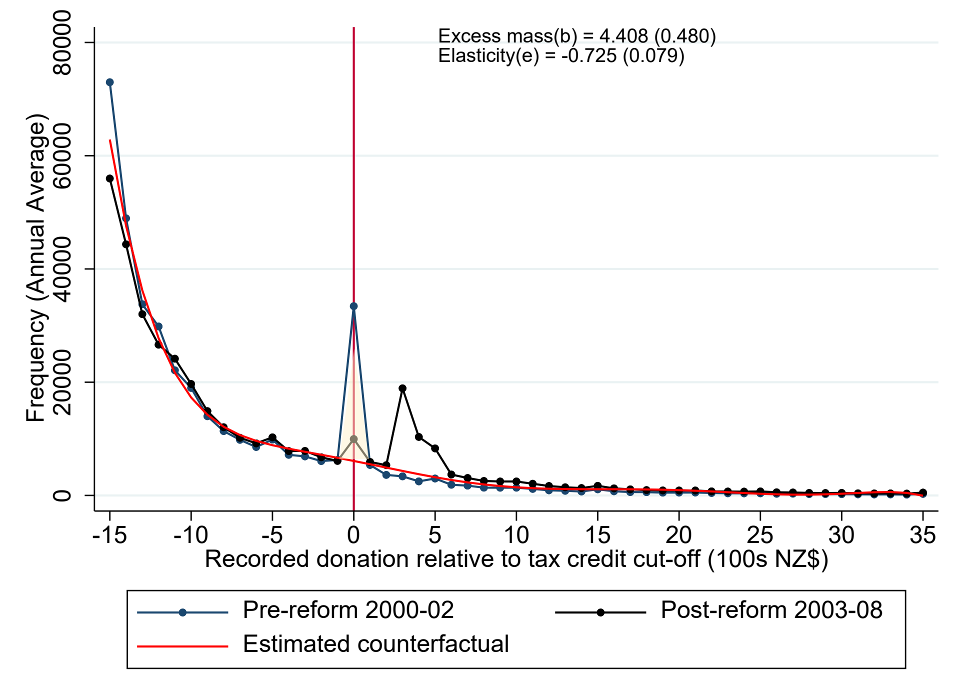
The two methods to estimate the counterfactual distribution provide a range for the elasticity of reported donations locally around the cut-off of between -0.725 to -0.558 over the 2000-02 period.

Figure 5: Distribution of reported donations 2000-02 period

Panel (a) Counterfactual estimated using standard cross-sectional method



Panel (b) Counterfactual estimated using pre- and post-reform donations distribution



Note: Figure 5 shows the distribution of reported donations around the $1,500 tax-credit cut off over the 2000-02 period. The series with blue dots plots the histogram of reported donations relative to the kink point. Each point shows #obs in 100 NZ$ bins. The tax credit cut-off is shown by the vertical red line at 0. The solid red line is the estimated counterfactual distribution of reported donations in the absence of the tax credit cut-off. The shaded region is estimated excess mass over the bunching window. In panel (a) the counterfactual distribution is estimated by fitting a 7th order polynomial to the distribution of reported donations excluding data over the bunching window. In panel (b) the counterfactual distribution is estimated on both the pre- and post-reform donations distribution.

7.2 2003-2008 period

The New Zealand government increased the ceiling for donations eligible for tax credits to $1,890 from $1,500 in 2003 and then removed the fixed ceiling in 2009. Figure 6 illustrates the estimates of the bunching mass when the $1,890 cut-off was in place using the pooled 2003-08 dataset. It can be seen from Panel (a) of Figure 6 that when the counterfactual distribution is estimated using the standard cross-sectional approach, the excess mass is $\hat{b} = 3.302$ (with standard error SE=0.452). The implied donations elasticity $\hat{e} = -0.431$ (with SE=0.059 and 95% confidence interval -0.546 to -0.315).

Some individuals are still observed to locate at the previous $1,500 cut-off point (identified by -4 on the chart), which reduces slightly the bunching mass at the $1,890 threshold. Adjustment to tax credit reforms is examined further in section 9.1.4. The modest 'round number bunching' is now observed at +/- 4 intervals around bin 1 (bin 1 includes donation amounts of $2,000). Some of the observed mass in the bunching window could be attributed to this 'round number bunching' at $2,000 but it is likely to be small. Panel (b) of Figure 6 shows that the mass of donations at $2,000 is much larger when the policy threshold is moved to $1,890 then it was when the policy threshold was $1,500, suggesting most of the excess mass at this point is a result of the nearby policy threshold.

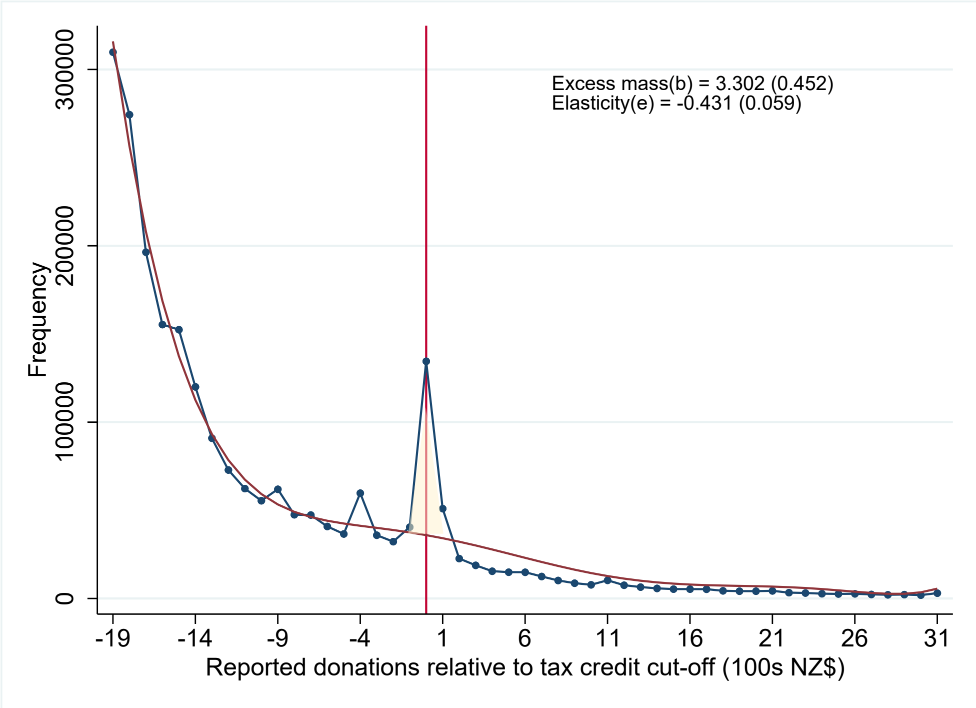
It can be seen from Panel (b) that when the counterfactual distribution is estimated using the pre- and post- reform distribution of reported donations, the excess mass is $\hat{b} = 5.144$ (with standard error SE=0.528). The implied donations elasticity $\hat{e} = -0.671$ (with SE=0.069 and 95% confidence interval -0.806 to -0.536).

In this case the pre-reform period is 2003-08 when the $1,890 ceiling was in place, and the post-reform period is 2009-18 when the fixed ceiling was removed. The distribution of donations following the 2009 reform reflects where actual donations would locate in the absence of the cut-off. For most individuals their donation amount is less than their annual taxable income, and so after 2009 taxpayers faced no binding cap on donations eligible for tax credits (98% of individuals report a donation amount less than their annual taxable income over the 2009-18 period). Individuals would also have no incentive to under-report their actual donation amount following the 2009 reform, as they would be foregoing tax credits by doing so. The distribution of reported donations following the 2009 reform therefore reflects a highly credible picture of the distribution of actual donations in the counterfactual case with no policy cut-off.

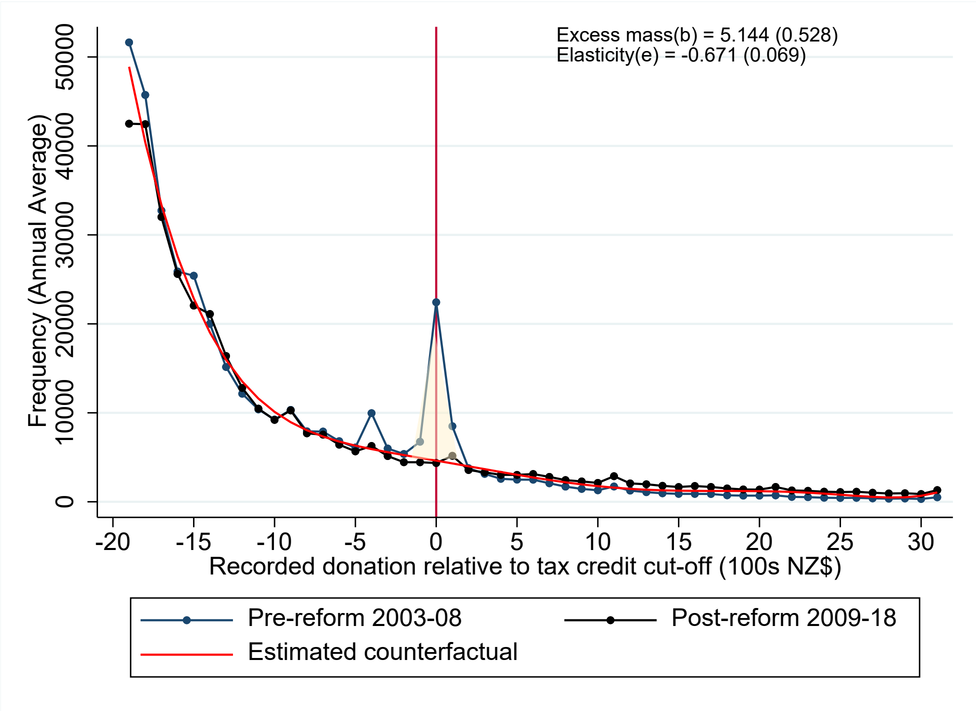
The two methods provide a range for the elasticity of reported donations locally around the cut-off of between -0.671 to -0.431 over the 2003-08 period.

Figure 6: Distribution of reported donations 2003-08 period

Panel (a) Counterfactual estimated using standard cross-sectional method



Panel (b) Counterfactual estimated using pre- and post-reform donations distribution



Note: Figure 6 shows the distribution of reported donations around the NZ$1,890 tax-credit cut off over the 2003-08 period. The series with blue dots plots the histogram of reported donations relative to the kink point. Each point shows #obs in 100 NZ$ bins. The tax credit cut-off is shown by the vertical red line at 0. The solid red line is the estimated counterfactual distribution of reported donations in the absence of the tax credit cut-off. The shaded region is estimated excess mass over the bunching window. In panel (a) the counterfactual distribution is estimated by fitting a 7th order polynomial to the distribution of reported donations excluding data over the bunching window. In panel (b) the counterfactual distribution is estimated on both the pre- and post-reform donations distribution.

Results for excess mass calculations and elasticities by year are reported in Table 3 for all individuals locating around the tax credit cut-off. Estimates for all individuals over each year 2000 to 2002 lie in the range of -0.618 to -0.479. The interpretation of these estimates is that a 1% decline in the price of giving would stimulate a 0.48% to 0.62% increase in reported donations.

Elasticity estimates for 2003 when the cut-off for donations eligible for tax credits was increased to $1,890 from $1,500 are somewhat lower than the prior years, which could reflect that not all the excess mass at the $1,500 threshold would have shifted to the new ceiling by 2003. This aspect is investigated further in the next section. Estimates for each year 2003 to 2008 lie in the range of -0.457 to -0.347.

Table 3: Excess mass and elasticity estimates

Year	Method 1			Method 2		
	b	e	95% confidence interval	b	e	95% confidence interval
2000	2.913	-0.479	-0.698 to -0.260			
	(0.680)	(0.112)				
2001	3.488	-0.573	-0.761 to -0.385			
	(0.583)	(0.096)				
2002	3.757	-0.618	-0.754 to -0.482			
	(0.421)	(0.069)				
2003	2.659	-0.347	-0.491 to -0.203			
	(0.563)	(0.073)				
2004	3.293	-0.430	-0.555 to -0.305			
	(0.488)	(0.064)				
2005	3.393	-0.443	-0.567 to -0.319			
	(0.484)	(0.063)				
2006	3.532	-0.437	-0.569 to -0.305			
	(0.517)	(0.067)				
2007	3.504	-0.457	-0.600 to -0.314			
	(0.559)	(0.073)				
2008	3.349	-0.437	-0.562 to -0.312			
	(0.487)	(0.064)				
2000-02	3.391	-0.558	-0.704 to -0.412	4.408	-0.725	-0.879 to -0.570
	(0.452)	(0.074)		(0.480)	(0.079)	
2003-08	3.302	-0.431	-0.546 to -0.315	5.144	-0.671	-0.806 to -0.536
	(0.452)	(0.059)		(0.528)	(0.069)	

Note: Excess mass (b) and elasticity (e) estimates for all donation tax credit claimants. Bootstrap standard errors in parentheses. Method 1 estimates counterfactual distribution by fitting a 7^{th} order polynomial to the distribution of reported donations excluding data over the bunching window. Method 2 estimates the counterfactual distribution on both the pre- and post-reform donations distribution.

8. Actual and Reporting Effects

Results presented in Section 7 show that there is significant bunching of reported donations at cut-off points for donations eligible for tax credits. The bunching of reported donations could reflect four different behavioural responses:

(i) Actual donations response: Individuals that would have donated an amount above the ceiling in the absence of the cut-off, donating an amount near to the ceiling due to the increase in the marginal price of giving at the cut-off.

(ii) Pure reporting effect: Individuals donating more than the ceiling, but only reporting to the tax authority the donation amount that is eligible for tax credits.

(iii) Inter-temporal shifting of donations: Donors smoothing actual donations across tax years to maximize tax credits over the time but not donating any more over the medium-term.

(iv) Household claims behaviour: Couples submitting more than one claim to report donations less than the tax credit cut-off.

Although taxpayers are asked by the tax authorities to report "the total amount paid in donations to approved charities" during the tax year, some taxpayers may report a rough guess of the total amount donated knowing there will be no adverse consequences for reporting an estimate as the amount eligible for tax credits will be determined based on the eligible receipts submitted and the prevailing ceiling. There are several reasons to believe that some taxpayers only report the donation amount that is eligible for tax credits. The first reason is that taxpayers obtain no tax credit benefit from reporting true donation amounts more than the ceiling and there are compliance costs associated with reporting donations, such as providing original donations receipts. Therefore, there would seem to be a strong theoretical reason to expect that some taxpayers will only report to the tax authority the donation amount that is eligible for tax credits.

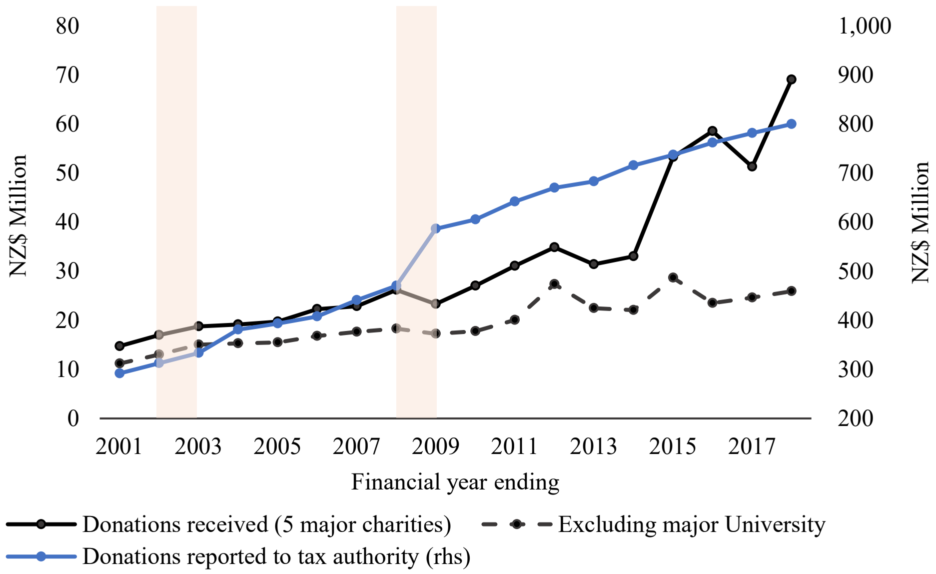
The second reason is that when examining the distribution of reported donations (Figure 2), we observe that the far-right tail of the donation distribution is thinner when the ceiling was in place than after the ceiling is removed, suggesting that taxpayers located to the cut-off from the far-right of the donation distribution. If bunching was only caused by a change in actual donations behaviour, then we would expect the change in the marginal price of giving at the ceiling to mainly effect donations of taxpayers within a narrow window of the ceiling.

The third reason to believe that donations were under-reported to the tax authority, is that following the 2009 reform donations reported to the tax authority appear to have increased by more than donations received by major charities. If the increase in donations reported to the tax authority reflected an actual increase in donations, then we would expect to observe this mirrored in the donations received by charities in general. I first examine donations reported by charities in their annual returns to the New Zealand Charities Register. The Charities Register is a database of charities registered under the

Charities Act 2005. The register opened on 1 February 2007 and includes information on charity activities and finances. Because the register opened on 1 February 2007, there are relatively few charities that file an annual return in the period prior to the 2009 tax reform (effective from 1 April 2008). I limit the sample to the 2,093 charities that file an annual return for the years ending 2008, 2009 and 2010. Total donations received by these charities increased by 9% in 2009 and 3% in 2010. For the 692 charities that use a 31 March or 30 June balance day (where 9-12 months of the 2008 financial year falls during pre-tax reform period), donations increased by 10% in 2009 and 5% in 2010. [21]

I also contacted the 20 largest charities (by donations) and requested information on the individual donations the charity received annually since 2000. I received the requested information from five charities.[22] Figure 7 shows the dollar value of donations received by major charities and donations reported to the tax authority. Whereas donations reported to the tax authority shifted upwards in 2009, donations received by major charities appear to have continued to follow the previous trend, with some volatility from year-to-year, which could reflect charity-specific factors, such as fundraising campaigns. The growth in donations received by charities since 2015 is driven by a single major New Zealand University, and so I also show donations received by charities excluding that university.

Figure 7: Donations received by major charities



[21] Total donations received by the 2,093 charities were equivalent to 59% of the individual donations reported to the Charities Register in 2008, and 13% when the sample is limited to the 692 charities using a 31 March or 30 June balance day. Donations reported to the Charities Register include monetary donations made by individuals, businesses, and trusts.

[22] The other charities either did not respond (8 charities) or were unable to unwilling to provide the requested data (7 charities). Donations received by the five charities were equivalent to 5% of donations reported to the tax authority in the 2008 year.

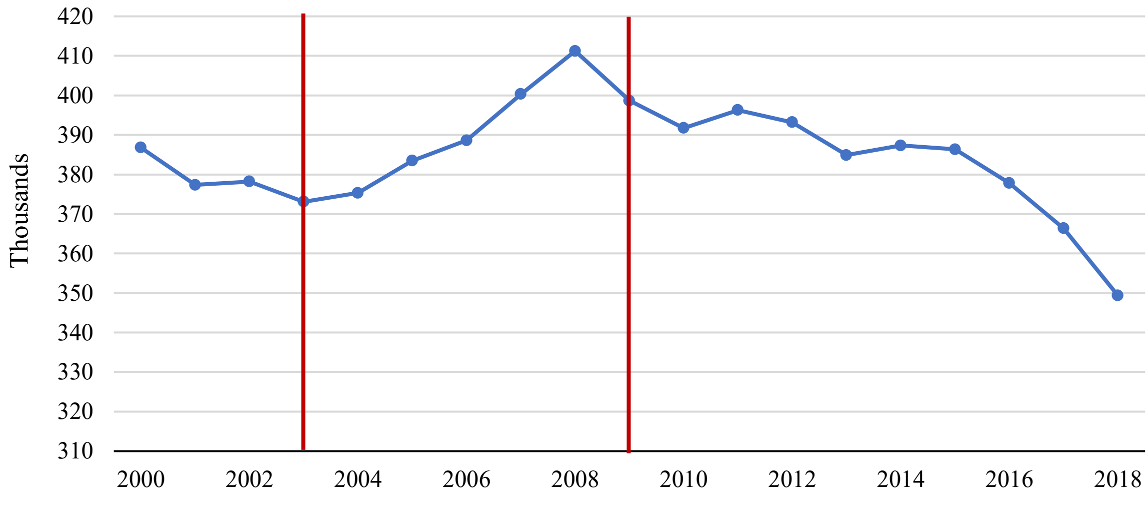
Note: Donations received by five major charities and donations reported by individuals to the tax authorities in million $NZ. The 2003 reform increased the fixed ceiling for donations eligible for tax credits to NZ$1,890 from NZ$1,500 from 1 April 2002, and the major 2009 reform removed the NZ$1,890 ceiling from 1 April 2008 (reform implementation periods demarcated by shade areas). The tax year is from 1 April to 31 March. Some charities report on a 30 June or 31 December financial year.

Source: Survey of major New Zealand charities, Inland Revenue.

Figure 8 shows that the number of donation tax credit claims submitted to the tax authority. The number of claims increased in the period prior to the 2009 reform. This could be because individuals wanting to donate more than the cut-off may have spread the donation over several years and submitted claims over several tax years. Couples donating more than the cut-off may have submitted one claim each. Following the 2009 reform there was less incentive for individuals to spread donations across tax years or for households members to share donation receipts and make multiple claims, which could have resulted in fewer tax credit claims.[23]

It is notable that the number of donation tax credit claims continued to decline over the post-2009 period, which could reflect the cohort of older claimants not being fully replaced by new claimants. The average age of donation tax credit claimants increased by 3.2 years between 2008 and 2018.

Figure 8: Number of donation tax credit claims



Note: Total number of donation tax credit claims in '000s. The 2003 reform increased the fixed ceiling for donations eligible for tax credits to NZ$1,890 from NZ$1,500, and the 2009 reform removed the NZ$1,890 ceiling (reform periods demarcated by vertical red lines). The more recent data may not be complete as taxpayers have up to four years to submit tax credit claims.

Source: Inland Revenue Department, author calculations.

[23] The available data is at an individual level and does not allow us to examine tax credit claims behaviour of couples or households.

From a policy perspective, we are interested in understanding by how much actual donations increase due to a decline in the price of giving to assess the extent to which tax credits stimulate charitable donations. There is strong evidence to suggest that reporting effects, the inter-temporal shifting of donations, and household claims behaviour increased the amount of bunching at the policy threshold over the 2000-2008 period. This means that the elasticity of actual donations will be no greater (in absolute value) than the elasticity of reported donations. The elasticity of reported donations obtained by this study therefore provides an upper boundary on the elasticity of actual donations. Since the elasticity of reported donations is inelastic (less than 1 in absolute value), this means the elasticity of actual donations must also be inelastic.

9. Further results

This section presents further results. Subsection 9.1 examines whether taxable incomes, age, or gender differences in bunching and elasticities are important. The subsection presents estimates using the pooled 2003-08 data set, since the post-reform donations distribution after the fixed ceiling for donations eligible for tax credits was removed (2009-18) provides the more ideal setting to estimate the counterfactual case then the 2000-02 post-reform period when a fixed ceiling was still in place. Subsection 9.2 explores how taxpayers adjusted following the 2003 reform to assess whether inertia reduced bunching at the new policy cut-off. Adjustment to the 2009 reform is examined to see whether anticipation of the reform affected bunching in the immediate pre-reform period. Subsection 9.3 investigates how far the main results are sensitive to the bunching specifications to test the robustness of the main results.

9.1 Heterogeneity

9.1.1 Estimates by taxable income level

Higher income households tend to give more to charity in absolute terms than lower income households, and this trend has become more pronounced over time in many countries (Andreoni and Payne, 2013). There is a consensus in the literature that lower income households give a larger proportion of their income to charity on average than middle-income households. This has been attributed to religious giving among lower income households, and a 'standard of giving' that society expects that does not adjust proportionally with income (Benediktson, 2018). Studies are yet to come to a consensus about whether the share of income increases for higher income households or continues to decline. James & Sharpe (2007) finds that in the U.S. the share of income given to religious causes is declining in household income, and the share giving to secular causes is 'U-shaped'. Furthermore, the U-shaped 'curve of giving' is driven by the top 5 percent of givers. For the other 95% of households, the proportion of income given to charity is similar across household income groups. Benediktson, (2018) finds a downward-sloping relationship between income and the percentage of income donated in Denmark, which they attribute to high marginal tax rates crowding out donations of high-income earners.

Perhaps surprisingly, previous studies have found no strong evidence of differences in donations elasticity across income levels (see Peloza and Steel, 2005; Bakija and Heim, 2011). In other research contexts higher income taxpayers are found to be more responsive to tax incentives than lower income taxpayers (see for example Alinaghi, Creedy and Gemmell, 2021 for an analysis of the responsiveness of taxpayers to marginal tax rates at the top and penultimate New Zealand income tax thresholds).

In New Zealand taxpayers with higher taxable income are more likely to claim donation tax credits, and report larger donation amounts on average. This may reflect underlying donations behaviour. It could also reflect that higher income taxpayers are more aware of the availability of donation tax credits, and so are more likely to claim tax credits for donations made, or some combination of the two reasons.

Table 4 shows excess mass and donation elasticities separately for donation tax credit claimants with different levels of taxable income. Claimants are divided into ten equal groups according to their individual taxable income in each tax year.[24] Decile 1 represents the lowest 10% of claimants by taxable income (with mean taxable income of NZ$7,677), and decile 10 represents the highest 10% of claimants by taxable income (with mean taxable income of NZ$179,380).

The results mostly show no clear difference in donation elasticities by taxable income decile, other than some evidence of a higher donations elasticity for taxpayers in the lowest income tax decile. Taxpayers in the lowest income decile have very low taxable incomes, and so may be different from other taxpayers, for example, have no labour income, but a small amount of capital income. A possible reason that we do not find a larger donations elasticity for higher income taxpayers is that the donations elasticity is a local elasticity for taxpayers reporting donations around the tax credit cut-off rather than for very large donation amounts.

[24] It is important to note that household members may be in different taxable income deciles, and household income may be a better measure of income relevant to household donations behaviour than individual taxable income. However, since New Zealand taxes on an individual basis, and data for this study is available at an individual level, the individual is the unit that is used for donation elasticity estimates.

Table 4: Excess mass and elasticity estimates by income decile

Income decile	#Obs	Method 1			Method 2		
		b	e	95% confidence interval	b	e	95% confidence interval
Decile 1	223,428	3.798	-0.496	-0.740 to -0.252	6.675	-0.871	-1.027 to -0.715
		(0.756)	(0.124)		(0.609)	(0.079)	
Decile 2	223,349	2.989	-0.39	-0.525 to -0.255	4.114	-0.537	-0.628 to -0.445
		(0.420)	(0.069)		(0.358)	(0.047)	
Decile 3	223,286	2.369	-0.309	-0.419 to -0.199	3.492	-0.456	-0.564 to -0.348
		(0.341)	(0.056)		(0.422)	(0.055)	
Decile 4	223,355	2.81	-0.367	-0.496 to -0.238	4.475	-0.584	-0.702 to -0.466
		(0.399)	(0.066)		(0.462)	(0.060)	
Decile 5	223,346	3.328	-0.434	-0.616 to -0.252	5.620	-0.733	-0.886 to -0.581
		(0.565)	(0.093)		(0.595)	(0.078)	
Decile 6	223,335	3.688	-0.481	-0.680 to -0.282	5.913	-0.772	-0.962 to -0.582
		(0.616)	(0.101)		(0.742)	(0.097)	
Decile 7	223,321	3.757	-0.49	-0.664 to -0.316	5.877	-0.767	-0.937 to -0.597
		(0.540)	(0.089)		(0.664)	(0.087)	
Decile 8	223,318	3.526	-0.46	-0.674 to -0.246	5.360	-0.700	-0.898 to -0.501
		(0.664)	(0.109)		(0.776)	(0.101)	
Decile 9	223,319	3.191	-0.416	-0.610 to -0.222	4.858	-0.634	-0.786 to -0.482
		(0.602)	(0.099)		(0.593)	(0.077)	
Decile 10	223,326	2.982	-0.389	-0.561 to -0.217	4.276	-0.558	-0.670 to -0.446
		(0.533)	(0.088)		(0.439)	(0.057)	

Note: Excess mass (b) and elasticity € estimates separately by taxable income decile, using the pooled 2003-08 dataset. (1) NZ$ (NZ$1≈US$0.67). Bootstrap standard errors in parentheses. Method 1 estimates counterfactual distribution by fitting a 7th order polynomial to the distribution of reported donations excluding data over the bunching window. Method 2 estimates the counterfactual distribution on both the pre- and post-reform donations distribution.

9.1.2 Estimates by age group

Studies in Western countries have typically found that charitable giving increases with age up to a certain point (around 65 or 75 years old) and then begins to decline (Wiepking and James, 2013). In New Zealand donation tax credit claimants are 10 years older on average than the general population of taxpayers. Over the study period 3% of donation tax credit claims are made by young people (less than 25 years old), 54% of claims are made by prime age (25-55 years old), and 42% of claims are made by older people (55+ years).

Table 5 shows excess mass and donation elasticities separately for claimants in different age groups. This reveals that taxpayers in older age groups may be less responsive to donation tax credits than younger taxpayers. The elasticity of reported donations may also be elastic for younger and prime aged taxpayers (greater than one in absolute value).

Table 5: Excess mass and elasticity estimates by age group

Age group	#Obs	Method 1			Method 2		
		b	E	95% confidence interval	b	e	95% confidence interval
Youth (<25 years)	66,175	4.174	-0.686	-0.997 to -0.375	8.406	-1.097	-1.394 to -0.800
		(1.214)	(0.158)		(1.161)	(0.152)	
Prime age (25-55 years)	1,202,611	3.551	-0.584	-0.725 to -0.443	6.389	-0.834	-1.119 to -0.549
		(0.553)	(0.072)		(1.114)	(0.145)	
Older (55+ years)	958,057	2.826	-0.465	-0.547 to -0.383	3.509	-0.458	-0.532 to -0.384
		(0.320)	(0.042)		(0.289)	(0.038)	

Note: Excess mass (b) and elasticity€(e) estimates separately by age group, using the pooled 2003-08 dataset. Bootstrap standard errors in parentheses. Method 1 estimates counterfactual distribution by fitting a 7th order polynomial to the distribution of reported donations excluding data over the bunching window. Method 2 estimates the counterfactual distribution on both the pre- and post-reform donations distribution.

9.1.3 Estimates for males and females

Studies based on the Survey of Giving and Volunteering and the Centre on Philanthropy Panel Study in the United States have found little to no differences in the amount given by single males and females, although women are found to give smaller amounts to a larger number of causes, whereas men tend to focus their donations on a smaller number of causes (one or two). For individuals in relationships the studies have come to mixed conclusions about whether couples give more when making giving decisions independently or jointly. Men are found to be more responsive than women to the price of giving (Andreoni and Payne, 2013).

In New Zealand, female taxpayers are more likely to claim donation tax credits than males. Over the study period 56% of donation tax credit claims are made by females, 43% of claims are made by males and 1% of claims are made by individuals with a non-gender-specific title (such as Dr., Prof., Judge). The higher incidence of females claiming donation tax credits could reflect that female taxpayers are more likely to make charitable donations than men, that they are more likely to claim tax credits for donations made, or it could reflect the gender division of labour within households as to who submits the tax credit claim.

Table 6 shows excess mass and donation elasticities for male and female taxpayers pooled over the 2000-08 period following the same approach as above. This reveals that male elasticities are slightly larger in absolute value than females, but not significantly different statistically.

Table 6: Excess mass and elasticity estimates: Males and females

Gender	#Obs	Method 1			Method 2		
		b	e	95% confidence interval	b	e	95% confidence interval
Female	1,272,428	3.061	-0.399	-0.526 to -0.273	4.654	-0.607	-0.741 to -0.474
		(0.495)	(0.065)		(0.520)	(0.068)	
Male	1,000,361	3.579	-0.467	-0.576 to -0.358	5.726	-0.747	-0.891 to -0.603
		(0.426)	(0.056)		(0.564)	(0.074)	

Note: Excess mass (b) and elasticity (e) estimates separately for male and female donation tax credit claimants, using the pooled 2003-08 dataset. Bootstrap standard errors in parentheses. Method 1 estimates counterfactual distribution by fitting a 7^{th} order polynomial to the distribution of reported donations excluding data over the bunching window. Method 2 estimates the counterfactual distribution on both the pre- and post-reform donations distribution.

Table 7 shows excess mass and donations elasticities for male and female taxpayers separately by taxable income quartile pooled over the 2000-08 period, to compare gender differences for taxpayers with similar taxable incomes. Females represent 65% of claimants in the lowest two taxable income quartiles, 56% of claimants in the third income quartile, and 38% of claimants in the fourth (top) income quartile.

Female and male claimants are divided into four equal groups according to their taxable income in each tax year. Quartile 1 represents the lowest 25% of claimants by taxable income, and quartile 4 represents the highest 25% of claimants by taxable income. This reveals that male elasticities are slightly larger in absolute value than females, even for the same taxable income level, but not significantly different statistically.

Table 7: Excess mass and elasticity estimates: Males and females by taxable income quartile

Gender and income	#Obs	Method 1			Method 2		
		b	e	95% CI	b	e	95% CI
Female							
Quartile 1	365,868	3.117	-0.407	-0.522 to -0.291	4.862	-0.635	-0.764 to -0.505
		(0.452)	(0.059)		(0.507)	(0.066)	
Quartile 2	362,252	2.686	-0.351	-0.442 to -0.260	4.336	-0.566	-0.689 to -0.443
		(0.356)	(0.046)		(0.480)	(0.063)	
Quartile 3	306,154	3.376	-0.441	-0.595 to -0.286	4.936	-0.644	-0.808 to -0.481
		(0.605)	(0.079)		(0.639)	(0.083)	
Quartile 4	201,194	2.816	-0.368	-0.526 to -0.209	3.575	-0.467	-0.591 to -0.342
		(0.620)	(0.081)		(0.485)	(0.063)	
Male							
Quartile 1	190,255	3.340	-0.436	-0.576 to -0.296	5.023	-0.656	-0.756 to -0.555
		(0.546)	(0.071)		(0.392)	(0.051)	
Quartile 2	193,562	3.324	-0.434	-0.557 to -0.311	5.406	-0.705	-0.818 to -0.593
		(0.482)	(0.063)		(0.438)	(0.057)	
Quartile 3	249,201	3.99	-0.521	-0.658 to -0.383	6.765	-0.883	-1.046 to -0.719
		(0.537)	(0.070)		(0.639)	(0.083)	
Quartile 4	343,954	3.339	-0.436	-0.539 to -0.333	5.300	-0.692	-0.882 to -0.501
		(0.402)	(0.052)		(0.745)	(0.097)	

Note: Excess mass (b) and elasticity (e) estimates separately for male and female donation tax credit claimants, by taxable income quartile, using the pooled 2003-08 dataset. Bootstrap standard errors in parentheses. Method 1 estimates counterfactual distribution by fitting a 7th order polynomial to the distribution of reported donations excluding data over the bunching window. Method 2 estimates the counterfactual distribution on both the pre- and post-reform donations distribution.

9.1.4 Adjustment dynamics to tax reforms

Previous literature examining the elasticity of taxable income has found that some taxpayers remain in suboptimal positions due to a lack of awareness of the new optimal position following a tax change (see Chetty et al., 2011, and in the New Zealand context, Alinaghi et al., 2021). The 2003 and 2009 reforms of New Zealand donation tax credits provide an opportunity to examine how important these effects are in our context.

In the case of the 2003 reform, I examine whether slowness to adjust to the policy change reduced bunching at the new $1,890 kink point. In the case of the 2009 reform, I examine whether bunching may have been more pronounced prior to the reform as taxpayers delayed making larger donations until after the dollar-cut off for donations eligible for tax credits was removed. I also examine how quickly taxpayers responded following the 2009 reform.

Panel (a) of Figure 9 shows the substantial shift in bunching to the new threshold following the 2003 tax reform. However, excess mass remains at the previous threshold of $1,500 (shown at -4 in the figure). Panels (b) through (f) show that excess mass at the previous $1,500 threshold declines gradually in the years following the reform but remains visible through to 2008. It therefore appears that some taxpayers responded to the change in the donation tax credit regime more quickly than others.

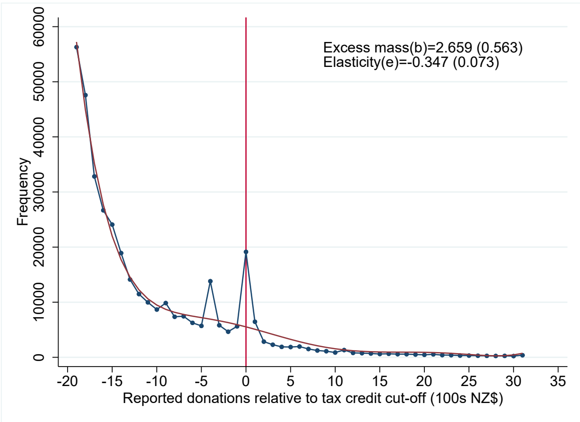
Taxpayers that are slow to adjust may have faced adjustment costs. They may have constrained the amount they donated to $1,500, unaware of the new higher threshold. Another possibility is that taxpayers reported a smaller donation amount to the tax authorities than was eligible for tax credits and as a result received fewer donation tax credits (donations of $1,500 would have received $130 less in tax credits than a donation of $1,890 or more). The reason for the relatively slow adjustment could have been because the threshold change was relatively small, and therefore not widely publicised, or because $1,890 is not a very memorable number, and so the new threshold was less salient and may not have stuck in the minds of taxpayers. The excess mass and elasticity estimates over the 2003-08 period are slightly smaller than they would have been if the adjustment to the tax change had occurred more quickly, especially in the earlier years.

The government passed a law (Income Tax Act 2007) removing the dollar-cut off for donations eligible for tax credits on 1 November 2007, five months prior to the change taking effect (1 April 2008). The bill was introduced into Parliament around a year earlier on 15 November 2006. Taxpayers could therefore have been aware of the possibility of the change during the 2007 and 2008 tax years. Despite this, there is no evidence that taxpayers held off making donations until after the 2009 tax reform. The year-on-year increase in total donations reported to the tax authorities in 2007 and 2008 was in line with historical trends (see Figure 2) and the amount of bunching at the $1,890 cut-off was not very different in 2007 or 2008 relative to the previous years.

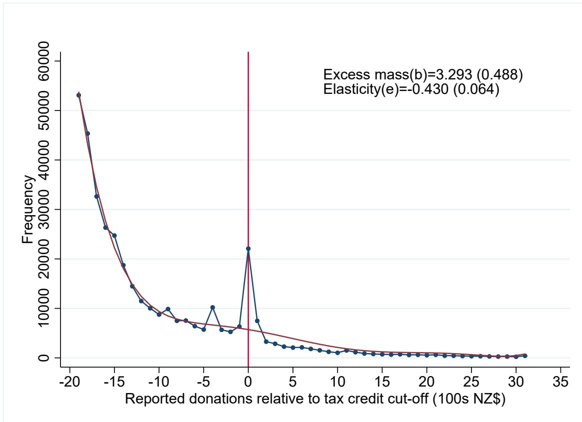
Figure 10 shows the distribution of reported donations by year after the $1,890 cut-off for donations eligible for tax credits was removed in 2009. There is some excess mass visible at the cut-off in the 2009 year but that disappears by the following year. There is some ‘round number’ bunching evident at $2,000 (bin 1). The speed of adjustment to the 2009 reform could be because the size of the reform incentivised charities to communicate the change to the public and their donors. The salience of the reform could also have made it memorable for taxpayers.

Figure 9: Distribution of reported donations following 2003 tax reform

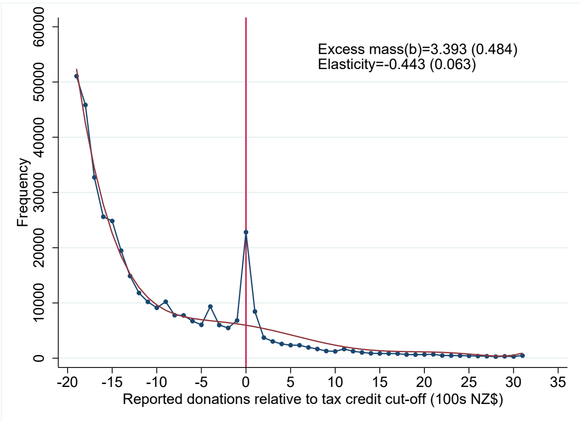
(a) 2003



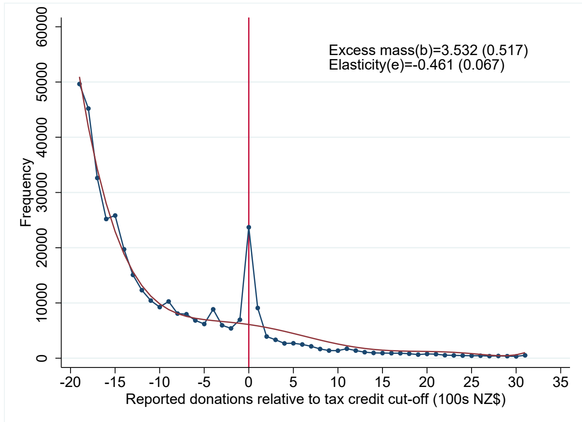
(b) 2004



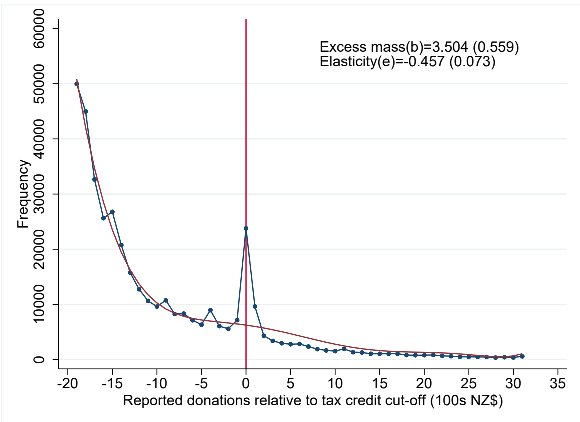
(c) 2005



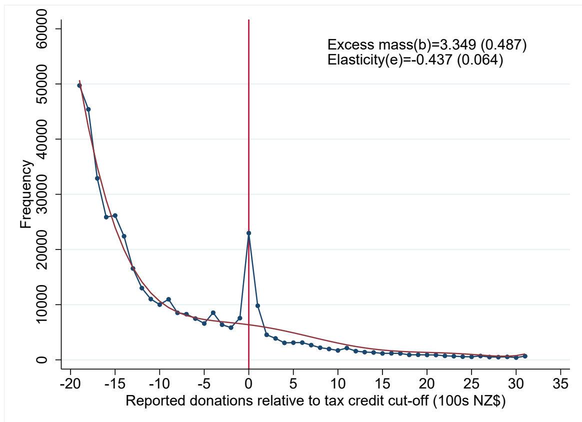
(d) 2006



(e) 2007



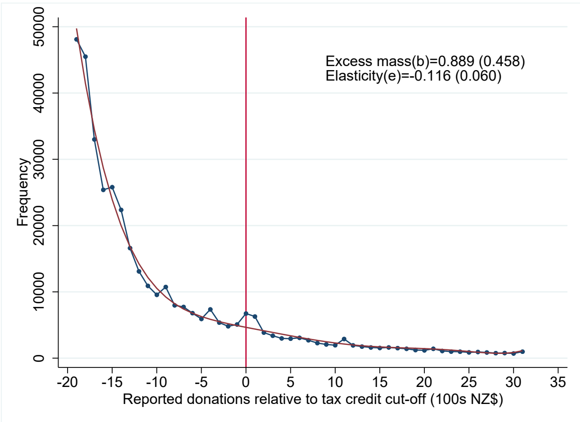
(f) 2008



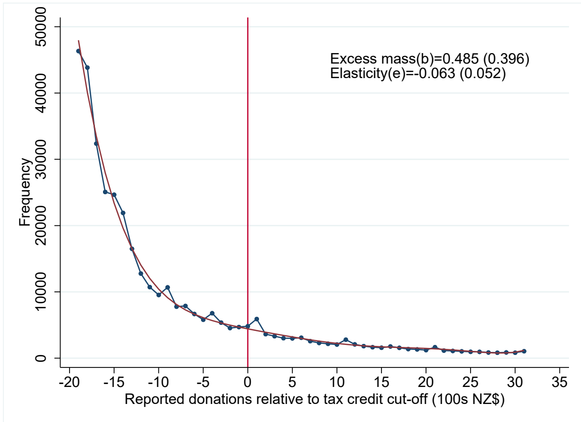
Note: Distribution of reported donations, excess mass and elasticity estimates separately by year following the 2003 tax reform that increased the cut-off for donations eligible for tax credits from $1,500 to $1,890. Counterfactual distribution estimated by fitting a 7th order polynomial to the distribution of reported donations excluding observations over the bunching window.

Figure 10: Distribution of reported donations following 2009 tax reform

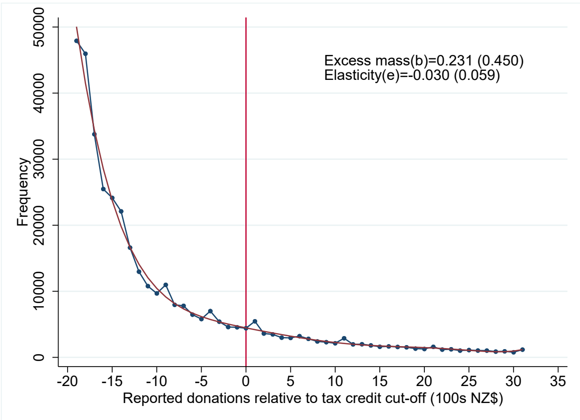
(a) 2009



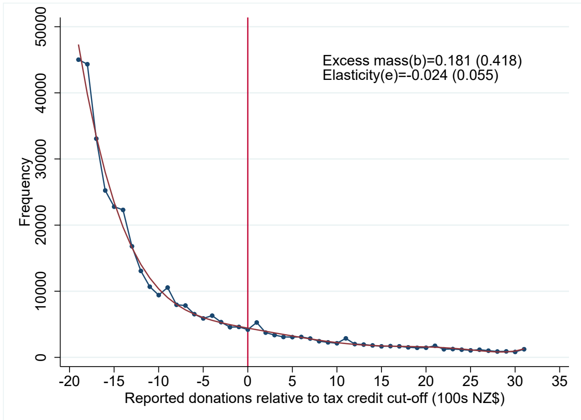
(b) 2010



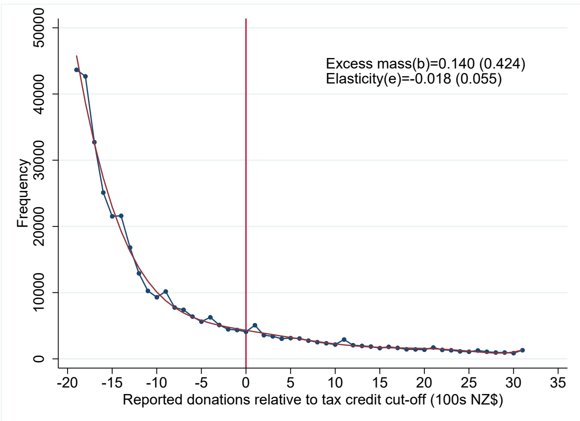
(c) 2011



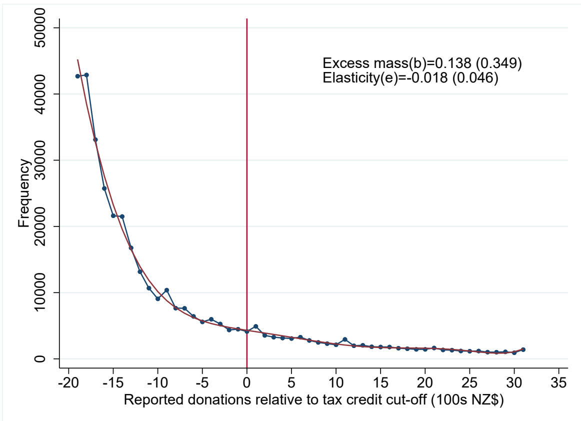
(d) 2012



(e) 2013



(f) 2014



Note: Distribution of reported donations and excess mass estimates separately by year following the 2009 tax reform that removed the $1,890 cut-off for donations eligible for tax credits. Donations data is recentred on the previous fixed ceiling ($1,890), and the counterfactual distribution is estimated by fitting a 7th order polynomial to the distribution of reported donations excluding observations over the bunching window 2003-08.

9.1.5 Robustness to bunching specifications

This subsection examines the sensitivity of the main results to three aspects of the bunching specifications: the size of the donation groups chosen (bin width), the size of the bunching window around the tax credit cut-off, and the degree of the polynomial selected to estimate the counterfactual distribution.

The first test in Table 8 considers using the data-driven approach proposed by Bosch et. al., (2020) to determine the bunching window. The data-driven approach suggests a bunching window of [0,1], which is narrower than the baseline case. The elasticity estimates show that this, unsurprisingly, leads to a slightly lower elasticity estimate relative to the baseline case. Studies from the elasticity of taxable income literature have found that the data-driven approach typically leads to a narrower bunching window than visual inspection.[25]

The second test considers increasing the bunching window from [-1,1] in the baseline case to [-2,2], which increases the width of the bunching window to [$1,690 to $2,190] over the 2003-08 period. The bunching mass is smaller when a wider bunching window is used but the estimates are not statistically different from the baseline case.

The third test reduces the donation groups from $100 to $50, thereby doubling the number of bins. The bunching window is defined as one bin either side of the policy cut-off in the baseline case, so the narrower bin width also has the effect of reducing the width of the bunching window to [$1,840 to $1,990] from [$1,790 to $2,090] in the baseline case over the 2003-08 period. The narrower bin width of $50 and [-1,1] bunching window reduces the elasticity (in absolute value) to -0.255 from -0.431 in the baseline case (and from -0.671 to -0.518 when the pre- and post-reform donations distribution is used to estimate the counterfactual case), since there is excess mass outside of the bunching window. This is not a preferred specification, as excess mass locating outside of the bunching window at $2,000 does appear to be related to the nearby policy cut-off at $1,890.

The fourth test considers using the data-driven approach to determine the bunching window with donation groups of $50. The data-driven approach suggests a bunching window of [0,0], because bunching around the policy threshold is not contiguous when donations are grouped in $50 bins. Bunching is observed at the threshold [$1,890 to $1,940] and in the second bin [$1,990 to $2,040]. Since there are strong reasons to believe that reported donations bunch around $2,000 because of the nearby policy threshold, I define the bunching window as [0,2]. The elasticity estimates are similar to the baseline case.

[25] Alinaghi et. al., (2022) find that the data-driven approach to identify the bunching window in the context of estimating the ETI results in a bunching window of [-3,3] or narrower compared to the [-5,5] window identified through visual inspection.

Lastly, using a less flexible sixth-order polynomial or a more flexible eighth-order polynomial leads to estimates that are statistically indistinguishable from the estimates in the baseline case.[26]

Table 8: Excess mass and elasticity estimates: robustness testing

Year	Method 1			Method 2		
	b	e	95% confidence interval	b	e	95% confidence interval
Baseline:[1]						
$100, [-1,1]	3.302	-0.431	-0.547 to -0.315	5.144	-0.671	-0.806 to -0.536
	(0.452)	(0.059)		(0.528)	(0.069)	
Bunching window:						
$100, [0,1][2]	2.809	-0.367	-0.502 to -0.231	3.242	-0.423	-0.525 to -0.321
	(0.528)	(0.069)		(0.399)	(0.052)	
Bunching window:						
$100, [-2,2]	2.887	-0.377	-0.529 to -0.225	5.112	-0.667	-0.850 to -0.484
	(0.594)	(0.078)		(0.716)	(0.093)	
Bin width:						
$50, [-1,1]	3.903	-0.255	-0.591 to 0.081	7.945	-0.518	-0.717 to -0.320
	(2.624)	(0.171)		(1.552)	(0.101)	
Bin width & bunching window:						
$50, [0,2][3]	5.243	-0.342	-0.574 to -0.111	10.843	-0.718	-0.893 to -0.543
	(1.810)	(0.118)		(1.368)	(0.089)	
Polynomial order:						
6	3.387	-0.326	-0.434 to -0.218	5.272	-0.688	-0.809 to -0.567
	(0.422)	(0.055)		(0.472)	(0.062)	
8	3.228	-0.421	-0.548 to -0.294	4.931	-0.644	-0.785 to -0.502
	(0.495)	(0.065)		(0.554)	(0.072)	

Note: (1) bin width $100, bunching window [-1,1], 7th order polynomial, using pooled 2003-08 dataset. (2) [0,1] bunching window suggested by data-driven procedure with $100 donation groups. (3) Data driven procedure with $50 donation groups suggests a [0,0] bunching window due to non-contiguous bunching mass around the policy threshold. A bunching window of [0,2] is selected as bunching in donation group 2 (around $2,000) is clearly attributable to the nearby policy threshold at $1,890. Method 1 estimates counterfactual distribution by fitting an n^{th} order polynomial to the distribution of reported donations excluding data over the bunching window. Method 2 estimates the counterfactual distribution by fitting an n^{th} order polynomial to the distribution of reported donations pooled over the pre-reform period, and post-reform period, excluding data over the bunching window in the pre-reform period. Bootstrap standard errors in parentheses.

The results presented so far define the cut-off for donations eligible for tax credits as the dollar cut-off. There is a small fraction of donation tax credit claimants whose taxable income is less than the dollar

[26] Note also that the Bayesian Information Criterion (BIC), used in the ETI literature to determine the optimal polynomial order, is minimized with a 7^{th} order polynomial specification.

cut off (4% of claimants over the 2000-08 period). For this group of taxpayers, the policy threshold where the marginal price of giving from after-tax income increases from 1-t to 1 is less than the dollar cut-off. Estimating the bunching mass and donation elasticity excluding these taxpayers has almost no impact on the estimates ($\hat{b} = 3.288$, e=-0.429, 95% confidence interval -0.576 to -0.282 over the 2003-08 period, when estimated using method 1).

10. Conclusions

This study provides evidence that there was substantial 'bunching' of reported donations around the fixed ceiling for donation tax credits over the 2000-08 period. We show that some of the observed bunching is likely to be due to reporting effects (i.e., individuals underreporting the actual donation amount to the tax authority) rather than all the bunching being due to an actual donation response.

We demonstrate that the observed bunching implies an elasticity of reported donations of around -0.7 to -0.4 for taxpayers reporting donations around the policy threshold. The estimated elasticities are likely to overstate the actual donations response due to reporting effects.

The elasticity of reported donations provides an upper boundary on the actual donation response since reporting effects would tend to increase, not decrease, the amount of bunching and the estimated elasticity. The results imply that in considering the donation tax credit, taxpayers will on average retain some of the benefit themselves, and pass some (but not all) of the benefit on to the charity through a higher donation amount. The important policy implication of the findings is that the price elasticity of demand of actual donations is inelastic (less than one in absolute value) meaning that the additional donations generated by the tax credit are less than the loss of government revenue from funding the credit.

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