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Market Behaviour Versus Tax Planning Responses to Changes in Marginal Income Tax Rates Among Older Couples

by Derek Messacar

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^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
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F too unreliable to be published
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Abstract

The standard model of labour supply predicts that individuals' taxable incomes will bunch at convex kink points in the budget set created by government tax and transfer systems. However, empirical evidence of such behaviour is scarce. Using administrative tax data from Canada, this paper estimates bunching responses in taxable income among older individuals at discontinuities in marginal tax rates created by federal and provincial and territorial systems, from 2001 to 2012. The results show that bunching is prevalent across the income distribution, but this is mostly driven by married individuals from 2007 onward. Further analysis reveals this occurs predominantly because pensioners split some of their pension income with their spouses who tend to have lower marginal tax rates. Pensioners do this pursuant to the introduction of this tax planning program in the 2007 federal budget. These findings offer credible evidence of significant intra-household tax planning behaviour that depends on the availability of deductions.

Keywords: pension income; elasticity of taxable income; tax planning; income splitting; bunching; empirical density design

Executive summary

This paper investigates the extent to which older Canadian taxfilers, aged 60 to 69, respond to predictable changes in marginal tax rates created by the tax and transfer system by exhibiting sorting behaviour in taxable income. More precisely, the prediction from the standard model of labour supply that individuals' taxable incomes bunch at convex kink points in their budget sets is tested, in an empirical density design.

Using administrative tax data for the years from 2001 to 2012, the analysis assesses how individuals respond to changes in marginal tax rates created at the lower bounds of the second, third and fourth federal tax brackets; the lower bounds of the second and third provincial and territorial tax brackets; and the thresholds at which the Old Age Security and Employment Insurance benefits start being clawed back through recovery taxes. The results indicate the following.

1. Taxable income is responsive to the changes in tax rates at the thresholds analyzed. Bunching is observed at every threshold. Hence, individuals are sorting in their taxable incomes in response to the tax and transfer system, as expected.

2. Bunching appears the most prevalent among married (either legally married or in a common-law relationship) individuals from 2007 onward.

However, a closer inspection shows the following:

3. Bunching is driven primarily by individuals who are married and who used the pension income splitting provision of the tax code, pursuant to the introduction of this program in the 2007 federal budget.

4. In contrast, the bunching responses to changes in income tax rates appear to be negligible among
    a. unmarried individuals
    b. married individuals before 2007
    c. married couples who do not have at least one spouse receiving private pension income and are ineligible for pension income splitting.

These findings offer credible evidence of intra-household tax planning behaviour that depends on the availability of deductions. Effectively, couples are not only using the pension income splitting program to reduce their own tax liabilities but also taking into account the marginal tax rates of their spouses to minimize household tax liabilities, as expected.

1 Introduction

Income taxes are often found to have small effects on individuals' labour supply decisions and other economic behaviour (e.g., investment decisions) and large effects on individuals' tax planning responses (Saez, Slemrod and Giertz 2012). Individuals can delay or avoid paying higher income taxes in many ways, such as by making tax-deductible charitable donations or contributions to retirement savings vehicles (Stiglitz 1985; Auten, Sieg and Clotfelter 2002; Bakija and Heim 2008). Shifting income from the personal to the corporate tax base is also a potential tax planning channel among business owners (Goolsbee 2000; Gordon and Slemrod 2000; Kreiner, Leth-Petersen and Skov 2014). Evidence suggests that the elasticity of taxable income (ETI) with respect to the marginal tax rate—a measure once viewed as a sufficient statistic for the efficiency cost of taxation (Feldstein 1995, 1999; Slemrod and Yitzhaki 2002)—depends on the availability of deductions and, therefore, can be manipulated by policy makers (Kopczuk 2005).

In general, the ETI is an incomplete measure of the deadweight loss from taxation when some burden of sheltering income is incurred as a resource or transfer cost (Chetty 2009). If the unit of taxation is the individual, sheltering can occur within households when family members split income—provided that resources are not shared, as in the unitary model of the household (Kornhauser 1993; Cantillon and Nolan 1998; Freiler, Stairs and Kitchen 2001; Gelber 2014). Consequently, a better understanding of the extent to which older couples reduce personal income tax liabilities through splitting warrants investigation.

The goal of this study is to assess the extent to which income taxes induce changes in market behaviour (sometimes called "real" responses) versus changes in tax planning strategies. The paper focuses particularly on income splitting between spouses as the channel through which tax avoidance may occur. Market response refers to a change in actual economic activity by individuals—such as a change in employment income through an adjustment in the number of hours worked. Tax planning response refers to the use of allowances, credits and deductions to reduce tax liabilities while holding constant economic behaviour.

The paper makes two key contributions. The first contribution is to use administrative data on a 20% nationally representative sample of Canadian taxfilers, for the years from 2001 to 2012, to estimate, in an empirical density design, the effects of changes in marginal tax rates on the taxable incomes of older individuals aged 60 to 69 (Saez 2010; Chetty et al. 2011). The standard model of labour supply predicts that individuals will bunch at convex kink points in their budget sets created by government tax and transfer systems, but evidence of such behaviour is scarce (Saez, Slemrod and Giertz 2012). This study finds significant bunching at various convex kink points along the income distribution associated with the lower bounds of the federal and provincial and territorial tax brackets, where marginal tax rates increase discontinuously as a result of tax progressivity. In addition, bunching is observed at two convex kink points where effective marginal tax rates change, namely the income thresholds where Employment Insurance (EI) and Old Age Security (OAS) benefits start being clawed back through recovery taxes. In these cases, responses are observed only among EI recipients and OAS-eligible individuals.

The second contribution of this paper is to estimate how much of this bunching is the result of intra-household tax planning. In theory, the magnitude of tax avoidance or evasion should be proportional to the expected costs of such behaviour, including costs from administration, effort or detection (Allingham and Sandmo 1972; Stiglitz 1985; Slemrod and Yitzhaki 2002). Pension income splitting in Canada is both legal and notional in the sense that it does not require a transfer of income or division of asset ownership. Pension income splitting is a no-cost tax avoidance

channel for older couples; consequently, take-up is predicted to be high.[1] To separately identify the effect of splitting from other types of market behaviour or tax planning responses, the analysis exploits exogenous variation in individuals' eligibility to split pension income by marital status and around the introduction of this program.[2] Moreover, the data provide information on whether individuals and their spouses are pension income recipients and the actual amounts of income they elect to split. This facilitates a direct comparison of bunching between couples who could have used or did use this tax provision and those who did not use it.

The results of this analysis show that bunching is only weakly observed before pension income splitting was introduced, as well as among unmarried individuals and couples who were ineligible for splitting after the reform was introduced. In contrast, the magnitude of bunching, after pension income splitting was introduced, among individuals collecting a private pension income or whose spouses do so is substantial. Further analysis conditional on whether splitting actually occurs shows that the bunching stems mostly from the use of this program. Within couples, bunching occurs from one of two possible behaviours:

1. an individual, who is a pensioner, sends enough income to a spouse to reduce taxable income to a lower tax bracket; or
2. an individual, whose spouse is a pensioner, receives income only up to the point where taxable income would otherwise enter a higher tax bracket.

Hence, pensioners are not only using this tax planning tool to lower their own tax liabilities but also to lower household tax liabilities, taking into account the marginal tax rates of their spouses. These findings offer credible evidence of intra-household tax planning behaviour that depends on the availability of deductions.

This paper contributes to a growing literature that seeks to disentangle market behaviour from tax planning responses to personal income taxation. Prior research shows that income shifting, both intertemporally and across tax bases, is substantial among high-income earners and the self-employed who have the most access to tax planning technologies (Gordon and Slemrod 2000; Goolsbee 2000; Chetty et al. 2011; le Maire and Schjerning 2013; Kreiner, Leth-Petersen and Skov 2014, 2016; Harju and Matikka 2016). However, few studies consider the extent to which families coordinate to reduce combined tax liabilities. This is likely because many studies that estimate the ETI are carried out using data from the United States, where the unit of taxation is the household. Other studies look at countries where the unit of taxation is the individual, but where household-level tax return data or the policy variation needed for proper identification are not available. A notable exception is Stephens and Ward-Batts (2004), who showed that the 1990 reform from joint to individual taxation in the United Kingdom led to an increase in the sharing of assets claimed by spouses with lower marginal tax rates. Wolfson and Legree (2015) used data from Canada on business owners and their families who work for the business and live in the same household. They posited that business owners make labour and dividend payments strategically to reduce household tax liabilities.[3] This paper is among the first to assess how, following the introduction of a mechanism that was explicitly designed to facilitate tax planning at the household level, taxable income responds to marginal tax rates within couples.

1. To declare the amount of pension income to be split each year, couples fill out and submit a form with their tax returns. The cost or disutility (time, effort, etc.) of completing this form is likely negligible for most couples given that they are already filing taxes. This contrasts with, for example, the sharing of income from public pensions—the Canada Pension Plan (CPP) and the Quebec Pension Plan (QPP). Pension sharing may result in tax savings, but this process requires an application and the amount of income that can be shared depends on the amount of time couples lived together. The process also involves a direct transfer of benefits from one spouse to the other. These factors attenuate couples' ability to use pension sharing to manipulate joint tax liabilities strategically, on a year-to-year basis, for the purpose of tax planning.
2. Couples who are legally married or in common-law relationships are eligible to split pension income. In this paper, the term "married" is taken to mean either of these cases.
3. The study by Wolfson and Legree (2015) cannot credibly identify whether labour and dividend payments to family members occur as part of tax planning or true labour and capital investments to firms.

It also relates more broadly to the work of Gugl (2009), who analyzed intra-household equity considerations of pension income splitting.

Since this paper centres on the responsiveness of older couples to income taxation, it relates to a large literature on the labour supply decisions of the elderly. Many studies investigate how pension receipt or retirement decisions are influenced by the design of public pension plans (Baker and Benjamin 1999; Feldstein and Liebman 2002; Baker, Gruber and Milligan 2003; French and Jones 2012). However, few studies consider the extent to which the tax code is a viable policy instrument for influencing the labour supply decisions of older workers (Schmidt and Sevak 2009; Alpert and Powell 2014; Messacar 2017). Lastly, this paper adds to a developing literature that estimates income responses to taxation using the empirical density design (Saez 2010; Chetty et al. 2011; le Maire and Schjerning 2013; Bastani and Selin 2014; Harju and Matikka 2015).

This paper proceeds as follows. The next section, Section 2, gives an overview of the standard model of labour supply and derives the bunching prediction; it includes a brief discussion of the empirical density approach for estimating excess mass. Section 3 summarizes features of the Canadian income tax system of relevance to the empirical analysis. Section 4 discusses the data and sample selection used in this study. Section 5 presents the baseline results, the analysis of the pension income splitting reform, two placebo checks, and tests of heterogeneous responses. Section 6 concludes.

2 Background

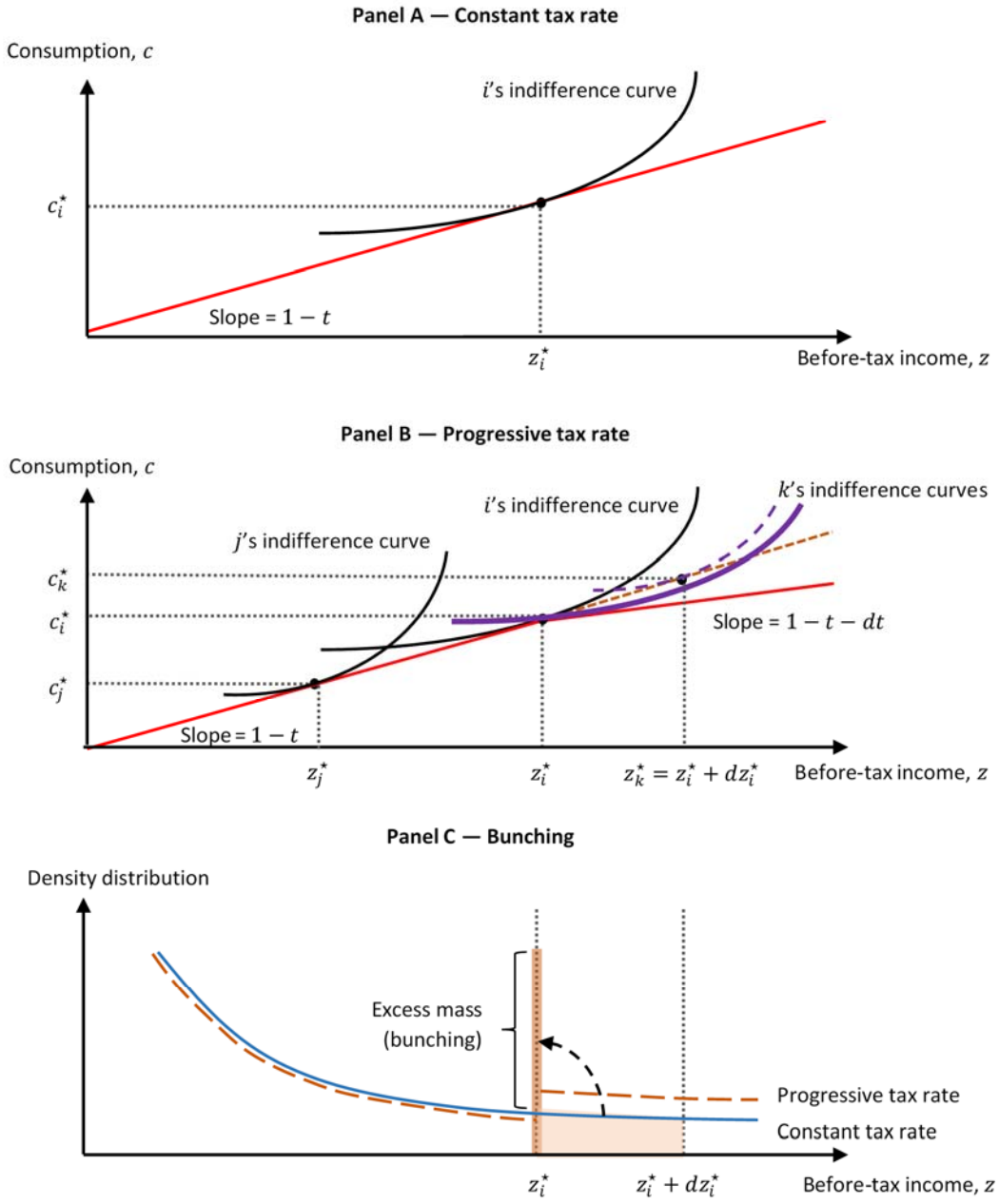
This section presents an overview of the theory of labour supply prediction that individuals bunch at convex kink points in their budget sets. Then, the method for estimating this bunching behaviour is briefly discussed. In particular, the theoretical and methodological contributions of Saez (2010) and Chetty et al. (2011), which are of direct relevance herein, are provided. The reader is encouraged to refer to those papers directly, as well as to the wide-spanning ETI literature discussed in Saez, Slemrod and Giertz (2012), for more information.

2.1 Theory

Saez (2010) considered the standard model of labour supply, in which an agent i's utility depends positively on after-tax income, c_i, and negatively on before-tax income, z_i. The agent prefers to consume more but is hindered by the effort cost of supplying labour to earn more. The utility function is given by $u_i\left(c_i, z_i\right)$ and satisfies several conditions: (1) $\partial u_i / \partial c_i > 0$; (2) $\partial u^2 / \partial c^2 < 0$; (3) $\partial u / \partial z < 0$; and (4) $\partial u^2 / \partial z^2 < 0$.

To begin, suppose an agent faces a linear budget set with a constant marginal tax rate t, so that after-tax income is $c = z\left(1 - t\right)$. A graphical depiction of the solution to this optimization problem is shown in Panel A of Figure 1. The agent will provide effort and earn income up to the point where the marginal benefit of consumption equals the marginal disutility of effort. For agent i, this results in the optimal levels of before-tax income, $z_i^\star$, and after-tax income, $c_i^\star$. The assumption that agents are heterogeneous in before-tax income because of underlying differences in preferences or ability is captured by heterogeneity in the utility function. The figure shows how the solution to this optimization problem varies across agents.

Figure 1
Theoretical prediction of agents' bunching responses to a convex kink in the budget set as the result of tax progressivity



Note: Panel A shows the optimal levels of before-tax and after-tax incomes for an agent with preferences given by the indifference curve shown, facing tax rate t. Panel B shows how agent k, who would optimally consume $z_k^\star$ given a constant tax rate, chooses $z_i^\star$ in the presence of the convex kink changing the marginal tax rate to $t + dt$. This puts agent k on a lower indifference curve (thick solid purple line) than under a constant tax rate (dashed purple line). Agents i and j optimally choose before-tax incomes at or below the convex kink point, and are therefore unaffected by it. Panel C shows the effect of the convex kink on the distribution of before-tax income. The distribution under a constant tax rate is smooth around the kink point (solid blue line). As a result of the kink, agents with before-tax incomes from $z_i^\star$ to $z_i^\star + dz_i^\star$ bunch at $z_i^\star$, creating a spike in the distribution under progressivity (dashed orange line), and the density above $z_i^\star + dz_i^\star$ shifts to $z_i^\star$.
Source: Statistics Canada, based on the model and bunching prediction of E. Saez, 2010, "Do taxpayers bunch at kink points?" p. 184.

That the response in taxable income occurs through the labour supply adjustment is referred to as a market behaviour response. In other words, the actual behaviour of economic agents is being affected by income taxation in a standard manner as predicted by economic theory. To understand how workers are expected to respond, suppose that a convex kink were introduced in the budget set at income $\tilde{z}$ by increasing the marginal tax rate from t to $t + dt$ on income earned above this tax threshold. Panel B of Figure 1 shows that, in this case, workers with earnings below the tax threshold (agents i and j in the figure) remain unaffected and continue to consume their initial amounts. However, an agent earning from $\tilde{z}$ to $\tilde{z} + d\tilde{z}$ (agent k in the figure), who initially consumed $c_k^\star$ under the scenario of a constant tax rate, now finds it optimal to consume $c_i^\star$. Hence, the convex kink in the budget set results in an excess of agents who optimally bunch at the convex kink point in before-tax income. Panel C of Figure 1 shows how the density distribution of before-tax (taxable) income is expected to look—within the context of the theory—under the scenarios of a constant or progressive piecewise-linear tax system. In contrast, a "tax planning" response refers to the use of allowances, credits or deductions to modify taxable income so that bunching occurs but without any change in actual economic behaviour.

The standard prediction from the economic model assumes labour income (or another type of income that requires effort) is the primary income source. Especially among older workers, adjustments may be prevalent—compared with young and middle-aged workers—through transitions into flex-time, part-time (e.g., partial retirement) or bridge employment. If an individual's main source of income requires no effort to collect, such as pensions, the size of the response is unclear. The response may be smaller because collecting income beyond a particular tax threshold has no effort cost. However, pensioners face an intertemporal trade-off between receiving an extra dollar at a higher marginal tax rate and delaying the receipt of that dollar until the following year, at a lower marginal tax rate. Bunching may be especially prevalent because the amount of pension income received can be manipulated. This issue is especially important in the context of this study, because only approximately one-third of taxfilers have employment earnings.

In addition, labour supply may not respond as predicted by the stylized model for many reasons. For example, many workers may have strict preferences to work a fixed number of hours per week. Similarly, employers may offer contracts with hours constraints. Search costs of changing jobs can significantly reduce the extent to which bunching at discontinuities in the marginal tax schedule occurs—this issue is explored in detail by Chetty et al. (2011). On balance, common labour frictions that are not always well represented in canonical models can significantly affect actual responses. The findings from this study, which centre on the introduction of pension income splitting, serve to credibly identify the effect of this tax planning tool on the ETI, which is analogous to that of a difference-in-differences approach.

2.2 Estimation

The approach developed by Saez (2010) and extended by Chetty et al. (2011) for estimating bunching in an empirical density design is used. To that end, the "bunch_count" Stata module (an ".ado" file) written by Olsen (2011) is employed in the analysis. This empirical procedure is briefly described here, with a discussion of how to interpret the results.

The approach begins by normalizing taxable income relative to the convex kink point analyzed; for example, having relative taxable income equal to zero in the reference year means taxable income was exactly equal to the tax threshold. Using this normalized taxable income variable, the study groups individuals with incomes within $10,000 on either side of the tax threshold into bins of width $250 (e.g., from -$10,000 to -$9,751, from -$9,750 to -$9,501, from -$9,500 to -$9,251), and bin counts (frequencies) are computed.

Then, a counterfactual density distribution is estimated. This gives a prediction of what the distribution would have looked like under a constant tax rate over the relevant range of taxable income. The counterfactual is estimated by fitting a polynomial to the bin counts, excluding data near the kink, where actual bunching would influence these results. The procedure adjusts for the fact that individuals at the convex kink point must come from other points to the right of this kink. The estimate of bunching is the excess mass around the convex kink point relative to the average density of the counterfactual earnings distribution within a range of income close to the convex kink point.[4]

For a bunching estimate b obtained from this procedure, the point estimate indicates that the excess mass around the convex kink point is b % of the height of the counterfactual distribution within the range of income close to the convex kink point. A parametric bootstrap procedure is used to compute standard errors for b.

3 Institutional details

Personal income tax in Canada is based on a measure of taxable income minus any permitted deductions; then credits are applied to determine the net amount payable. The unit of taxation in Canada is the individual. However the income tax system recognizes that individuals may have reduced abilities to pay income taxes when they have dependent spouses or relatives. This is provided for in the form of additional credits and of transfers of certain dependents' unused credits to the taxpayer.

Income taxes are determined at both federal and provincial and territorial levels. Each government applies its own tax rates to a uniform measure of taxable income and offers its own credits to determine the net amount of income taxes owed. In 2012, federal taxable income was divided into four brackets. The tax rate was 15% for the first bracket ($42,707 or less), 22% for the second bracket (from $42,708 to $85,414), 26% for the third bracket (from $85,415 to $132,406), and 29% for the fourth bracket ($132,407 or more). This tax progressivity creates the convex kink points in individuals' budget sets that are expected to induce bunching responses. The federal basic exemption in 2012 was $10,822, such that the marginal tax rate applied to taxable income below this threshold was 0%.[5]

At the provincial and territorial levels, the income tax structures and rates are significantly heterogeneous. For example, Alberta imposed a flat tax rate of 10% in 2012 on taxable income above a basic personal exemption of $17,282. The provinces that had only two tax brackets in 2012 were Newfoundland and Labrador, Prince Edward Island, Quebec, Ontario, Manitoba and Saskatchewan. The provinces and territories with three tax brackets in 2012 were New Brunswick, Northwest Territories, Yukon and Nunavut. The provinces with four tax brackets in 2012 were Nova Scotia and British Columbia. In general, provinces and territories set thresholds for their tax brackets that fall within the federal tax brackets. For example, in 2012, the lower bounds of the

4. The empirical analysis of this study uses a sextic polynomial to estimate the counterfactual distribution, as well as a bandwidth of $750 on either side of the convex kink point to compute excess mass near this point. Using the notation from Chetty et al. (2011), this study sets $q = 6$ and $R = 3$. A comparatively small R is used in this study because individuals have significant ability to exactly control their taxable incomes in this setting. The results are very robust to using different polynomial orders or bandwidths. In addition, while this analysis focuses only on individuals with taxable incomes within $10,000 on either side of the convex kink point, the results are also very robust to using different values. This threshold is appropriate given the actual spacing of the convex kink points analyzed from each other. As will be shown later, the bunching results are clearly discernible in graphical inspections of the distributions of taxable income.
5. Bunching responses to federal and provincial or territorial basic exemptions are not estimated given that they are very close to one another. Separately identifying each effect is not possible; both convex kink points would likely influence each other's estimated counterfactual distributions. In addition, several other nearby thresholds, including working income tax benefit clawback thresholds, could affect how individuals sort around the basic exemptions.

second and third brackets were the following: $32,893 and $65,785 in Newfoundland and Labrador; $39,020 and $78,043 in Ontario; and $37,013 and $74,028 in British Columbia. The differences between federal and provincial and territorial brackets are useful for the empirical analysis to separately identify bunching at these various convex kink points.

In addition to estimating bunching at these federal and provincial and territorial tax thresholds, this study also considers the extent to which individuals respond to clawback provisions in the OAS and EI programs. First, the OAS pension is a demogrant for individuals starting at age 65 (Baker, Gruber and Milligan 2003) based on Canadian legal status and residence requirements; the maximum annual OAS pension was $6,540 in 2012. However, if annual net world income exceeds a pre-specified amount, recipients must repay part or all of their pension benefits. In 2012, the threshold was $69,562, and the recovery tax rate was 15%.

Second, EI is a public insurance program providing temporary financial benefits to unemployed individuals, including regular benefits for those who lose their jobs through no control of their own and sickness benefits for people unable to work because of sickness or injury. Individuals who received regular benefits with net incomes exceeding a pre-specified threshold, which was $57,375 in 2012, may have been required to repay 30% of the lesser of net income in excess of the threshold or the total regular benefits paid in the tax year.

On January 1, 2007, the federal government implemented pension income splitting, which permits individuals to split income drawn from private pensions with their spouses. The pension recipients who are sending income ("pensioners") may allocate up to 50% of eligible pension income to their spouse ("transferees") to reduce joint tax liabilities. For those aged 65 years and older, eligible income includes annuity and registered retirement income fund payments, registered retirement savings plan annuity payments and other types of pension and retirement compensation. However, for those under age 65, eligible income is limited to registered pension plan (RPP) payments and certain benefits received as a result of the death of a spouse. As mentioned earlier, this transfer is notional in the sense that no direct transfer of income or division of asset ownership takes place. To declare the amount of pension income to be split each year, couples simply fill out and submit a form with their tax returns.

4 Data and sample selection

This study is based on an analysis of the Longitudinal Administrative Databank (LAD), a panel dataset comprising a 20% nationally representative sample of Canadian taxfilers. The sample was derived from T1 Family File (T1FF) income tax data from the Canada Revenue Agency. The T1FF is a yearly cross-sectional dataset of taxfilers and their census families. Individuals file tax returns independently in Canada, but census families were created in the T1FF according to the spousal social insurance number listed on each individual's tax form or by matching the name, address, age, sex and marital status. As a result, the LAD contains a wide set of variables about demographics, earnings, income, taxes, transfers, credits, allowances and savings for the individuals represented and their spouse. The LAD is updated annually to ensure accurate cross-sectional representation. The tax data do not provide a direct measure of individuals' marginal tax rates. To overcome this issue, these rates are calculated using the Canadian Tax and Credit Simulator (CTaCS) of Milligan (2016).

Table 1 presents the descriptive statistics for the sample used in this analysis. On average, individuals are 64.1 years old, of whom 52.0% are women and 72.3% are married (i.e., legally married or in common-law relationships; see Footnote 2). In addition, the table shows that a significant fraction of individuals have labour earnings from employment (34.7%) or self-employment (9.1%), investment income (44.6%), OAS income (42.8%), and private pension income (38.9%). The mean value of taxable income, conditional on these values being strictly

positive, is $39,550, and the median value is $28,300 (expressed in 2012 constant dollars). Using CTaCS, the mean value of the predicted marginal income tax rate is 22.1%, and the median value is 23.6%.

Table 1
Descriptive statistics

	Mean	Median
	years	
Demographics		
Age	64.1	64.0
	percent	
Female	52.0	…
Male	48.0	…
Married	72.3	…
Employment and income		
Has employment earnings	34.7	…
Has self-employment earnings	9.1	…
Has investment income	44.6	…
Has capital gains	12.6	…
Has Old Age Security income	42.8	…
Has private pension income	38.9	…
Has taxable income	98.1	…
	2012 constant dollars	
Conditional earnings and income		
Employment earnings	42,800	27,100
Self-employment earnings	28,100	10,100
Investment income	3,400	750
Capital gains	9,200	750
Old Age Security income	5,700	6,500
Private pension income	21,700	17,250
Taxable income	39,550	28,300
	percent	
Income-tax rates		
Predicted marginal income tax rate	22.1	23.6
Predicted average income tax rate	11.4	13.2

… not applicable

Note: The descriptive statistics pertain to the sample of taxfilers aged 60 to 69 analyzed in this study, based on the pooled data from 2001 to 2012. The conditional earnings and income statistics are conditional on the values being strictly positive, and are expressed in 2012 constant dollars. The tax rates are calculated using the *Canadian Tax and Credit Simulator (CTaCS)* of Milligan (2016).

Source: Statistics Canada, Longitudinal Administrative Databank.

The analysis centres on all Canadian taxfilers in the LAD, for the years from 2001 to 2012, who were 60 to 69 years of age in the reference year. This timeframe was chosen to provide a wide interval of observations for a comparative analysis over time, while centring the tax code reform from 2007 that introduced pension income splitting. This age group was chosen to focus on individuals who are both old enough to be collecting a pension, since this is a prerequisite for pension income splitting, and young enough to be employed, so that labour income responses to taxation are plausible. More precisely, the earliest age at which individuals can start to collect public pension income is 60, which serves as the benchmark for the lower bound of this target sample.[6] Individuals must start to receive income from their employer-sponsored RPP by the end of the year in which they turn age 69, which serves as the upper bound for this target sample.

6. The earliest age at which individuals can generally start to collect income from private pensions is 55. Extending the analysis to include individuals aged 55 to 59 would not change this study's results.

5 Results

This section is organized as follows. First, an assessment is provided of how much individuals' effective marginal tax rates actually change at the thresholds analyzed. The analysis centres on the lower bounds of the second, third and fourth federal income tax brackets, the lower bounds of the second and third provincial and territorial tax brackets, and the income thresholds at which OAS and EI benefits start being clawed back through recovery taxes.[7] The results are presented for the full period analyzed and separately for the periods preceding and following the introduction of pension income splitting. The analysis of bunching at the OAS recovery tax threshold is conditional on individuals aged 65 to 69 as a result of a benefit eligibility requirement for this program, and the analysis of bunching at the EI recovery tax threshold is conditional on individuals who are observed as receiving such benefits.[8]

Second, the analysis of bunching responses to the convex kink points is presented, both as a graphical inspection and in an empirical density design. Third, how individuals' bunching responses to taxes changed as a result of the pension income splitting reform is assessed. Fourth, the results from placebo tests are presented that consider how individuals known to be unaffected by the OAS and EI recovery taxes behave at these thresholds. The section concludes with a heterogeneity analysis.

5.1 Changes in effective marginal tax rates

The bunching analysis exploits convex kink points in individuals' budget sets. As a result of tax progressivity, individuals' marginal tax rates should increase discontinuously at the thresholds analyzed. As a result, consideration of how much variation is actually observed in individuals' marginal tax rates at these thresholds is warranted. For example, Milligan (2009) showed that income tax schedules in Canada are complex functions of age, province or territory of residence, income sources, spousal characteristics, and other factors that may interact to attenuate the effects of changes in direct taxes on effective marginal tax rates.

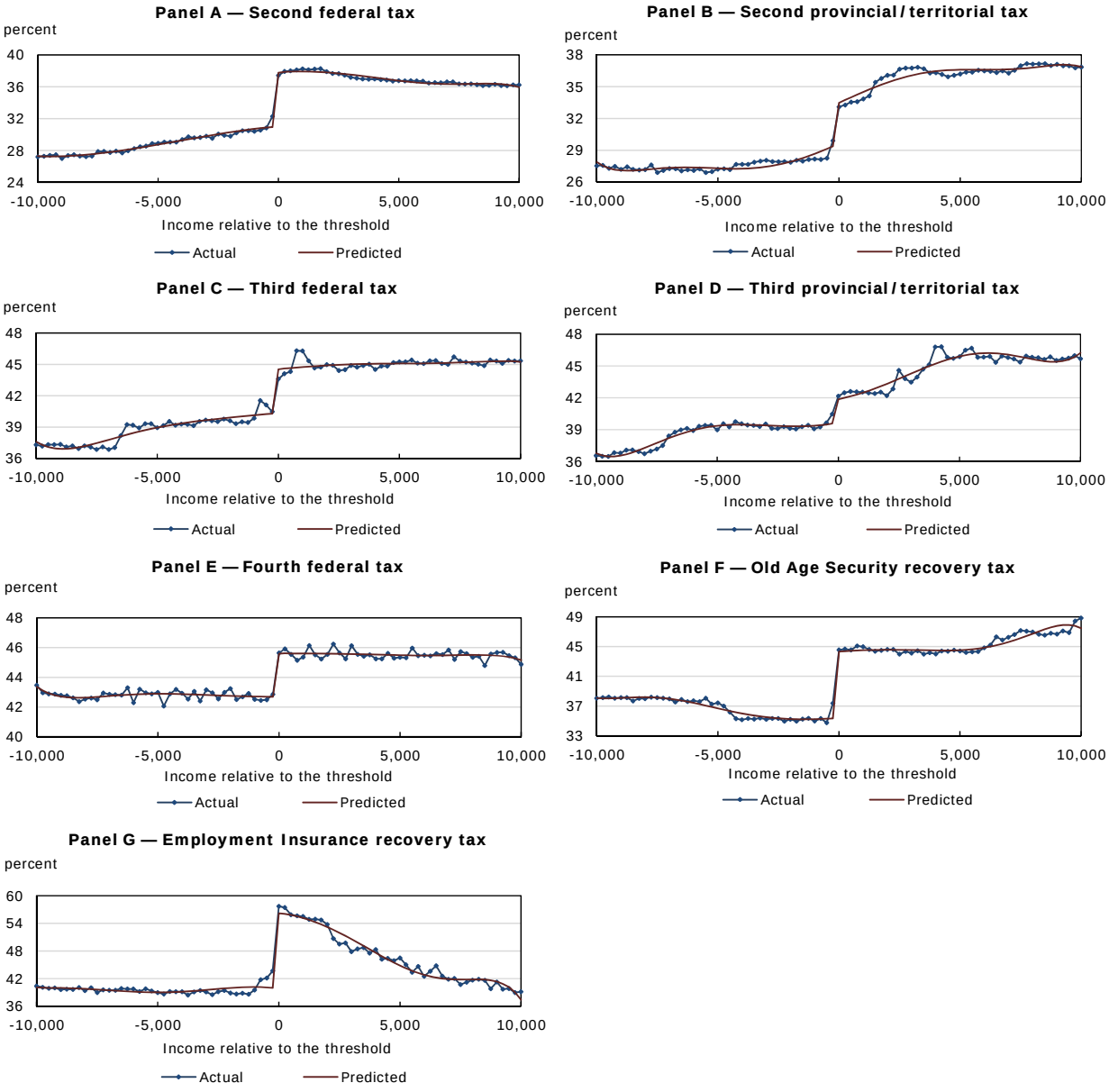
To investigate this issue, Charts 1-1 and 1-2 show how individuals' effective marginal tax rates change at the thresholds analyzed. Chart 1-1 looks at the pre-reform period, and Chart 1-2 looks at the post-reform period. The tax rates (shown on the vertical axes) are calculated using CTaCS (Milligan 2016), and the running variable (shown on the horizontal axes) is taxable income relative to the threshold, as calculated by CTaCS. For example, in Panel A, an individual with 0 relative income has taxable income equal to the lower bound of the second federal tax bracket. Each panel shows the average values of the effective marginal tax rates within $250 bins over the range of taxable income spanning $10,000 on either side of the threshold. Each panel also shows the predicted values from an ordinary least squares (OLS) regression of marginal tax rates on a sextic polynomial in taxable income relative to the threshold. Specifically, in each case, the following equation is estimated using OLS.

7. In most provinces and territories, the lower bound of the third tax bracket tends to fall between the lower bounds of the second and third federal tax brackets. For example, in 2012, the third tax bracket of Newfoundland and Labrador was $65,785; Ontario was $78,043; and British Columbia was $74,028. The only notable exception is Saskatchewan, where the third tax bracket commences at $120,185, which is closest to the fourth federal tax bracket. As a result, residents of Saskatchewan are excluded from the bunching analysis at the lower bound of the third provincial or territorial tax bracket. This condition ensures all individuals in the analysis of provincial and territorial taxes are relatively homogeneous in taxable income.
8. Individuals can delay claiming their OAS pension benefits for up to five years after the month they turn age 65 and receive an additional 0.6% of their pension entitlements for each month their benefits are delayed. However, this program feature was not introduced until July 2013. Hence, the pension income splitting reform had no effect on individuals' incentives to claim OAS benefits, since irrespective of splitting, no gain was associated with delaying OAS pension receipt over the period analyzed in this study.

$$MTR_{it} = \alpha + \sum_{k=1}^{6} \beta_k \left(Y_{it} - T_t \right)^k + \gamma 1\left(Y_{it} - T_t \geq 0 \right) + \varepsilon_{it}, \quad (1)$$

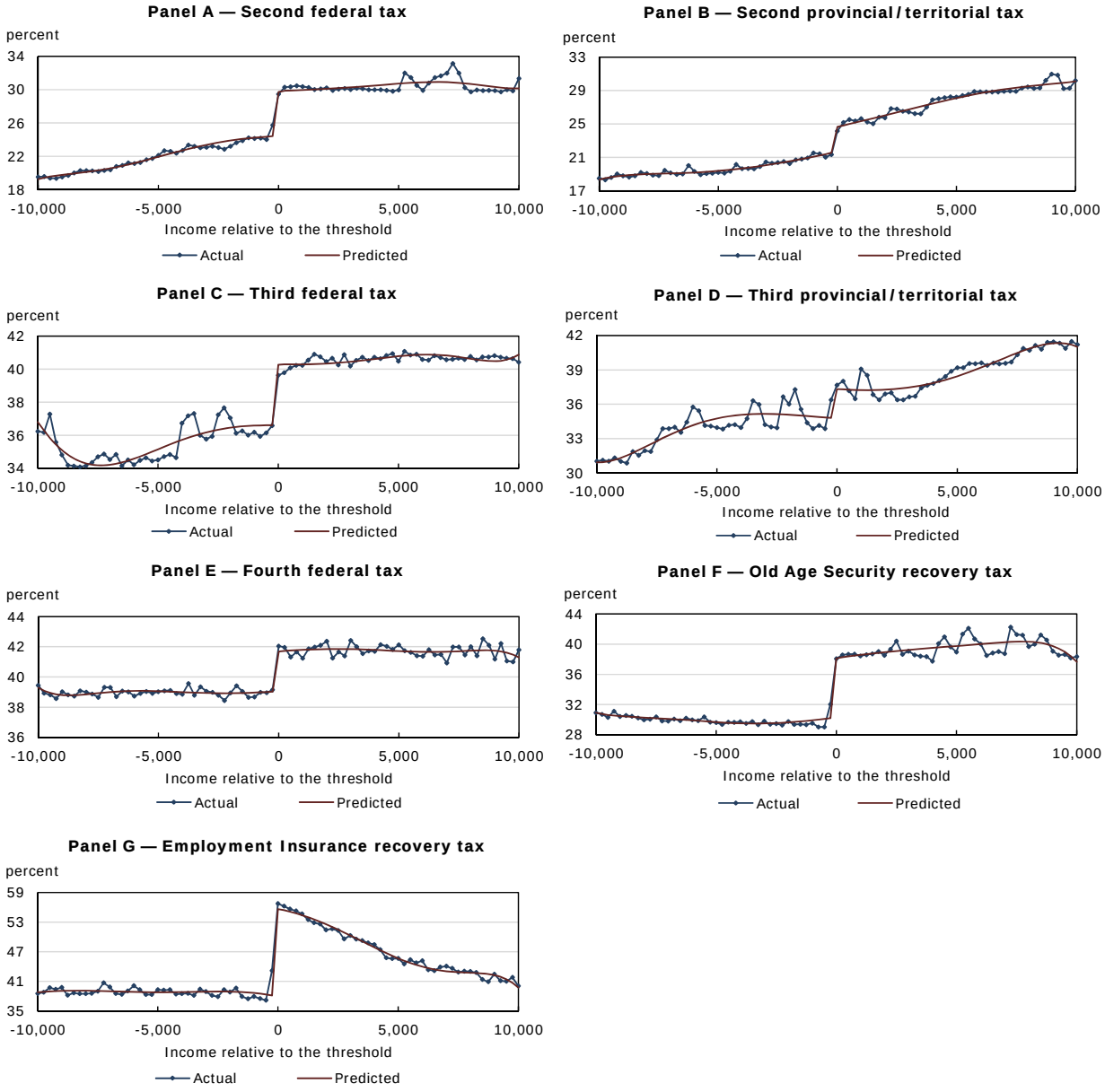
where MTR_{it} is the effective marginal tax rate of each individual i in year t calculated using the CTaCS program; Y_{it} is the corresponding level of taxable income; T_t is the threshold for the particular convex kink point under analysis; $1(\cdot)$ is an indicator function that takes the value of "1" if its argument is true and "0" otherwise; and ε_{it} is a statistical residual. The parameter γ captures the increase in the marginal tax rate at the tax threshold. Using OLS to estimate Equation (1) for each threshold is equivalent to estimating the average changes in effective marginal tax rates in a parametric regression discontinuity (RD) design (Imbens and Lemieux 2007; Lee and Lemieux 2010). As expected, the effective marginal tax rates tend to increase meaningfully at each threshold, even after potential mitigating factors from other dimensions of the tax system have been taken into account.

Chart 1-1
Marginal tax rates as functions of taxable income relative to the thresholds, 2001 to 2006



Note: This chart plots changes in marginal tax rates using pooled data from 2001 to 2006. Each panel shows the average values of tax rates within bins of width $250, for individuals earning within $10,000 on either side of the relevant tax threshold in the reference year. The tax rates are calculated using the *Canadian Tax and Credit Simulator (CTaCS)* by Milligan (2016). Predicted values are based on a sextic polynomial regression. Each tax threshold refers to the lower bound of the relevant tax bracket.
Source: Statistics Canada, Longitudinal Administrative Databank.

Chart 1-2
Marginal tax rates as functions of taxable income relative to the thresholds, 2007 to 2012



Note: This chart plots changes in marginal tax rates using pooled data from 2007 to 2012. Each panel shows the average values of tax rates within bins of width $250, for individuals earning within $10,000 on either side of the relevant tax threshold in the reference year. The tax rates are calculated using the *Canadian Tax and Credit Simulator (CTaCS)* by Milligan (2016). Predicted values are based on a sextic polynomial regression. Each tax threshold refers to the lower bound of the relevant tax bracket.
Source: Statistics Canada, Longitudinal Administrative Databank.

The charts also show that effective marginal tax rates increase from the second to the third tax bracket and from the third to the fourth tax bracket as a result of tax progressivity. This is consistent with expectations. The rate increases at the recovery tax thresholds for OAS, and EI benefits are comparatively large, since these programs claw back benefits at high rates of up to 15% (OAS) and 30% (EI). Lastly, as expected, a comparison of the two charts suggests that the rate changes are similar in each period.

The OLS regression estimates of the parameter γ from Equation (1) are presented in Table 2, by period and separately for each year; the standard errors in this analysis are clustered by individual. The size of each estimate varies over time in the yearly analysis. This likely stems from the relatively small sample sizes in these cases. On balance, the estimates match expectations.

For example, marginal tax rates are known to have increased from one bracket to the next by 6% to 7% at the lower bounds of the second federal tax bracket, 4% at the lower bounds of the third and 3% at the lower bounds of the fourth. The RD estimates of the changes in effective marginal tax rates are 6.097% for the second bracket, 3.893% for the third and 2.652% for the fourth.

Table 2
Regression estimates of discontinuities in marginal tax rates at the thresholds, 2001 to 2012

	Direct tax thresholds					Indirect tax thresholds	
	Second federal tax	Second provincial/ territorial tax	Third federal tax	Third provincial/ territorial tax	Fourth federal tax	Old Age Security recovery tax	Employment Insurance recovery tax
				percent			
By time period							
2001 to 2012	6.097 ***	3.430 ***	3.893 ***	2.475 ***	2.652 ***	8.434 ***	17.340 ***
2001 to 2006	6.853 ***	3.861 ***	4.213 ***	2.206 ***	2.927 ***	8.983 ***	16.440 ***
2007 to 2012	5.369 ***	2.987 ***	3.685 ***	2.567 ***	2.656 ***	7.907 ***	17.770 ***
By year							
2001	6.937 ***	6.849 ***	4.753 ***	3.636 ***	2.534 ***	9.395 ***	19.450 ***
2002	6.927 ***	5.731 ***	4.411 ***	3.031 ***	2.516 ***	9.125 ***	19.160 ***
2003	6.598 ***	5.541 ***	4.696 ***	2.930 ***	2.714 ***	9.133 ***	18.010 ***
2004	5.256 ***	1.959 ***	4.735 ***	1.960 ***	3.140 ***	9.159 ***	15.570 ***
2005	7.865 ***	1.525 ***	7.704 ***	0.830 **	3.008 ***	8.521 ***	13.870 ***
2006	7.547 ***	2.104 ***	-0.689	1.682 ***	2.840 ***	9.296 ***	15.090 ***
2007	5.552 ***	3.460 ***	3.375 ***	4.531 ***	2.461 **	8.044 ***	17.120 ***
2008	4.461 ***	5.500 ***	6.411 ***	5.838 ***	2.665 ***	9.849 ***	17.540 ***
2009	5.919 ***	3.332 ***	3.996 ***	-0.561	2.777 ***	7.790 ***	18.830 ***
2010	6.063 ***	2.763 ***	1.876 ***	0.691 *	2.990 ***	8.256 ***	17.800 ***
2011	5.866 ***	1.875 ***	3.094 ***	3.973 ***	2.921 ***	6.810 ***	16.950 ***
2012	4.353 ***	0.606 **	3.288 ***	0.914 **	2.190 ***	7.218 ***	18.000 ***

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates by time period and year, for the full sample of taxfilers analyzed. Each regression employs a sextic polynomial in taxable income, and is conditional on individiuals earning $10,000 on either side of the tax threshold in the reference year. Standard errors are clustered by individual. Each tax threshold refers to the lower bound of the relevant tax bracket.

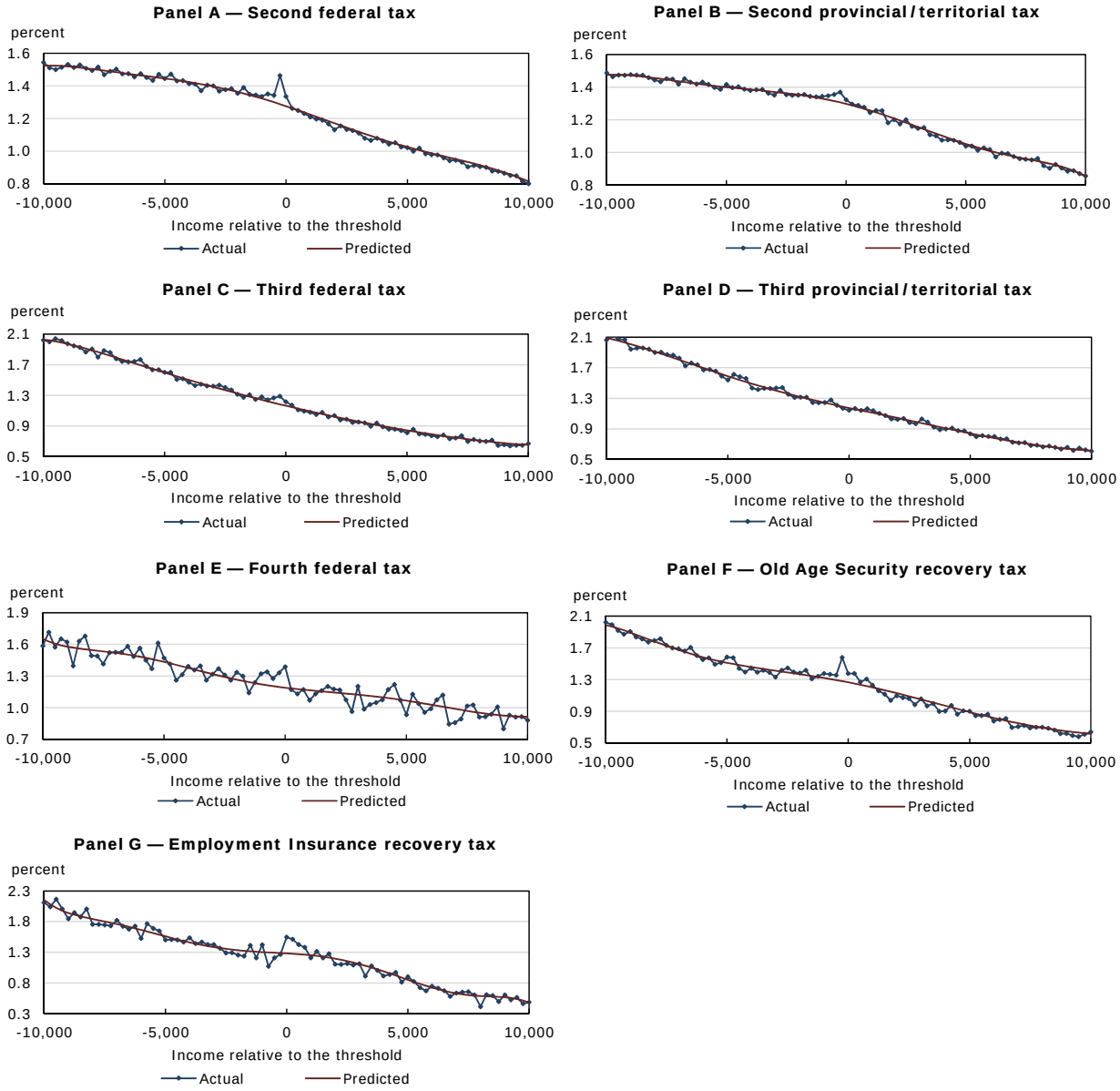
Source: Statistics Canada, Longitudinal Administrative Databank.

5.2 Bunching analysis

Graphical inspections of bunching at the tax thresholds are shown in Charts 2-1 and 2-2. Chart 2-1 looks at data from the pre-reform period, and Chart 2-2 looks at the post-reform period. Each panel shows the distribution of taxable income relative to the relevant tax threshold over an interval spanning $10,000 on either side of that threshold. Each dot shows the percentage of individuals in the sample with taxable incomes within a bin of width $250.[9] In addition, each panel shows the estimated counterfactual distribution based on the procedure of Chetty et al. (2011).[10] This analysis appears to show that individuals are somewhat responsive to the discontinuous increases in their marginal tax rates in both periods, where spikes in the distributions of taxable income are observed at most tax thresholds.

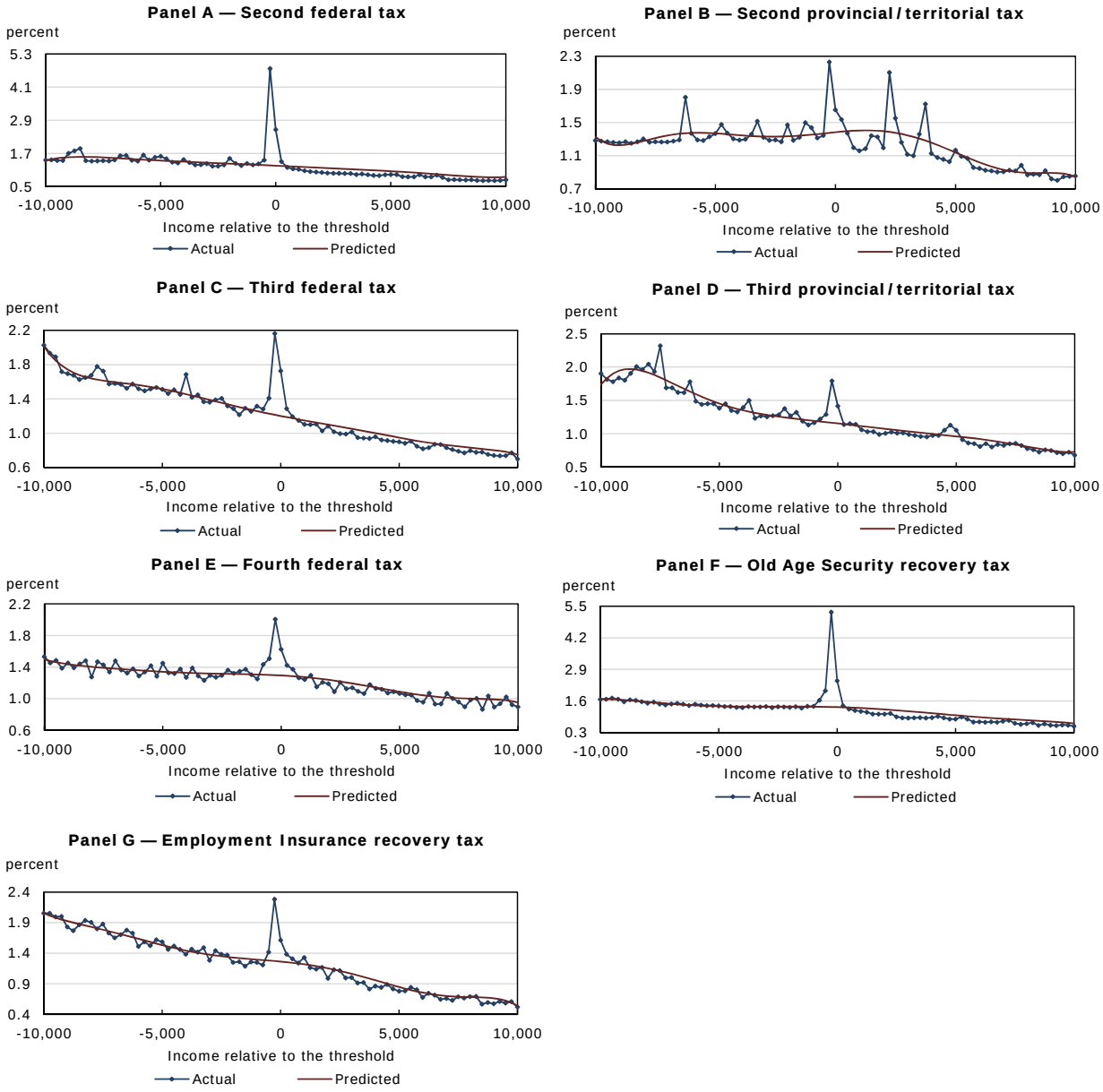
9. Within each panel, the percentage of individuals within each bin for taxable income of width $250 summed across bins necessarily tallies to 100%.
10. The “bunch_count” Stata module, by Olsen (2011), is used to estimate counterfactual distributions.

Chart 2-1
Distributions of taxable income relative to the thresholds, 2001 to 2006



Note: This chart plots the distributions of taxable income using pooled data from 2001 to 2006, for individuals who have taxable incomes within $10,000 on either side of the relevant tax threshold in the reference year. The bin widths are $250. The predicted distributions are calculated using the procedure described in R. Chetty, J.H. Friedman, T. Olsen, and L. Pistaferri, 2011, "Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from Danish tax records, and the Stata module described by T. Olsen, 2011, "bunch_count: Stata module to calculate bunching statistics for a distribution." Each tax threshold refers to the lower bound of the relevant tax bracket.
Source: Statistics Canada, Longitudinal Administrative Databank.

Chart 2-2
Distributions of taxable income relative to the thresholds, 2007 to 2012



Note: This chart plots the distributions of taxable income using pooled data from 2001 to 2012, for individuals who have taxable incomes within $10,000 on either side of the relevant tax threshold in the reference year. The bin widths are $250. The predicted distributions are calculated using the procedure described in R. Chetty, J.H. Friedman, T. Olsen, and L. Pistaferri, 2011, "Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from Danish tax records, and the Stata module described by T. Olsen, 2011, "bunch_count: Stata module to calculate bunching statistics for a distribution." Each tax threshold refers to the lower bound of the relevant tax bracket.
Source: Statistics Canada, Longitudinal Administrative Databank.

The distributions of taxable income appear noisier as sample sizes decrease. For example, compare the results at the third federal tax bracket to those at the fourth bracket: the sample size is larger in the former than the latter. The distributions around the provincial and territorial tax thresholds are confounded by the fact that these thresholds vary by province and territory and are fairly close to other convex kink points that could also induce bunching. For this reason, the results of bunching at provincial and territorial tax thresholds should be interpreted a bit more cautiously than the other results. However, the bunching responses are substantial in all cases, despite the potential for these factors to have confounded the analysis.

A comparison of the results across periods reveals that the majority of bunching occurs in the post-reform period. From 2001 to 2006, before pension income splitting was introduced, only a

small amount of bunching is observed at most convex kink points. This greatly contrasts with the extent of bunching observed from 2007 to 2012, where the spikes in the distributions are very apparent.

To better quantify the extent of bunching observed in these charts, Table 3 uses the empirical density estimator from Chetty et al. (2011) (see Footnote 8) to estimate the magnitude of excess mass at each tax threshold. These results confirm that bunching is more prevalent from 2007 to 2012 than from 2001 to 2006. For example, the amount of bunching following the reform is 15.8 times larger than it was before pension income splitting was introduced at the lower bound of the second federal tax bracket, 6.4 times larger for the third and 2.4 times larger for the fourth. The results by year are slightly noisier given that the sample sizes are smaller. This results in taxable income distributions that are estimated less precisely. Nevertheless, in these cases, bunching continues to be more prevalent in the post-reform years. This is especially apparent when the results are compared over time at the second and third federal tax brackets, as well as the OAS recovery tax threshold, where sample sizes are still comparatively large.

Table 3

Empirical density estimates of bunching in taxable income at the thresholds, 2001 to 2012

	Direct tax thresholds					Indirect tax thresholds	
	Second federal tax	Second provincial/ territorial tax	Third federal tax	Third provincial/ territorial tax	Fourth federal tax	Old Age Security recovery tax	Employment Insurance recovery tax
	percent						
By time period							
2001 to 2012	2.446 ***	0.595 ***	0.932 ***	0.469 ***	0.918 ***	2.787 ***	0.924 ***
2001 to 2006	0.257 ***	0.141 ***	0.241 ***	0.004	0.484 **	0.581 ***	0.345 *
2007 to 2012	4.056 ***	0.908 **	1.536 ***	0.892 ***	1.182 ***	4.402 ***	1.229 ***
By year							
2001	0.328 ***	0.291 ***	0.342 *	0.349 *	1.345 *	0.689 ***	0.408
2002	0.258 ***	0.070	0.154	0.020	-0.192	0.043	-0.381
2003	0.294 ***	0.291 ***	0.194	0.155	0.181	0.442 **	0.567
2004	0.150 †	0.078	0.671 ***	-0.021	0.178	0.818 ***	0.774 †
2005	0.360 ***	0.090	-0.071	-0.245 †	-0.546	0.740 ***	0.343
2006	0.157 *	0.043	0.217	-0.130	1.854 ***	0.729 ***	0.291
2007	2.152 ***	0.815 **	0.727 **	0.567 †	1.553 ***	3.624 ***	0.422
2008	2.792 ***	2.680 ***	1.498 ***	2.085 ***	0.820 **	5.028 ***	0.977 *
2009	4.467 ***	1.450 **	1.312 ***	0.085	0.698 *	4.506 ***	1.025 **
2010	4.982 ***	0.460	2.376 ***	0.569	1.259 **	4.219 ***	1.939 ***
2011	5.247 ***	0.086	1.628 ***	0.748	1.456 ***	4.759 ***	1.849 ***
2012	4.850 ***	0.068	1.722 ***	1.366 *	1.278 ***	4.279 ***	0.893 *

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

† significantly different from reference category ($p < 0.10$)

Note: This table presents the empirical density estimates of bunching by time period and year, for the full sample of taxfilers analyzed. The procedure described in R. Chetty, J.H. Friedman, T. Olsen, and L. Pistaferri, 2011, "Adjustment costs, firm responses, and micro vs. macro labor supply elasticities: Evidence from Danish tax records," using the Stata module of T. Olsen, 2011, "bunch_count: Stata module to calculate bunching statistics for a distribution," is employed. Each analysis conditions on individuals with taxable incomes of $10,000 on either side of the tax threshold in the reference year. Each tax threshold refers to the lower bound of the relevant tax bracket.

Source: Statistics Canada, Longitudinal Administrative Databank.

5.3 The effect of pension income splitting

The previous results show that income responses to taxation changed fundamentally from 2006 to 2007. This coincides with the introduction of pension income splitting. To further assess the extent to which the results are driven by splitting, this section delineates the analysis along several margins of variation that affected individuals' eligibility to split pension income.

Table 4 repeats the previous analysis across individuals by marital status and whether they, or their spouses if married, are collecting private pension income. The effects of the convex kink points on effective marginal tax rates are reported in Panel A, and the subsequent bunching responses are reported in Panels B. The results show, first, that the effective marginal tax rate changes at each tax threshold are quite uniform across groups. This is not surprising given that the unit of taxation is the individual. The tax thresholds apply to everyone equally irrespective of marital status. Moreover, the tax code treats most types of income identically, so that whether the income derives from private pensions or other sources should not affect these results.[11]

11. For example, in 2012, the federal marginal tax rates on most sources of income was 15% in the first tax bracket, 22% in the second, 26% in the third and 29% in the fourth. The corresponding marginal tax rates on capital gains were 7.5%, 11%, 13% and 14.5%. The marginal tax rates were -0.03%, 9.63%, 15.15% and 19.29% on eligible Canadian dividends and 2.08%, 10.83%, 15.83% and 19.58% on non-eligible Canadian dividends. Despite the differences in the tax rates applied to each type of income, the taxable income thresholds defining the tax brackets were the same in every case. Hence, all individuals are expected to be treated to some extent by the tax thresholds, and only those individuals who derive income primarily from capital gains or Canadian dividends should be treated to a lesser extent than everybody else.

Table 4

Estimated changes in marginal tax rates and bunching at the thresholds, by marital status and pension income receipt, 2007 to 2012

	Unmarried			Married			
					Has pension income		
	No pension income	Has pension income	Either	No pension income	Individual	Spouse	Either
				percent			
Panel A — Changes in marginal tax rates							
Direct tax thresholds							
Second federal tax	6.843 ***	6.117 ***	6.394 ***	6.838 ***	4.707 ***	3.375 ***	4.261 ***
Second provincial/territorial tax	2.149 ***	3.073 ***	2.546 ***	2.710 ***	3.105 ***	3.244 ***	3.198 ***
Third federal tax	3.895 ***	3.709 ***	3.809 ***	3.750 ***	3.368 ***	3.688 ***	3.592 ***
Third provincial/territorial tax	3.837 ***	3.167 ***	3.479 ***	3.244 ***	1.781 ***	1.406 **	1.883 ***
Fourth federal tax	3.925 ***	1.594	2.942 ***	2.925 ***	2.321 ***	2.061 ***	2.280 ***
Indirect tax thresholds							
Old Age Security recovery tax	8.168 ***	9.404 ***	8.997 ***	8.066 ***	7.699 ***	6.898 ***	7.416 ***
Employment Insurance recovery tax	18.250 ***	19.020 ***	18.620 ***	19.010 ***	17.440 ***	15.060 ***	16.660 ***
Panel B — Bunching in taxable income							
Direct tax thresholds							
Second federal tax	0.072	0.025	0.045	0.346 ***	7.327 ***	8.299 ***	7.077 ***
Second provincial/territorial tax	0.124	0.021	0.065	0.093 †	1.596 *	1.351 *	1.461 **
Third federal tax	-0.148	0.200	0.014	0.282 *	3.884 ***	4.282 ***	3.505 ***
Third provincial/territorial tax	0.505 **	0.132	0.306 **	0.034	1.880 ***	2.120 ***	1.804 ***
Fourth federal tax	0.249	-0.328	-0.009	0.311 †	2.913 ***	3.143 ***	2.784 ***
Indirect tax thresholds							
Old Age Security recovery tax	0.848 **	0.331 †	0.472 **	1.086 ***	7.195 ***	8.661 ***	7.056 ***
Employment Insurance recovery tax	0.615	0.672 †	0.639 *	-0.196	2.493 ***	3.629 ***	2.849 ***

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

† significantly different from reference category ($p < 0.10$)

Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates and the empirical density estimates of bunching. The analysis is conditional on the post-reform period and delineates according to marital status and whether the individual (if unmarried) or couple (if married) has private pension income. Each tax threshold refers to the lower bound of the relevant tax bracket.

Source: Statistics Canada, Longitudinal Administrative Databank.

Despite the uniformity of treatment, the bunching responses vary significantly across groups. Among unmarried individuals, the responses are all small in magnitude and generally insignificant except in a few cases, notably at the OAS and EI thresholds and the lower bound of the third provincial or territorial tax bracket. Similarly, married individuals without a pensioner in the couple, who are unable to split income, exhibit bunching at most thresholds, but the magnitudes of the responses are comparatively small. These results could differ from those of the unmarried non-pensioners for several reasons, including differences in market behaviour responses to taxation or access to other tax planning technologies related to marital status. In addition, the results may simply be more precisely estimated among married individuals given that 72.3% of the individuals in the sample are legally married or in common-law relationships, as shown in Table 1. This analysis also shows that the bunching responses of married individuals in a couple with at least one person receiving private pension income are both relatively large in magnitude and statistically significant at every tax threshold. Being a pensioner appears to be a precursor to responding actively to the changes in marginal tax rates in a manner predicted by the standard model, described earlier. This is consistent with expectations regarding the role of pension income splitting in driving the results.

To further explore the role of splitting, Table 5 conditions on married individuals in the post-reform period and on whether and how the pension income splitting program is actually used. On balance, the effects of the tax rate increases on effective marginal tax rates are quite uniform across groups, as shown in Panel A. The only notable exceptions are among transferees, who receive pension income from their spouses, at the lower bounds of the third provincial and territorial brackets and the fourth federal tax bracket threshold. However, most higher-income earners tend to send income to their spouses rather than receive income from them, and the imprecision of these estimates is partly the result of small sample sizes. However, as Panel B shows, the bunching responses at every tax threshold are almost entirely driven by individuals who utilize the pension income splitting program.

Table 5
Estimated changes in marginal tax rates and bunching at the thresholds, among married individuals, by type of pension income splitting, 2007 to 2012

	No splitting	Has splitting		
		Send	Receive	Either
		percent		
Panel A — Changes in marginal tax rates				
Direct tax thresholds				
Second federal tax	6.565 ***	7.053 ***	2.129 ***	3.681 ***
Second provincial/territorial tax	2.895 ***	2.843 ***	3.319 ***	3.125 ***
Third federal tax	3.755 ***	3.540 ***	3.811 ***	3.540 ***
Third provincial/territorial tax	3.212 ***	2.150 ***	-0.214	1.481 **
Fourth federal tax	2.843 ***	2.523 ***	1.670 †	2.232 ***
Indirect tax thresholds				
Old Age Security recovery tax	8.361 ***	8.305 ***	5.403 ***	7.137 ***
Employment Insurance recovery tax	18.830 ***	17.970 ***	10.640 ***	15.880 ***
Panel B — Bunching in taxable income				
Direct tax thresholds				
Second federal tax	0.369 ***	8.657 ***	10.600 ***	9.509 ***
Second provincial/territorial tax	0.113 **	2.261 **	1.334 *	1.864 *
Third federal tax	0.316 **	4.313 ***	6.223 ***	5.084 ***
Third provincial/territorial tax	0.084	2.365 ***	3.074 **	2.655 ***
Fourth federal tax	0.300 †	3.396 ***	5.137 ***	4.140 ***
Indirect tax thresholds				
Old Age Security recovery tax	1.020 ***	7.958 ***	12.790 ***	9.906 ***
Employment Insurance recovery tax	-0.048	2.925 ***	7.961 ***	3.946 ***

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

† significantly different from reference category ($p < 0.10$)

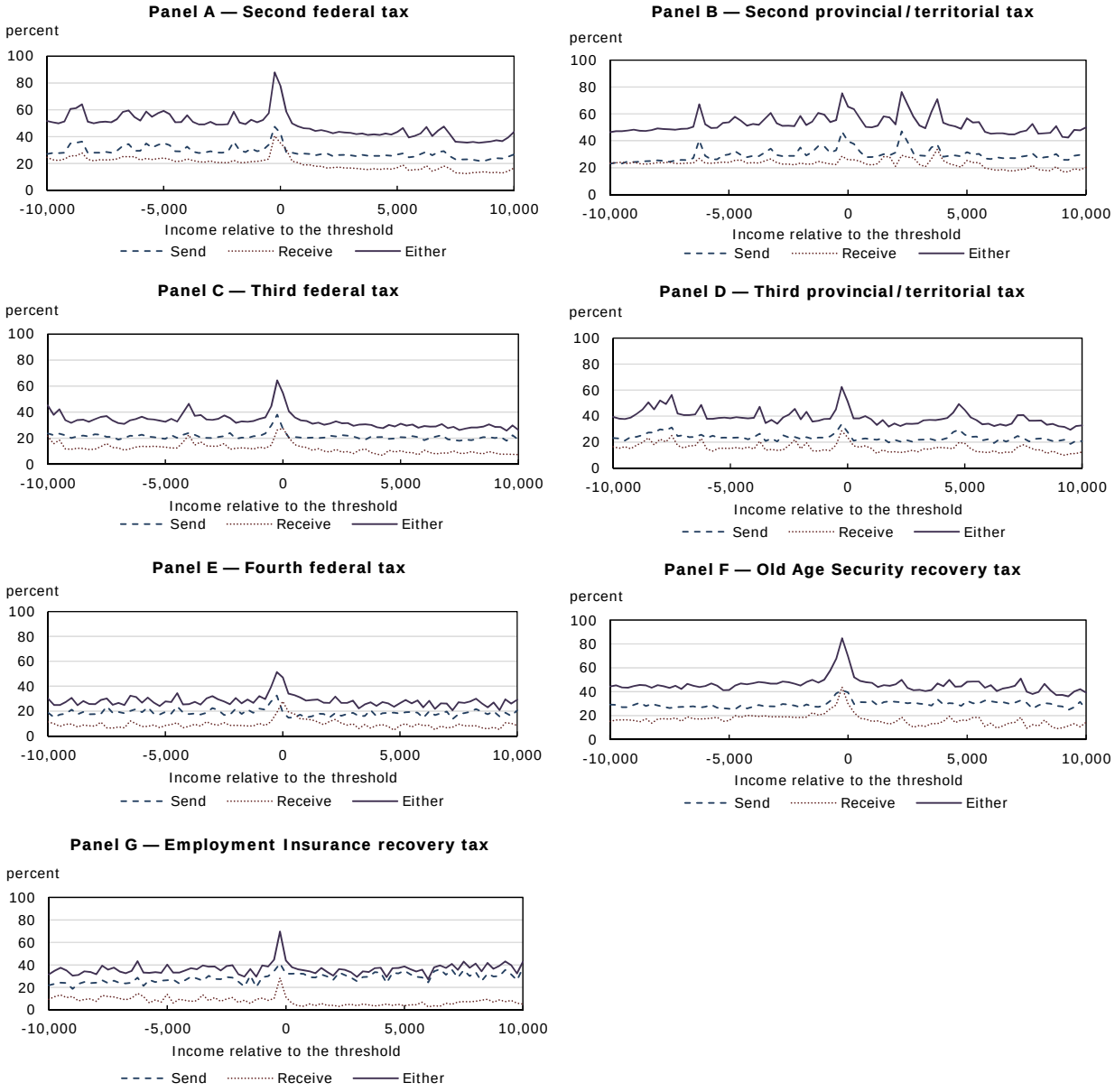
Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates and the empirical density estimates of bunching. The analysis is conditional on married individuals in the post-reform period and delineates according to marital status and type of pension income splitting. Each tax threshold refers to the lower bound of the relevant tax bracket.

Source: Statistics Canada, Longitudinal Administrative Databank.

Interestingly, these responses are qualitatively similar across individuals who send and receive pension income. This suggests bunching is the result of two types of tax planning responses. First, individuals who are pensioners are sending enough income to spouses that their taxable incomes are reduced to lower tax brackets, at which point they stop because the marginal tax rates of individuals and spouses have presumably equalized. Second, individuals with spouses who are pensioners receive income up to the point where their taxable incomes would otherwise enter higher tax brackets, and at the margin they would end up paying taxes equal to or greater than those already being paid by their spouses. Hence, couples appear to be effectively coordinating to reduce joint tax liabilities.

A final check of the importance of the pension income splitting program in driving these results is shown in Chart 3. Specifically, this chart plots the probability of sending or receiving pension income relative to each tax threshold analyzed, among married individuals in the post-reform period who are eligible for this program. The results show large spikes in the probability distributions around each threshold. This is consistent with expectations.

Chart 3
Probabilities of splitting pension income relative to the thresholds, among married individuals, 2007 to 2012



Note: This chart plots the probabilities of sending pension income to a spouse, receiving pension income from a spouse, and either sending or receiving pension income through splitting. The analysis uses pooled data from the post-reform period for married individuals who had taxable incomes within $10,000 on either side of the relevant tax threshold in the reference year. The bin widths are $250. Each tax threshold refers to the lower bound of the relevant tax bracket.
Source: Statistics Canada, Longitudinal Administrative Databank.

5.4 Placebo checks

The validity of the estimator and robustness of the results in studies that use quasi-experimental methods in cross-sectional settings can be tested several ways. For example, Ganong and Jäger (2017) proposed a permutation test for the regression kink (RK) design that involves repeating the RK estimation at points along the running variable localized around the true kink to assess how the significances vary. Another approach is to repeat the analysis on a running variable or sample known not to be treated (Landais 2015; Messacar 2015). This approach is used here to assess how individuals known not to be affected by the OAS and EI recover tax thresholds behave around these points in the income distribution.

Prior to July 2013, individuals could not delay claiming OAS benefits to receive higher monthly payments upon receipt. This means the majority of taxfilers began collecting OAS when they became eligible, at age 65, since delaying provided no benefit. As a result of this exogenous variation in eligibility, a potentially valid control group at this tax threshold is individuals aged 60 to 64 who are unaffected by the recovery tax.[12] The analysis delineated by age is presented in Table 6, shown separately for individuals by marital status, private pension income receipt, and whether pension income splitting is observed. Panel A indicates that individuals' effective marginal tax rates are unaffected by the recovery tax until they turn age 65. This supports this placebo test approach. Bunching responses are robustly observed only among married individuals who had pension income or used the pension income splitting program, as indicated in Panel B. This is consistent with the previous findings. This behaviour is driven predominantly by individuals aged 65 to 69 who are affected by the recovery tax.

12. Since OAS income is taxable, the additional income received by OAS recipients as compared with non-recipients likely means that individuals aged 60 to 64 and 65 to 69 localized around the same point of the income distribution are not perfectly comparable. This is because individuals aged 65 to 69 are "pushed up" in the distribution by OAS benefits. Nevertheless, the age requirement is exogenous to individuals' perspective and provides a useful margin of variation to exploit empirically.

Table 6

Estimated changes in marginal tax rates and bunching at the Old Age Security recovery tax threshold, by marital status, pension income receipt, type of pension income splitting, and age, 2007 to 2012

	Unmarried		Married			
	No pension income	Has pension income	Pension income		Pension income splitting	
			No	Yes	No	Yes
	percent					
Panel A — Changes in marginal tax rates						
Age 60	0.122	0.157	-0.339	0.551	-0.254	0.766
Age 61	-0.191	1.705	-0.376	-0.448	-0.345	-0.545
Age 62	0.001	0.524	0.404	0.687	-0.011	1.220 *
Age 63	0.437	-0.565	-0.205	0.313	0.079	0.242
Age 64	-0.673	0.928	0.119	-0.345	-0.051	-0.460
Age 65	8.440 ***	9.716 ***	6.622 ***	7.919 ***	6.595 ***	8.348 ***
Age 66	8.314 ***	9.447 ***	7.573 ***	7.046 ***	8.190 ***	6.590 ***
Age 67	7.779 ***	9.574 ***	8.986 ***	7.020 ***	9.036 ***	6.492 ***
Age 68	8.380 ***	9.090 ***	10.740 ***	7.152 ***	9.554 ***	6.920 ***
Age 69	7.213 ***	9.015 ***	8.160 ***	7.986 ***	10.020 ***	7.327 ***
Panel B — Bunching in taxable income						
Age 60	0.312	-0.135	0.078	0.891 **	0.179	1.102 **
Age 61	-0.046	-0.436	-0.259	0.410	-0.167	0.600
Age 62	0.273	-0.437	0.260	0.249	0.100	0.527
Age 63	0.188	-0.076	0.050	0.476	-0.028	0.828 †
Age 64	0.095	-0.117	-0.260	0.488	-0.300	0.943 †
Age 65	-0.525	0.684	1.138 **	5.456 ***	1.093 ***	7.827 ***
Age 66	0.709	-0.099	1.048 ***	6.916 ***	0.928 ***	9.722 ***
Age 67	1.279	0.553	0.966 **	6.930 ***	0.938 ***	9.657 ***
Age 68	2.398 **	0.602	1.197 **	8.033 ***	1.187 ***	10.980 ***
Age 69	3.099 **	-0.153	1.095 *	8.314 ***	0.956 ***	11.620 ***

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

† significantly different from reference category ($p < 0.10$)

Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates and the empirical density estimates of bunching at the Old Age Security recovery tax threshold, in the post-reform period. The analysis delineates according to marital status, whether the individual (if unmarried) or couple (if married) has private pension income, whether pension income splitting is observed, and age.

Source: Statistics Canada, Longitudinal Administrative Databank.

The primary analysis of bunching around the EI recovery tax threshold conditions on individuals who received these benefits, since those who did not are untreated. In Table 7, EI non-recipients are used as a placebo group to test how effective marginal tax rates and the distributions of taxable income would have otherwise evolved around this convex kink point in the post-reform period. As before, the analysis delineates individuals by marital status, private pension income receipt, and whether pension income splitting is observed. The results show that changes in effective marginal tax rates are meaningful only for those individuals receiving EI, as expected. The small discontinuities in the tax rates for those not receiving EI that in some cases appear significant may be attributed to the size of the dataset and the fact that tax rates generally increase with income. However, the magnitudes of the estimates in these cases are not economically relevant. The bunching responses are observed only among those individuals who both received EI and were eligible to split pension income, as expected.

Table 7

Estimated changes in marginal tax rates and bunching at the Employment Insurance recovery tax threshold, by marital status, pension income receipt, type of pension income splitting, and Employment Insurance receipt, 2007 to 2012

	Unmarried		Married			
	No pension income	Has pension income	Pension income		Pension income splitting	
			No	Yes	No	Yes
	percent					
Panel A — Changes in marginal tax rates						
Has Employment Insurance income	18.250 ***	19.020 ***	19.010 ***	16.660 ***	18.830 ***	17.540 ***
No Employment Insurance income	0.350	0.696 **	0.174	0.243 *	0.207	0.245 **
Panel B — Bunching in taxable income						
Has Employment Insurance income	0.615	0.672	-0.196	2.849 ***	-0.048	3.946 ***
No Employment Insurance income	-0.057	0.063	-0.098	0.002	-0.115 *	0.108

* significantly different from reference category (p < 0.05)

** significantly different from reference category (p < 0.01)

*** significantly different from reference category (p < 0.001)

Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates and the empirical density estimates of bunching at the Employment Insurance recovery tax threshold, in the post-reform period. The analysis delineates according to marital status, whether the individual (if unmarried) or couple (if married) has private pension income, whether pension income splitting is observed, and Employment Insurance receipt.

Source: Statistics Canada, Longitudinal Administrative Databank.

5.5 Heterogeneous responses

Briefly considering how the primary results of this study vary across different personal characteristics is instructive. Much of the literature cited earlier found responses to income taxes are larger among women, the self-employed and individuals working in sectors with more flexible labour markets (Saez, Slemrod and Giertz 2012). On this basis, this section considers how effective marginal tax rates change and bunching responses vary by sex, type of income and sector of employment for unmarried (Table 8-1) and married individuals (Table 8-2).

First, Table 8-1 indicates that the effects of the tax thresholds on effective marginal tax rates are both consistent with the previous findings and uniform across groups, as shown in Panel A. This means that any differences in bunching across groups are not likely to be the result of differences in treatment. However, Panel B shows that no meaningful bunching responses to tax rate changes appear among unmarried individuals across groups, notwithstanding a few cases that appear weakly significant. For example, the self-employed are not much more likely to respond to changes in taxes by bunching than other workers. Second, Table 8-2 shows that, among married individuals, the results are qualitatively similar. The effects of the tax rate changes are uniform across groups, and no meaningful differences appear in the corresponding bunching responses.

Table 8-1
Heterogeneous responses among unmarried individuals, 2007 to 2012

	By sex		By type of income			By industry of employment	
	Female	Male	Has employment earnings	Has self-employment earnings	Has investment income or capital gains	Manufacture, construction or trade	Other non-agricultural and non-manufacture
				percent			
Panel A — Changes in marginal tax rates							
Direct tax thresholds							
Second federal tax	6.435 ***	6.340 ***	6.901 ***	5.661 ***	6.343 ***	6.807 ***	6.863 ***
Second provincial/territorial tax	2.614 ***	2.418 ***	2.237 ***	3.687 ***	2.878 ***	1.990 ***	2.195 ***
Third federal tax	4.338 ***	3.130 ***	3.569 ***	3.627 ***	3.840 ***	3.165 ***	3.896 ***
Third provincial/territorial tax	3.402 ***	3.580 ***	3.435 ***	3.839 ***	3.993 ***	3.225 ***	3.403 ***
Fourth federal tax	3.039 **	2.821 **	3.476 ***	1.988	2.547 **	3.854 ***	3.274 ***
Indirect tax thresholds							
Old Age Security recovery tax	8.626 ***	9.639 ***	8.170 ***	8.353 ***	8.469 ***	9.051 ***	7.714 ***
Employment Insurance recovery tax	18.200 ***	18.770 ***	18.570 ***	25.130 ***	19.760 ***	18.610 ***	18.820 ***
Panel B — Bunching in taxable income							
Direct tax thresholds							
Second federal tax	0.087	-0.028	0.055	0.138	0.171 *	0.092	0.048
Second provincial/territorial tax	0.099 †	0.004	-0.007	0.213	0.056	-0.107	0.098
Third federal tax	0.101	-0.106	-0.025	-0.229	0.214	-0.270	0.026
Third provincial/territorial tax	0.274 *	0.352 *	0.397 **	-0.274	0.378 *	0.286	0.416 **
Fourth federal tax	-0.139	0.099	-0.020	0.894	-0.025	0.264	-0.120
Indirect tax thresholds							
Old Age Security recovery tax	-0.009	0.483 ***	0.231 *	0.463	0.209	0.574 *	0.067
Employment Insurance recovery tax	0.132	-0.070	0.018	-0.578 *	0.127	-0.036	0.005

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

† significantly different from reference category ($p < 0.10$)

Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates and the empirical density estimates of bunching among unmarried individuals in the post-reform period. The analysis delineates according to sex, sources of income, and industry of employment. The group "manufacture, construction or trade" (simplified for compactness) refers to industries with two-digit North American Industrial Classification System (NAICS) codes 21 to 49. The group "Other non-agricultural and non-manufacture" refers to industries with two-digit NAICS codes 51 to 92. Each tax threshold refers to the lower bound of the relevant tax bracket.

Source: Statistics Canada, Longitudinal Administrative Databank.

Table 8-2
Heterogeneous responses among married individuals, 2007 to 2012

	By sex		By type of income			By industry of employment	
	Female	Male	Has employment earnings	Has self-employment earnings	Has investment income or capital gains	Manufacture, construction or trade	Other non-agricultural and non-manufacture
				percent			
Panel A — Changes in marginal tax rates							
Direct tax thresholds							
Second federal tax	4.102 ***	6.027 ***	5.664 ***	5.986 ***	5.022 ***	5.715 ***	5.631 ***
Second provincial/territorial tax	3.295 ***	2.904 ***	2.599 ***	2.716 ***	3.231 ***	2.459 ***	2.779 ***
Third federal tax	3.701 ***	3.664 ***	3.795 ***	3.026 ***	3.605 ***	3.591 ***	3.902 ***
Third provincial/territorial tax	1.635 **	2.630 ***	2.877 ***	1.900 †	2.408 ***	2.821 ***	2.844 ***
Fourth federal tax	1.930 **	2.809 ***	2.624 ***	1.669 *	2.623 ***	2.702 ***	2.811 ***
Indirect tax thresholds							
Old Age Security recovery tax	6.930 ***	7.986 ***	7.033 ***	8.287 ***	7.725 ***	6.998 ***	7.179 ***
Employment Insurance recovery tax	15.420 ***	17.900 ***	17.460 ***	18.790 ***	17.490 ***	17.360 ***	17.730 ***
Panel B — Bunching in taxable income							
Direct tax thresholds							
Second federal tax	6.081 ***	4.624 ***	3.064 ***	3.971 ***	5.705 ***	2.258 ***	3.747 ***
Second provincial/territorial tax	0.944 *	1.277 **	0.645 *	1.044 ***	1.359 **	0.549 **	0.710 *
Third federal tax	2.834 ***	1.618 ***	1.394 ***	2.157 ***	2.386 ***	0.834 ***	1.757 ***
Third provincial/territorial tax	1.357 **	0.926 ***	0.749 ***	1.547 ***	1.211 **	0.539 **	0.875 ***
Fourth federal tax	2.836 ***	0.999 ***	1.298 ***	1.477 ***	1.658 ***	0.436	1.761 ***
Indirect tax thresholds							
Old Age Security recovery tax	3.294 ***	1.933 ***	1.145 ***	2.151 ***	2.959 ***	0.761 ***	1.396 ***
Employment Insurance recovery tax	0.100	0.079	0.156 †	-0.203	-0.059	0.002	0.293 **

* significantly different from reference category ($p < 0.05$)

** significantly different from reference category ($p < 0.01$)

*** significantly different from reference category ($p < 0.001$)

† significantly different from reference category ($p < 0.10$)

Note: This table presents the regression discontinuity estimates of the changes in marginal tax rates and the empirical density estimates of bunching among married individuals in the post-reform period. The analysis delineates according to sex, sources of income, and industry of employment. The group "manufacture, construction or trade" (simplified for compactness) refers to industries with two-digit North American Industrial Classification System (NAICS) codes 21 to 49. The group "Other non-agricultural and non-manufacture" refers to industries with two-digit NAICS codes 51 to 92. Each tax threshold refers to the lower bound of the relevant tax bracket.

Source: Statistics Canada, Longitudinal Administrative Databank.

6 Conclusion

The standard model of labour supply predicts bunching responses in taxable income to convex kink points in budget sets created by the tax and transfer system. This paper assesses the extent to which older Canadian taxfilers, aged 60 to 69, exhibit such responses. Bunching was detected at various points along the income distribution coinciding with the lower bounds of the second, third, and fourth federal tax brackets and of the second and third provincial or territorial tax brackets; as well as with the recovery tax thresholds for Old Age Security and Employment Insurance benefits. This is consistent with expectations. Such behaviour is apparent from graphical inspections of the distributions of taxable income around these tax thresholds and is credibly estimated in an empirical density design. However, a closer inspection of this result finds that bunching occurs primarily because of pension income splitting between married individuals and their spouses in order to reduce joint tax liabilities. This finding offers novel evidence of intra-household tax planning behaviour that depends on the availability of tax deductions.

When a tax planning technology is introduced in a salient manner and very low costs—in terms of administration, effort and implementation—are associated with using the technology, individuals can be expected to proactively use the technology to reduce tax liabilities. As stated earlier, income sharing is also permissible for income drawn from the Canada Pension Plan and the Quebec Pension Plan. However, this transfer is not strictly notional, and more administrative procedures control the use of this tax planning provision. This suggests that the procedures associated with using a tax planning technology can significantly affect the level of responsiveness to income taxation. Another interesting finding from this study is that such behaviour occurs at the household level. This implies coordination that is to some extent consistent with the unitary model (Messacar 2017). However, in the absence of such a technology, taxable income—from labour, pensions and otherwise—is relatively non-responsive to changes in marginal income tax rates. This finding is consistent with the related literature on the elasticity of taxable income.

Several studies have found recently that individuals sometimes struggle to understand the true marginal costs of their actions at the time of making economic decisions. For example, Ito (2014) showed, using administrative data from the United States that household consumption of electricity often varies more with the average, rather than the marginal, price. Consumers do not always understand complex nonlinear electricity pricing schedules. Such behaviour has been coined “schmeduling” behaviour (Liebman and Zeckhauser 2004) in that economic agents are responding to a price “schmedule” rather than the true price schedule. In a related study, Messacar (2017) assessed the effects of the introduction of pension income splitting on the labour supply decisions of older Canadian taxfilers. That study found that individuals are more responsive to their average, rather than marginal, income tax rates at the time of making labour supply decisions at the household level. The finding from this paper that individuals bunch at convex kink points in their budget sets indicates that they are sensitive to marginal tax rates. However, this occurs *ex post*, at the time of filing taxes and depends on whether a tax planning technology exists to facilitate such behaviour.

Individuals do respond to marginal tax rates at the time of filing their taxes, but the underlying mechanism for this behaviour cannot be discerned from the data. For example, are taxfilers sufficiently tax code savvy and aware of how to use pension income splitting to minimize tax liabilities, or do they rely on the assistance of software or tax professionals? A better understanding of this issue would contribute to a large literature on tax literacy (Feldman and Katuščák 2006; Chetty, Looney and Kroft 2009; Finkelstein 2009; Chetty and Saez 2013; Taubinsky and Rees-Jones 2015; Feldman, Katuščák and Kawano 2016) and remains an important issue for future research.

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