

Bunching of closely held corporations: Targeted tax incentives, persistence and firms' heterogeneity

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Abstract

We analyze bunching of closely held corporations at the 200,000 euros kink in the Dutch corporate income tax schedule. To do so, we use tax return and administrative data linking firms to their owners over 2009-2018. We investigate heterogeneity in individuals' and firms' characteristics and the use of targeted tax incentives. We find that bunching is driven by experienced and large firms using deductions for energy and environment investments and operating in agriculture, forestry and fishing industries. We show persistence in bunching, which is driven by large and consolidated firms using repeatedly energy and environment investment deductions, operating in agriculture, forestry and fishing industries and owned by director-owners who locate repeatedly near personal taxable income kinks.

JEL codes: H24, H25, H26, H30

Keywords: elasticity of taxable income, owner-managers, closely held business, bunching, tax deductions

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1 Introduction

In the Netherlands as in many other countries corporations are mostly private closely held firms owned by shareholders with a controlling stake who often act as managing directors.¹ Director-owners contribute to firms' success with capital, time and effort, which blurs the distinction between labor income produced by the owner and capital income produced by the firm. As a result owners can, to some extent, shift income between personal and corporate tax bases. In addition, owners of closely held firms have more control over the financial account of their business, leaving room for implementing tax optimization strategies.²

Understanding the behavior of such firms is important for at least three reasons. First, closely held corporations play an important role in the evolution of top incomes and wealth in many countries.³ Second, owners of closely held corporations earn returns to both capital and labor and are faced with multiple and interacting tax schedules. Third, private corporations represent a large share of firms in many countries, and thus contribute substantially to corporate income tax revenues.⁴ Despite their importance for understanding the evolution of top incomes, for designing of optimal labour and capital income taxation and for government revenues, there is still comparatively little evidence on the response of closely held firms and their owners to tax incentives.

This paper explores how closely held firms and their owners respond to corporate tax incentives by investigating the main channels of adjustment, the main predictors of responsiveness and persistence in firms' and director-owners' behavior. Firms' responses to tax incentives have traditionally been measured using the elasticity of corporate taxable income (E-CIT), i.e. the percentage change in

¹Private corporations are companies that are not publicly quoted. In the Netherlands closely held firms are companies in which there is at least one major-shareholder, i.e. an individual owning at least 5% of the shares.

²For instance, director-owners retain some control over the timing of income realization, and they can use the firm, to some extent, for personal expenses.

³Smith et al. (2019); Kopczuk and Zwick (2020). This seems to be the case also in the Netherlands, as owners of closely held corporations locate at the top of the wealth (see Leenders et al., 2020; Dutch Ministry of Finance, 2020) and income distribution. For instance, figure A1 in the appendix shows that approximately 20% of Dutch residents in the top 1% of personal income percentiles report income from closely held corporations.

⁴Private corporations represent about 22% of firms in the Netherlands, the second largest group after sole proprietors (Statistics Netherlands, average over 2008-2018).

corporate taxable income following a one percent increase in the net-of-tax rate.⁵ However, responses to tax changes depend on the institutional framework and the existence of tax deductions (Doerrenberg et al., 2017; Saez et al., 2012; Kopczuk, 2005). In the context of firms, deductions are often targeted tax incentives, such as investment deductions and pension provisions. In addition, accounting rules allow for the use loss offsets, i.e. loss carry-back and loss carry-forward. Both tax deductions and loss offsets may distort firms' behavior in the timing and amount of deductible costs incurred and losses accumulated to minimize the tax bill. As knowledge about deductions is essential, their use could be firm and director-owner specific.

We exploit a kink at 200,000 euros in the corporate tax schedule over 2009–2018 and employ bunching techniques (Saez, 2010; Chetty et al., 2011) and probit analysis (Mortenson and Whitten, 2020) to uncover (i) the magnitude of the response, as measured by the E-CIT; (ii) the role of individual and firms characteristics; (iii) the role of targeted tax incentives; (iv) persistence in behavioral responses. That is, in this paper we aim to understand *who* reacts to the corporate income tax system, *how* do firms and their owners react, and the role of persistence. We use firms' corporate tax filings and link them to tax return and administrative data of their owners via a unique id. In order to link firms to their owners, we focus on firms that have at most one major shareholder and on owners of at most one corporate declaration.⁶

We find a small elasticity of 0.07 at the 200,000 euros threshold, where the corporate income tax (CIT) rate increases by five percentage points. However, we document large heterogeneity in the response when restricting the baseline sample to specific characteristics and to the use of deductions. Specifically, we find sizable elasticities for firms using repeatedly deductions for energy and environment investments (EEI, E-CIT=0.49) and operating in agriculture, forestry and fishing (E-CIT=0.47). We argue that firms in these industries may be able to

⁵In the spirit of Feldstein (1995, 1999). In principle, this parameter is informative about the deadweight loss of taxation. However, E-CIT measures neglect spillover effects to other income bases, such as the personal income tax base. Moreover, most existing estimates ignore intertemporal responses whereas in contrast to personal taxation, lifetime approach to taxation of firms is common to firm taxation.

⁶As we do not observe the ownership share of each director-owner we are not able to exactly attribute the income from the firm to the individual in the cases where there is more than one director-owner. A single corporate declaration can include firms who are part of a group and report consolidated corporate profits.

access EEI deductions more easily. In addition, we show that these deductions are used both at the intensive and the extensive margin in order to bunch at the kink, but that their use does not seem to have positive effects on turnover growth. Moreover, we find that large firms that have been active longer are more likely to be responsive to the kink, and that responsiveness is increasing in firms size and in the number of times firms use EEI deductions. We do not find evidence on the use of other tax incentives, such as small investment deductions, research and development (R&D) incentives, pension provisions, and charity donations.

We investigate the joint correlation of firms' and individuals' characteristics and the role of deductions with the likelihood of locating around the 200,000 euros corporate income tax kink persistently. We find that firms bunching repeatedly at the kink are large and part of a group reporting consolidated corporate taxable income. In addition, they operate in agriculture, forestry and fishing industries and use repeatedly energy and environment investment deductions. Finally, firms that are persistent at the corporate income tax kink are owned by individuals who also locate (repeatedly) near personal taxable income tax kinks. Thus, some director-owners persistently optimize along multiple tax schedules.

Our contributions are as follows. First, we document persistence of firms at corporate income tax kinks and show that firms and their owners use certain types of investment deductions repeatedly to locate at the threshold. To the best of our knowledge, we are the first to document persistence in the behavioral responses that make firms bunch at kinks. In addition, whereas firms' responsiveness at taxable income thresholds has been largely documented (e.g. Coles et al., 2019; Devereux et al., 2014; Lediga et al., 2019), persistence of taxpayers has only been studied systematically for individual taxpayers (Mortenson and Whitten, 2020).⁷ We investigate this for firms in the context of the E-CIT.

Second, this paper contributes to the understanding of the behavior of closely held businesses and their owners by providing new evidence on the link between personal and corporate tax schedule optimization. Overall, the literature is limited mostly due to data availability and the institutional framework.⁸ Miller

⁷Although Brockmeyer (2014) mentions that there are firms that bunch repeatedly in her sample, she mostly focuses on one-time bunchers and does not investigate systematically the behavior of persistent bunchers.

⁸Only a few countries provide administrative and tax return data that can link firms to their owners. This is the case in the US (Smith et al., 2019). However, the US institutional

et al. (2019) use matched data for the UK to study kinks in the personal income tax schedule and a change in the top marginal income tax rate. They investigate intertemporal income shifting responses of director-owners and show that they retain systematically earnings within their companies in order to smooth volatility of business income. In contrast to Miller et al. (2019), our data is linked via a unique id provided by the tax authority, ensuring a more precise match between firms and their owners. In addition, Miller et al. (2019) focus mostly on incentives created by the personal taxable income schedule, whereas we focus mostly on incentives along the corporate income tax schedule.

Third, we systematically investigate the role of targeted tax incentives as well as individuals' characteristics *and* firms' characteristics. This allows us to show which are the most relevant adjustment channels underlying the E-CIT and what are the main predictors of responsiveness at the corporate income tax kink, which in turn provides additional insights for understanding the "anatomy of the tax system" (Doerrenberg et al., 2017). Previous literature has looked either at the role of firms characteristics in bunching in corporate taxable income (Coles et al., 2019) or at the role of individual characteristics in bunching in personal taxable income (Bastani and Waldenström, 2020). We are able to investigate both firms' characteristics and individuals' characteristics simultaneously thanks to the link in the data between firms and their owners. In addition, previous literature investigating the use of deductions at the level of the corporation focused on specific incentives, whereas we consider all available deductions in our analysis. Doerrenberg et al. (2017) consider several deductions, but in the context of the personal income tax system whereas Mortenson and Whitten (2020) study the main characteristics predicting responsiveness of taxpayers in the context of personal income tax credits in the US.

By quantifying the impact of targeted tax incentives and loss offsets on the E-CIT, we contribute to the meagre literature on the use of firm-level deductions. With the exception of a more developed literature on R&D incentives (e.g. Chen et al., 2018) and to some extent on the role of losses (e.g. Zwick, 2021), this literature is still understudied. Brockmeyer (2014) investigates the role of investment deductions in the UK using bunching techniques to show that small

framework implied that up until recently closely held firms were mostly taxed as pass-through entities (S-corporations).

firms around the first corporate tax kink reduce taxable income by increasing reported investments at the intensive and extensive margin. However, she finds no evidence of use of investment deductions at the higher tax kink. In contrast to that, we find that Dutch closely held firms use specific types of investment deductions (repeatedly) at the intensive and extensive margin to bunch at the high corporate income threshold. Erickson et al. (2013) find that companies artificially increase losses to claim tax refunds before they expire, reporting on average 46% lower earnings than firms that cannot use tax incentives.⁹ Asatryan and Joulfaian (2021) investigate charity donations in Armenia and measure the tax elasticity of giving at the intensive margin using bunching techniques. To the best of our knowledge, there is no empirical evidence on the role of pension provisions in the context of corporate taxable income.

The paper is structured as follows. The institutional background is discussed in Section 2. Section 3 describes the methodology and section 4 the data. Results are presented in section 5 whereas section 6 concludes.

2 Institutional Background

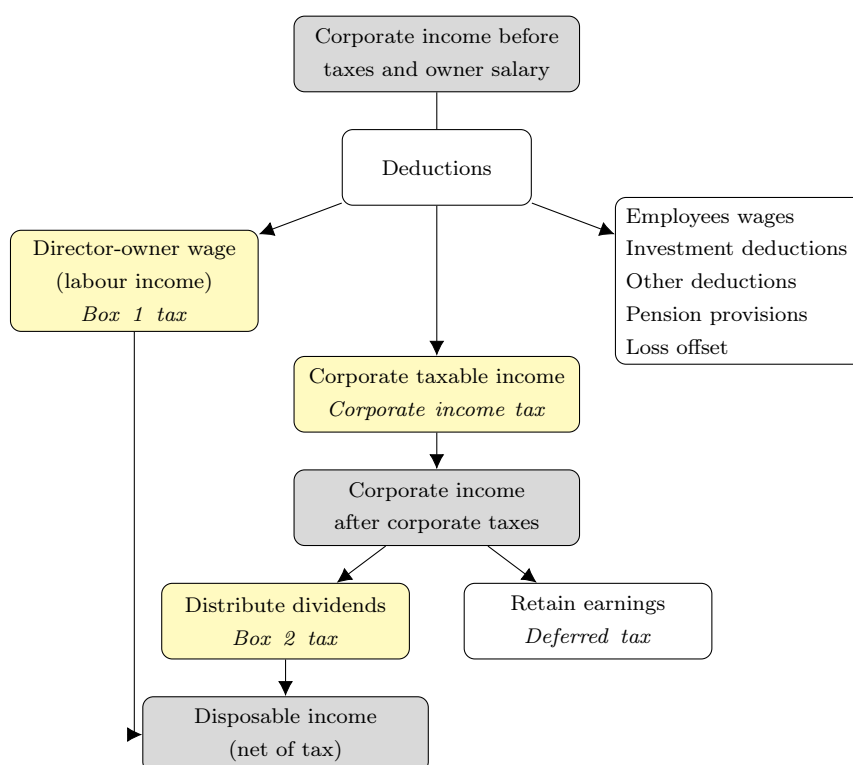
In the Netherlands, private corporations are limited liability companies often owned by large shareholders who usually also act as directors. When shareholders own at least 5% of shares in a corporation, Dutch tax law considers them “directors-major shareholders”, i.e. director-owners of the company. This status implies a specific set of rules for taxation of individual income earned from dividend distribution, as discussed below. The tax scheme for the director-owner implies that her income is liable for three types of taxes, as shown in yellow in figure 1.

Overall, Dutch corporations are liable for the corporate income tax, whereas director-owners are liable for the personal income tax. Both personal and corporate income tax schedules display kinks at which marginal tax rates change,

⁹Using a model for firm investment decisions, Edgerton (2010) suggests that tax asymmetries due to carry-back and carry-forward of operating losses undermine the effectiveness of tax incentives. Coles et al. (2019) use variation in net operating losses to construct control groups to firms which display similar taxable income but result in different effective tax schedules because of losses. However, Zwick (2021) shows that only 37% of corporations claim loss refunds, and that those claiming losses are sophisticated preparers.

creating an incentive for director-owners to declare taxable income just below or at the thresholds in order to be taxed at lower marginal tax rates. That is, director-owners who have control over the financial account of the corporation can optimize along multiple margins. We discuss the details of the personal and corporate income tax schedule below and summarize the tax system over 2009-2018 in table A1 in the appendix.

Figure 1: *Director-owner tax schedule and corporate taxable income*



Notes: The figure shows how income produced in a private closely held corporation is taxed at the firm level and at the individual level in the Dutch tax system.

2.1 Personal income tax

As of the 2001 Income Tax Act, the Dutch tax system attributes personal taxable income to three “boxes”, i.e. three income components which are taxed differently. Box 1 contains labour income, which is subject to progressive personal income tax rates with four brackets. This category includes labor income earned by the self-employed through their (unincorporated) business activity (i.e. business profits) as well as the wage received by director-owners of closely held corporations.

As marginal tax rates on labour income are higher than those levied on corporate income, director-owners have an incentive to lower self-declared income in box 1 and to finance consumption through the firm.¹⁰ To limit this, certain rules apply to the minimum wage that the director-owner of a company should receive. For instance, it should not be lower than that of the best-paid employee, and it should be comparable to the wage of other director-owners. Each year the tax authorities specify a reference wage below which the burden of proof for paying less than the reference amount lies on the director-owner. Bettendorf et al. (2017) point out that although the reference wage is not an absolute legal minimum, director-owners seem to interpret it that way as the density of their gross wage income peaks at the reference level. The reference wage lies below the top personal taxable income bracket but above the third taxable income bracket. Within the boundaries of the reference wage, director-owners still retain some discretion on how much salary to pay themselves. In general, the top marginal tax rate of 52% over 2009-2018 creates an incentive for director-owners to declare box 1 income below the top bracket.¹¹

Box 2 taxes at a flat rate of 25% profits distributed to individuals owning at least 5% of closely held corporations and capital gains realized on the sale of (part of) the company. Finally, box 3 applies to all remaining personal capital income items above an exempted amount, such as savings, investments, non-owner-occupied housing and stocks with less than 5% ownership. A flat-rate of return of 4% is assumed and the statutory tax rate applied is of 30%, resulting in a nominal tax rate of 1.2% which acts as a *de facto* net wealth tax.¹²

2.2 Corporate income tax

The Corporate Income Tax Act levies corporate taxes on profits of publicly and closely held corporations according to a two-rate structure. Over 2009-2018 the rate equals 20 percent up to 200,000 euros and 25 percent above this threshold,

¹⁰For instance, by taking a loan against the company to finance consumption and/or private savings, or by billing personal expenses that can be deducted as input costs to the firms' corporate account. See table A1 in the appendix for a summary of personal and corporate income tax rates over 2009-2018.

¹¹The tax incentive is large as the change in the marginal tax rate is between 10 to 12 percentage points, depending on the year. See table A1 in the appendix.

¹²As of 2017, the assumed rate of return was made progressive.

Table 1: *Definition corporate taxable income*

Corporate income before taxes and labour income
– Director-owner wage
– Other labour costs
= Profit income
– Investment deductions
– Small investments
– Energy and environment investments
– Pension provisions
– Other deductions
– Charity donations
– R&D incentives
= Corporate taxable income before loss offsets
– Loss offsets (carry-forward)
= Corporate taxable income (z), current year

Notes: This table shows the computation of corporate taxable income.

which creates one kink at zero and one at 200,000 euros.¹³ In this paper, we focus mostly on the 200,000 euros threshold but we discuss results at the zero threshold in the appendix.

The base is corporate taxable income. Importantly, labour income (employees and director-owner wages) as well as tax incentives and loss offsets are deductible from taxable income, as described in table 1. In general, the presence of kinks in the tax schedule will induce director-owners to reduce corporate taxable income in order to be taxed at a lower rate. This can be done, for instance, by timing the use of deductions in a given year. We explain the deductions available in more detail in the subsections below.

After payment of the corporate income tax, the director-owner can either pay out dividends, which are taxed at a proportional rate of 25 percent in box 2, or retain profits within the company, which will be taxed at a later stage. This choice is visualized at the bottom of Figure 1. According to Bettendorf et al. (2017), retaining profits is very common as around 58 percent of Dutch firms did not pay out dividends in five years and almost half in eight years. That is, given progressive rates in (box 1) personal income taxation and double taxation

¹³The tax rate above the threshold in 2009-2010 was 25.5%.

of income at the corporate and at the dividend distribution (box 2) level, the incentive for director-owners is to pay as little wage as possible and retain profits within the firm. This in turn could be driven by inter-temporal income shifting to smooth volatile business incomes (Miller et al., 2019) and/or by director-owners effectively using the corporation as a tax shelter (Alstadsæter et al., 2014). The latter could include imputing private consumption as a firm cost or borrowing against the firm to finance private consumption.

2.2.1 Investment deductions

Several investment deductions are available to both incorporated and unincorporated entrepreneurs in the Netherlands. These are usually in place to encourage investments, as the latter increase company profitability and lead to higher future tax revenues. However, a set of investment deductions aimed at providing (positive) energy efficiency and sustainability externalities are also available. Table A2 in the appendix summarizes the main investment schemes.

The most commonly used investment incentives are small-scale deductions for fixed assets investments.¹⁴ To be eligible, companies need to report aggregate investments between a minimum and a maximum amount. From 2010, the maximum deduction available is decreasing above a given threshold.¹⁵ A set of energy and environment investment (EEI) deductions are also available, namely the energy investment allowance, the environmental investment deduction and the arbitrary depreciation of environmental investments. Under these schemes, the rate at which the deduction is applied and the maximum size of qualifying investments are larger than under the small fixed assets investments scheme.¹⁶

¹⁴Investments in residences, land, securities, passenger cars (except for professional transport), assets (mostly) intended for rental or use abroad, assets that entrepreneurs transfer from their private assets to the company or for which entrepreneurs enter into obligations towards relatives do not qualify for the deduction. The allowance applies to aggregate investments excluding investments below 450 euros.

¹⁵For instance, in 2016 28% of aggregate investments between 2,300 and 56,024 euros were deductible from corporate taxable income. For investment between 56,024 and 103,748 euros the allowance remained fixed at 15,687 euros, whereas investments above 103,748 euros received 15,687 euros minus 7.56% of the amount in excess of 103,748 euros. Finally, aggregate investments above 311,242 euros made the allowance inapplicable.

¹⁶For instance, in 2016 58% of costs for new energy-efficient business assets were deductible for investments up to 120 million euros under the energy investment allowance scheme, whereas the maximum deduction under the small fixed assets investments scheme was 15,687 euros. In addition, firms could deduct up to 36% of the costs for environmentally friendly assets up to

Investments qualifying for EEI deductions are listed on the Energy List and Environment List, which show that many of these investments are industry-specific.¹⁷ The right to EEI deductions is declared with the tax return, provided the investment is reported within three months from entering an obligation with the supplier to the Netherlands Enterprise Agency (NEA). The latter controls the correct application of EEI deductions and carries out both automatic checks and on-site random checks.¹⁸ EEI deductions can be combined with small deductions for fixed assets investments. However, the energy investment allowance cannot be combined with environmental schemes.

Overall, both small scale investment deduction schemes and EEI deductions can be used strategically by firms in order to reduce corporate taxable income in a given fiscal year. This can be done in two ways. The first is simply by timing the investment and its amount. The second is to create fake receipts or misreport invested amounts. Given the automatic and random checks carried out by the NEA for EEI deductions and the specificity of the qualifying investments, providing fake receipts and misreporting can be quite risky. It could however be less risky in the case of small scale fixed assets investments. Small scale investment deductions however are less flexible than EEI deductions, as the former are capped at a maximum annual aggregate investment amount.

a maximum investment of 25 million euros using the environmental investment deduction and write off up to 75% of the costs using the arbitrary depreciation. The exact rate applicable to assets qualifying for environment investment deduction depends on the ministerial classification of assets. Before 2011 the arbitrary depreciation allowed to write off up to 100% of the investment.

¹⁷In some cases investments that are not in the list can be reported under a generic code if they meet specific energy saving standards. Alternatively, companies can request for sustainable investments to be included in the list. Examples of specific investments are energy performance improvement of existing commercial buildings, energy-efficient milk cooling system, air circulation system in horticultural greenhouses for the energy investment allowance; water-saving facility, equipment for processing of plant residues into raw materials, facility for utilizing waste from neighboring companies for environment schemes. See www.rvo.nl.

¹⁸For instance, after receiving the application for the energy investment allowance the NEA conducts an automatic financial and a technical check to see if the deduction is applied correctly. To gain more information for the procedure the agency can request more information or carry out a control visit. Following application for environment deductions the agency announces within 10 days if the application will be subject to a random check on whether the conditions for the schemes are met.

2.2.2 Other deductions

Other deductions are available to all Dutch entrepreneurs, namely deductions for R&D activities and for charity donations.¹⁹ R&D tax relief is provided both through a payroll withholding tax credit for wage costs and a tax allowance for non-labour related expenses, which from 2016 are unified in the so-called WBSO. The headline credit rate in 2016 was 32% (40% for new firms) up to 350,000 euros of expenses and 16% above that amount. Charitable contributions are deductible from corporate taxable income if the donation is documented in writing and contributed to a qualifying charity. The deductible amount may not exceed 50 per cent of the taxable profits, with a maximum of 100,000 euros.²⁰ Charitable donations are also deductible from box 1 personal taxable income.²¹ As the box 1 tax schedule is more progressive than the corporate income tax schedule, it may be more convenient for director-owners to deduct charitable contributions from personal income rather than from corporate income.

2.2.3 Pension provisions

Until 2018, director-owners could choose either to build their pension within the corporation. Pension reservations made within the firms were deductible from corporate taxable income, but their return was taxed under the corporate income tax schedule. Once retired, the entrepreneur received a pension benefit from the firm, taxed under the personal income tax schedule. Since tax rates for pensioners in the first two brackets are much lower (about 20%-points) than the standard personal income tax rates, this could lead to tax savings.²² In principle, pension reservations could be used to reduce taxable income. However, the complexity of the tax code regulating pension provisions within the firm may imply that these deductions were not flexible enough or suitable for this.

¹⁹Additional deductions that are only applicable to certain firms (e.g. exporting firms) are not the focus of this paper.

²⁰Donations to a cultural organisation may be multiplied by 1.5 in respect of the corporate income tax deduction for gifts, with a maximum increase of 2,500 euros.

²¹The deduction can be as high as 10% of aggregate income before the application of the personal allowance.

²²Dynamics may be more complex, as there were various alternatives for entrepreneurs to build pensions over our sample period.

2.2.4 Loss offsets

Loss offsets allow firms to smooth the tax burden, thus reducing liquidity problems and allowing risk-sharing. They also increase effectiveness of tax incentives, as the latter are often not available to loss-making firms. The logic behind loss offsets results from the legal standpoint of lifetime income taxation of firms.²³ Current losses are initially offset against previous years profits (carry-back). If this is not possible, losses can be offset with future profits (carry-forward). Over 2008-2018 firms were allowed to carry-back losses for one year and carry them forward for 9 years. However, as a temporary measure over the global financial crisis, between 2009 and 2011 firms could opt for 3 years carry-back instead of one, which entailed reducing to 6 years the carry-forward option.

The sum of losses that are carried forward after applying the loss carry-back is the stock of net operating losses. The latter can be used strategically by firms in order to reduce their tax bill and bunch at corporate income tax thresholds (Coles et al., 2019). For instance, firms with the stock of net operating losses of 20,000 euros will be paying zero taxes in a given fiscal year by declaring 20,000 euros in corporate taxable income and using the stock of losses to offset the amount of taxes due. That is, the stock of losses that are carried forward after the loss-offset can be used to bunch at corporate income tax thresholds. However, corporate tax complexity may imply that only sophisticated filers will claim tax refunds (Zwick, 2021).

3 Empirical Methodology

3.1 Bunching

Firms responses to tax incentives are traditionally measured using the elasticity of corporate taxable income. The latter helps quantify the welfare losses due to income taxation and summarizes all kinds of behavioural responses, including real responses, tax avoidance and tax evasion, in the spirit of Feldstein (1995,

²³The idea that loss offsets are beneficial is discussed in Kaymak and Schott (2019). Furthermore, the existence of the CIT might be discouraging for investment and entrepreneurship as pointed out by Erosa and González (2019). This is beyond the scope of our paper.

1999).²⁴ The compensated elasticity of taxable income measures the percentage change in reported taxable income z following an increase in the net-of-tax rate $(1 - \tau)$ of one percent:

$$e(z) = \frac{dz}{z} \bigg/ \frac{d(1 - \tau)}{(1 - \tau)} \quad (1)$$

To identify this parameter we use the bunching methodology first developed by Saez (2010) and Chetty et al. (2011) in the context of personal taxable income. The approach rests upon a neoclassical model featuring agents with well-behaved preferences and discontinuities in marginal tax rates that create kinks in their budgets. The key insight is that a tax rate increase from τ_1 to τ_2 at a specific point in the tax schedule will induce some agents to decrease taxable income in order to be taxed at the lower rate.²⁵ This will create a spike in the income density of taxpayers at the kink, or a bunching window in presence of adjustments costs and optimization frictions that do not allow for precise targeting of the kink (Kleven and Waseem, 2013).

Saez (2010) and Chetty et al. (2011) show that the elasticity $e(z)$ can be obtained by looking at excess bunching, i.e. by comparing the income density distribution of taxpayers at the kink-point with a counterfactual density measuring what would have been the distribution had there not been a tax kink. The compensated E-CIT identified at threshold income level z^* is then given by:

$$e(z) = \frac{b}{z^* \cdot \log\left(\frac{1-\tau_1}{1-\tau_2}\right)} \quad (2)$$

Where $\log\left(\frac{1-\tau_1}{1-\tau_2}\right)$ percent represents the change in net-of-tax rate. Taxable income below the threshold z^* is taxed at the rate τ_1 and taxable income above z^* at rate τ_2 . The only parameter that needs to be estimated is the relative excess mass of taxpayers at the threshold, b . The latter indicates the share of taxpayers bunching at the kink relative to the counterfactual density. The identifying assumption in bunching methods is that without the tax kink, firms at the threshold would behave similarly to firms further away from the kink. In such case, the counterfactual distribution can be predicted from the observed density outside the income range affected by the kink. The estimate of the excess mass

²⁴The E-CIT however is not a structural parameter, unless specific assumptions are met. In addition, there are conditions under which the E-CIT is not a sufficient statistic for welfare analysis (Saez, 2004; Chetty, 2009; Doerrenberg et al., 2017).

²⁵Assuming convex preferences smoothly distributed across the population.

b is then given by:

$$\hat{b} = \frac{\hat{B}}{\sum_{j=l}^u \hat{N}_j} \quad (3)$$

Where l is the lower bound of the bunching window and u is the upper bound. \hat{B} is the number of individuals bunching within the bunching window and is obtained subtracting from the effective number of taxpayers in each taxable income bin j in the bunching window, N_j , the counterfactual number of taxpayers that would have been in income bin j in the absence of the kink, \hat{N}_j , i.e. $\hat{B} = \sum_l^u N_j - \hat{N}_j$. The counterfactual number of individuals within income bin j is estimated by a local polynomial regression on binned data which excludes bins comprised in the bunching window:

$$\hat{N}_j = \sum_{i=0}^q \beta_i \cdot Z_j^i + \sum_{k=l}^u \gamma_k \cdot \mathbb{I}[Z_j = k] + \varepsilon_j \quad (4)$$

Z is the midpoint of an income bin and γ_k represent bin fixed effects for each bin in the excluded range within the bunching window. The optimal number of polynomials is chosen using the BIC criterion and the bunching window is obtained using Bosch et al. (2020) reiterated data driven procedure. Standard errors are obtained using bootstrapping techniques.

3.2 Probit analysis

In order to investigate the *joint* correlation of deductions and characteristics with the likelihood of locating near the corporate income tax kink and persistence of firms at the threshold we couple the bunching analysis with probit analysis. In this we follow Mortenson and Whitten (2020), who conduct a similar analysis for credit maximizing kinks and individual characteristics for the US personal income tax schedule.

For our baseline sample, we select a range of $[\pm 5,000]$ or $[\pm 10,000]$ euros around the 200,000 euros corporate tax kink. We define as dependent variable a dummy that equals one if the director-owner declares corporate income taxes within $[-1000, 300]$, $[\pm 300]$ or $[\pm 500]$ euros of of the kink in a given year. This is with the intention to mirror, to some extent, the dynamics in bunching over a bunching window and to allow for (asymmetric) optimization frictions. As

independent variables we use dummies for individuals' and firms' characteristics and for the use of deductions. Assuming that characteristics and deductions do not affect the likelihood of unintentionally locating near the corporate income tax threshold – conditional on being in the selected range around the threshold – the coefficients can be interpreted as correlations with the likelihood of bunching at the corporate income tax kink (average marginal effect).

Using the same method, we can also investigate the characteristics and dedications used by director-owners who bunch at the corporate income tax threshold repeatedly. To do so, we define the dependent variable to be equal to one if the firm locates near the corporate kink in more than one year. Alternatively, the dummy equals one if it locates near the kink for two consecutive years. Again, we select ranges of $[-1000, 300]$, $[\pm 300]$ or $[\pm 500]$ euros around the kink and a regression window of either $[\pm 5,000]$ or $[\pm 10,000]$ euros. In both specifications we include year dummies and cluster standard errors at the taxpayer level.

4 Data

We combine administrative and tax returns data provided by Statistics Netherlands over 2009-2018.²⁶ We obtain tax return data on all private corporations in the Netherlands owned by at least one major-shareholder, i.e. an individual with at least 5% of the shares.

Thanks to a unique individual id, we match firm-level tax return data with individual-level administrative and tax return data on director-owners. In order to accurately link individual and firm-level data, we consider only corporations in which there is a single major-shareholder and only director-owners with a single corporate declaration, based on yearly observations. Thus, the unit of observation is both the director-owner and the corporate declaration. Our selection includes observations in which there is a single major-shareholder of a corporate

²⁶We focus on the 2009-2018 as 2007 and 2008 were affected by reforms. After several years in which the threshold was at 22,689 euros and rates changed by 4-5%-points, in 2007 a three brackets structure was introduced. Specifically, firms paid 20% tax on corporate taxable income up to 25,000 euros; 23.5% on income between 25,000 and 60,000 euros and 25.5% above 60,000 euros. In 2008, the schedule was changed back to a two rate structure, with a 275,000 euros threshold. Figure A2 shows that there is no bunching at 25,000 euros threshold in 2007 nor at the 275,000 euros kink in 2008 and only a tiny increase of the mass at the 60,000 euros threshold. This suggests that there may be frictions and adjustment costs.

group, i.e. a group of firms reporting corporate taxable income as one entity for tax purposes.²⁷ Overall, single owner, single corporate declaration companies represent 69% of all firm-year observations in the initial sample, as shown by table A3.²⁸

The dataset contains demographic characteristics of the director-owner and of the company. For the director-owner, we observe sex, age, position in the household (i.e. single or with fiscal partner, main breadwinner or second earner), how many unincorporated businesses the individual owns and information on whether the entrepreneurs' family has been in the Netherlands for two generations. We create dummies for all the individual characteristics that we observe. We also have data on personal taxable income from the director-owner's personal tax returns. We create dummies that equal one if box 1 personal taxable income declared by the director-owner is within a $[\pm 500]$ or $[-1000, 300]$ euros range of any personal taxable income thresholds in a given year or in any year.

We observe corporate taxable income before and after loss carry-forward and the amount of taxes paid by each firm every year. We assume that taxable income is zero if taxable income before loss offsets is positive and corporate taxable income is missing. Since we observe the year in which the firm was created we can calculate the age of the firm.²⁹ In addition, the dataset contains information on whether the firm has personnel and on the employees size class. We also have information on the wage the entrepreneur pays herself, total assets and equity in euros, the Nace industry classification code of the firm and whether the firm is part of a corporate group reporting consolidated tax returns or if it is a standalone entity.³⁰ We create dummies for all firms' characteristics. As we observe the director-owner wage, we create a dummy which equals one if the wage is within $[\pm 300]$ euros of the reference wage in a given year.

²⁷As our firm data is tax return data, the unit of observation at the firm level is the corporate tax return declaration.

²⁸The initial sample contained approximately 2.6 million observations. Firms owned by at most two director-owners and where the director-owners own at most one corporation represent approximately 94% of the initial sample. In a robustness check, we test the sensitivity of the baseline estimate to alternative sample selections.

²⁹Whenever we observe two different years we assume the correct one is the earliest year observed.

³⁰Whenever information on employees size class, fiscal unity or Nace classification is missing in a given year for a firm, we assume the variable to be equal to the variable as observed in previous or following year.

Table 2: *Summary statistics (selected variables)*

	N	mean	sd	p10	p50	p90
<i>Full sample</i>						
Director-owner age	1,719,000	50.31	11.09	36	50	65
Box 1 taxable income	1,756,000	61,129	70,466	20,500	53,039	102,368
Box 2 taxable income	233,254	124,403	395,151	8,991	57,224	250,000
Box 3 taxable income	709,970	16,211	61,268	334	4,204	35,939
Corporate taxable income	1,651,000	42,072	425,584	-27,667	6,457	126,483
Positive corporate taxable income	974,169	97,109	464,400	3,863	34,184	195,058
Losses	498,515	-50,446	403,991	-90,943	-14,534	-1,414
Loss carry-forward	266,489	42,101	538,776	1,003	11,063	77,348
Firm age	1,738,000	14.95	16.32	2	11	30
Assets	1,766,000	1,361,000	52,500,000	23,542	343,119	2,276,000
Investment deductions	338,770	7,707	135,834	804	3,430	15,211
Small investment deductions	324,086	5,264	4,906	794	3,136	14,339
EEl deductions	22,730	28,415	508,175	1,688	14,115	34,264
Pension provisions	765,896	219,603	286,938	24,586	130,301	509,277
Charity donations	133,673	10,081	826,605	157	1,075	6,000
R&D	12,334	15,988	130,616	1,800	6,480	18,150
<i>Corporate taxable income 175K-225K</i>						
Director-owner age	33,139	50.34	10.06	38	50	64
Box 1 taxable income	33,628	85,162	87,086	38,559	69,697	138,876
Box 2 taxable income	9,178	164,302	335,632	20,000	100,000	250,000
Box 3 taxable income	18,146	21,333	61,183	582	7,146	47,675
Corporate taxable income	33,780	197,708	13,858	179,324	197,022	218,022
Loss carry-forward	1,440	91,068	200,795	2,303	32,283	207,003
Firm age	33,581	17.94	17.91	3	14	36
Assets	33,780	2,586,000	6,260,000	470,146	1,451,000	5,606,000
Investment deductions	13,787	8,297	31,104	877	4,601	15,609
Small investment deductions	13,398	6,125	5,201	865	4,192	15,196
EEl deductions	1,097	25,500	103,008	1,688	11,919	37,874
Pension provisions	17,413	283,282	350,776	30,581	166,678	661,760
Charity donations	3,257	8,702	128,454	242	1,482	8,994
R&D	266	13,051	18,223	2,016	7,949	27,540

Notes: The table reports summary statistics for selected variables over the period 2009-2018. The top panel reports statistics for the full sample, whereas the bottom panel shows statistics for firms reporting corporate taxable income between 175,000 and 225,000 euros. See text for variables' description.

Table 3: *Summary statistics, shares (selected variables)*

	<i>Full sample</i>			<i>Taxable income 175K-225K</i>		
	N	mean	sd	N	mean	sd
Firm active ≥ 10 years	1,738,000	0.551	0.497	33,581	0.651	0.477
Consolidated	1,766,000	0.230	0.421	33,780	0.491	0.500
0-9 employees	1,679,000	0.897	0.304	32,926	0.796	0.403
10-59 employees	1,679,000	0.091	0.287	32,926	0.179	0.384
≥ 50 employees	1,679,000	0.012	0.110	32,926	0.025	0.155
Assets 0-500K	1,766,000	0.600	0.490	33,780	0.114	0.318
Assets 500K-1M	1,766,000	0.166	0.372	33,780	0.226	0.418
Assets 1-3M	1,766,000	0.163	0.369	33,780	0.423	0.494
Assets 3-5M	1,766,000	0.035	0.183	33,780	0.117	0.321
Assets ≥ 5 M	1,766,000	0.037	0.188	33,780	0.121	0.326
Equity 0-500K	1,766,000	0.547	0.498	33,780	0.272	0.445
Equity 500K-1M	1,766,000	0.108	0.310	33,780	0.262	0.440
Equity 1-3M	1,766,000	0.100	0.300	33,780	0.304	0.460
Equity 3-5M	1,766,000	0.021	0.144	33,780	0.071	0.256
Equity ≥ 5 M	1,766,000	0.023	0.149	33,780	0.075	0.264
Loss t-1	1,507,000	0.297	0.457	30,822	0.050	0.217
Investment deductions	1,766,000	0.192	0.394	33,780	0.408	0.491
Small investment deductions	1,766,000	0.184	0.387	33,780	0.397	0.489
EEl deductions	1,766,000	0.013	0.113	33,780	0.033	0.177
Pension provisions	1,766,000	0.434	0.496	33,780	0.515	0.500
Charity donations	1,766,000	0.076	0.265	33,780	0.096	0.295
R&D	1,766,000	0.007	0.083	33,780	0.008	0.088
Man	1,719,000	0.884	0.320	33,139	0.895	0.306
40-56 years old	1,766,000	0.537	0.499	33,780	0.601	0.490
With partner	1,766,000	0.826	0.379	33,780	0.844	0.363
Main breadwinner	1,766,000	0.849	0.358	33,780	0.902	0.297
Dutch (2 generations)	1,766,000	0.682	0.466	33,780	0.652	0.476

Notes: The table reports summary statistics for selected dummy variables over the period 2009-2018. The left panel reports statistics for the full sample, whereas the panel on the right shows statistics for firms with corporate taxable income between 175,000 and 225,000 euros. See text for variables' description.

In addition, the dataset contains details regarding pension provisions, small scale fixed assets investment deductions, EEI deductions, deductible research and development costs and donations. We create dummies to indicate whether firms use any of these deductions, in a given year or in any year. For small scale fixed assets investments we create a dummy indicating whether the firm in a given year is reporting the maximum deductible amount. In addition, we create variables indicating how many times the firm has used deductions at any point in time, and how many times in total the firm has used deductions over the time period it is observed. In terms of loss offsets, we only observe the use of loss carry-forward, i.e. whether previous years' losses are offset against current positive taxable income.

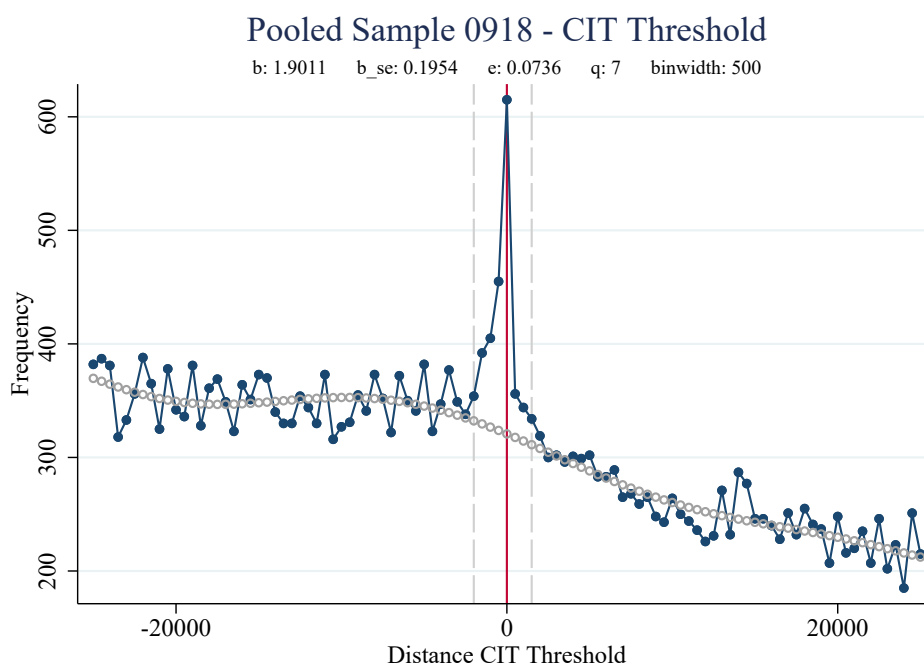
Tables 2 and 3 report summary statistics for a selection of variables, reported in levels or as shares respectively. The tables report statistics for the full sample as well as for observations where corporate taxable income is comprised between 175,000 and 225,000 euros. Table 2 shows average taxable income reported by firms in the sample is 42,072 euros, which reflects the fact that the sample contains many small firms and that firms often report losses. Corporate taxable income in the 90th percentile is 126,483 euros, meaning that by focusing on firms at the 200,000 euros threshold we are considering mainly firms at the top of the corporate income distribution. Table 3 shows that when considering the full sample most firms are small in terms of employees, as approximately 90% of the sample has zero to nine employees. The average asset size is of approximately 1.4 million euros, although 60% of firms have assets below 500,000 euros. The average investment deduction is quite small, but is mainly driven by small investment schemes. The average EEI deduction is larger, yet used much less by firms in the sample. This may reflect the specificity of the the scheme and of qualifying investments. Firms reporting taxable income around the 200,000 euros threshold are larger in terms of assets and employees, invest more, and are owned by individuals reporting on average larger sums on their personal income tax return.

5 Results

5.1 Baseline estimate

We estimate bunching of firms at the 200,000 euros threshold using the methodology outlined in section 3.1. Figure 2 displays the results obtained for the 2009-2018 sample of single owners of single corporate declarations at the 200,000 euros threshold. The figure plots the frequency of firms in each taxable income bin (in blue) relative to the distance to the threshold, 25,000 euros above and below the kink. The grey line represents the estimated counterfactual. The threshold is marked by the red vertical line. The dotted vertical grey lines represent the upper and lower bound of the bunching window. At the top of the figure we report the relative excess mass b , the standard error of the estimate, the elasticity, the polynomial order and the size of the bin width.

Figure 2: *Bunching at the 200,000 euros threshold*



Notes: The figure shows results obtained by applying bunching techniques at the 200,000 euros threshold over 2009-2018. b is the relative excess mass, se is the standard error of the relative excess mass, e is the elasticity and q the polynomial order. The bin width is of 500 euros.

The excess mass b represents director-owners who react to the kink in the corporate income tax schedule by reducing reported taxable income. b is 1.9, which means that there are approximately two times more observations around the threshold than what we would have expected had there not been a kink at 200,000 euros. That is, over 600 firm-year observations bunch exactly at the kink whereas less than 350 pay the higher corporate income tax rate. The relative small number of observations around the threshold is explained by the fact that 200,000 euros is a high kink for closely held firms in the Netherlands. As shown by table 2, firms around this threshold are located at the top of the corporate taxable income distribution.

The estimate is robust to alternative choices of the polynomial order, as shown by table A4 in the appendix. In our baseline estimate, we choose a bin width of 500 euros. Table A4 in the appendix shows that reducing the size of the bin with slightly reduce the elasticity estimate, whereas increasing the size of the bin width increases slightly the elasticity estimate. Overall, these robustness checks imply an estimate ranging between 0.06 and 0.09.

5.1.1 Alternative samples

Our baseline sample selects firms with a single owner and owners who are major-shareholders of a single corporation in order to link accurately individual and firm-level data. In this section, we investigate how this choice affects our baseline estimate. We report the results obtained for different sample selections in table 4. The table reports the excess mass, its standard error, the number of observations in the bunching window, what share of the initial sample they represent and the elasticity estimate.

Including in our sample all corporations, i.e. adding to our sample firms that are owned by more than one major-shareholder and firms where major-shareholders own multiple corporations, results in an elasticity of 0.10. Interestingly, although our baseline sample represents only about 50% of the observations in the bunching window compared to the estimate with all corporations, the elasticity is still relatively large. Considering firms with at most two owners results in an elasticity of 0.09 and covers up to 98% of the initial bunching sample.

Although the E-CIT depends on the institutional context, the estimate for all

Table 4: *Alternative samples*

	b	se	N	N share	E-CIT
All owners, all corporations	2.48	0.228	6459	1.00	0.10
All owners, single corporation	2.39	0.225	5760	0.89	0.09
Max 2 owners, all corporations	2.45	0.229	6350	0.98	0.09
Max 2 owners, single corporation	2.39	0.228	6070	0.94	0.09
Single owner, all corporations	2.05	0.253	5515	0.85	0.08
Single owner, single corporation	1.90	0.195	3255	0.50	0.07
Single owner, single corporation	1.90	0.195	3255	1.00	0.07
– Observed ≥ 3 years	1.88	0.201	3150	0.97	0.07
– Observed ≥ 5 years	1.98	0.231	3187	0.98	0.08
– Observed every year	2.25	0.251	1438	0.44	0.09

Notes: Results are for the pooled sample over 2009-2018. The baseline bin width choice is 500 euros. Sample selections specified in the first column are based on firm-year observations. b is the relative excess mass, se are the standard error of the excess mass. N is the number of observations bunching in the bunching window.

corporations is probably the most comparable to the elasticity of 0.13-0.17 calculated by Devereux et al. (2014) for all companies in the United Kingdom at the 300,000 pounds tax kink. Differences in estimates can be associated to differences in the underlying sample of firms considered (we only consider closely held firms whereas the authors consider all UK companies) as well as with the fact that the change in marginal tax rates at the high kink is of 12.5 percentage points in the UK, and individuals tend to respond more strongly to larger tax changes. Overall, our estimate is also in line with evidence by Lediga et al. (2019), who find elasticities in the range of 0.08-0.15 for a 7 to 10 percentage points increase in the tax rate at a comparably high kink in South Africa.

Finally, in our baseline sample we include all firms regardless of the number of time we observe them in the sample. The bottom of table 4 reports results obtained when selecting only firms that are observed at least three years, at least five years and all years over 2007-2018. The elasticity estimate increases slightly when when we select firms observed every year.

5.2 Individual heterogeneity

In this section, we show how responsiveness of firms to tax incentives, as measured by the E-CIT, varies with individual characteristics. We conduct the same analysis as for figure 2 but select subsets of the initial sample depending on individual characteristics. We summarize the results in table 5, which reports the excess mass, its standard error and the number of firms in the bunching window around the threshold in the first three columns. The fourth column reports the share of observation with certain characteristics that locate in the bunching window relative to the baseline. The last two columns show the elasticity estimate and the associated change in reported corporate taxable income for a 5%-points increase in the tax rate.

Table 5: *Individual heterogeneity*

	b	se	N	N share	E-CIT	Δ taxable income, %
Baseline	1.90	0.195	3255	1.00	0.07	0.48
$[\pm 500]$ PIT threshold in any year	2.89	0.371	805	0.25	0.11	0.72
$[\pm 500]$ PIT threshold	3.05	0.474	95	0.03	0.12	0.76
$[\pm 500]$ PIT threshold ≥ 3 years	3.93	0.706	79	0.02	0.15	0.98
$[-1000, 300]$ PIT threshold in any year	2.54	0.345	899	0.28	0.10	0.64
$[-1000, 300]$ PIT threshold	2.43	0.451	116	0.04	0.09	0.61
$[-1000, 300]$ PIT threshold ≥ 3 years	3.86	0.629	103	0.03	0.15	0.97
$[\pm 300]$ reference wage	3.35	0.699	63	0.02	0.13	0.84
40-56 years old	2.50	0.215	2202	0.68	0.10	0.62
Dutch (1st and 2nd gen.)	2.50	0.282	2984	0.92	0.10	0.63
Owns unincorporated business	2.12	0.269	748	0.23	0.08	0.53
Single	2.27	0.375	397	0.12	0.09	0.57
Women	2.72	0.392	280	0.09	0.11	0.68
Second breadwinner	2.21	0.412	160	0.05	0.09	0.55

Notes: The table is based on bunching analysis conducted as in figure 2 but restricting the sample to individual characteristics as listed in the table based on firm-year observations. See main text for description. Results are based on pooled data over 2009-2018 and on bin width of 500 euros.

First, we look at individuals who optimize along the personal income tax schedule. That is, we restrict the sample to owners who at any point in time, in a given year or for at least three years over the time span in which they are observed, have declared personal taxable income within a $[\pm 500]$ or $[-1000, 300]$ euros of

any box 1 kink. Since we are focusing on firms owned by single director-owners who have control over the corporation's financial account, we conjecture that individuals optimizing along the personal income tax schedule will try to do that also along the corporate income tax schedule. In comparison to the baseline, we find larger estimates of the excess mass and of the E-CIT for director-owners optimizing (repeatedly) along the personal income tax schedule. This suggests that individuals optimizing along the personal income tax schedule are also more responsive to the corporate income tax schedule. Next, we restrict the sample to owners who paid themselves a salary falling within $[\pm 300]$ euros of the reference wage in a given year. Although these individuals represent a small fraction of the initial sample, their responsiveness at the corporate income tax threshold seems larger in comparison to the baseline estimate.

In addition, the bottom of table 5 shows that for director-owners who in a given year are 40-56 years old, have Dutch background in both first and second generation, are single, women, second breadwinners (if in a couple), and who own also unincorporated businesses the excess mass increases slightly in comparison to the baseline. Individuals who are Dutch for two generations and 40-56 year-old represent the majority of observations bunching around the threshold. This is not the case for second earners, women and singles. Many firm-owners within the bunching window also own a non-corporate business.

5.3 Firm heterogeneity

Next, we investigate how bunching behavior changes depending on firms' characteristics. We conjecture that larger firms may be more refined tax planners, e.g. because they can hire good tax advisors who help them minimize their tax bill. One way to measure firm size is by its assets. For companies that have more than 3 or 5 million euros worth in assets, the elasticity of corporate taxable income is higher than the baseline, as shown by table 6. In addition, responsiveness of firms to the corporate income tax threshold seems to be increasing in assets size.

Firm size can also be measured in terms of personnel. We find that the larger the company in terms of employees, the larger the elasticity estimate. As shown in table 6, around 20% of firms bunching around the 200,000 euros thresholds have 10 or more employees and the elasticity for these firms is higher than the baseline.

Table 6: *Firm heterogeneity*

	b	se	N	N share	E-CIT	Δ taxable income, %
Baseline	1.90	0.195	3255	1.00	0.07	0.48
Assets $\geq 1,000,000$	2.18	0.239	2255	0.69	0.08	0.55
Assets $\geq 3,000,000$	2.59	0.299	705	0.22	0.10	0.65
Assets $\geq 5,000,000$	2.83	0.342	287	0.09	0.11	0.71
Employees ≥ 10	3.13	0.315	636	0.20	0.12	0.78
Employees ≥ 30	3.50	0.413	312	0.10	0.14	0.88
Employees ≥ 50	4.72	0.675	59	0.02	0.18	1.18
Equity $\geq 1,000,000$	2.14	0.264	1416	0.44	0.08	0.53
Equity $\geq 3,000,000$	2.07	0.359	288	0.09	0.08	0.52
Equity $\geq 5,000,000$	1.96	0.352	117	0.04	0.08	0.49
Consolidated	2.16	0.207	1322	0.41	0.08	0.54
Active ≥ 10 years	2.21	0.210	1983	0.61	0.09	0.55

Notes: The table is based on bunching analysis conducted as in figure 2 but restricting the sample to firm characteristics as listed in the table based on firm-year observations. See main text for description. Results are based on pooled data over 2009-2018 and on bin width of 500 euros.

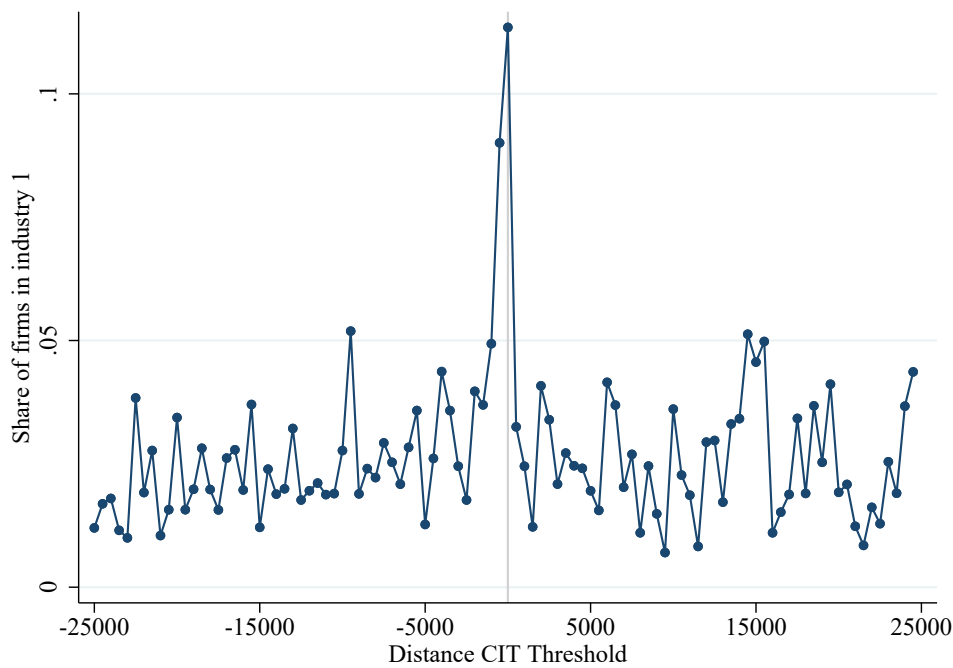
For firms with 50 or more employees the elasticity estimate is 0.18, which more than doubles the baseline estimate, implying that a 5%-point increase in the corporate tax rate leads to about 1.2% decrease in reported taxable income.

We also look at firms' equity. Although the elasticity estimate is slightly larger in comparison to the baseline, there is no evidence that responsiveness of firms increases with a company's equity. Finally, we investigate responsiveness of firms that are consolidated in fiscal unity and firms that have been active for ten years or longer. These firms represent a large proportion of firms locating around the threshold, yet are only slightly more responsive to the corporate income tax kink in comparison to the baseline.

Firms' responsiveness to tax incentives may be industry specific. This could be due to the director-owner information and skills set or to the specificity of industries products and production processes, which could be more suitable to manipulation of corporate taxable income (e.g. via misreporting or via the use of deductions that firms in specific sectors can access). Figure A3 in the appendix shows the industry composition of firms around the threshold. The majority of firms around the kink operate in professional, scientific and technical activities

(M), financial and insurance activities (K) and wholesale and retail trade; repair of motor vehicles and motorcycles (G).

Figure 3: *Share of firms in agriculture, forestry and fishing*



Notes: The figures plots the average share of firms in agriculture, forestry and fishing in each taxable income bin relative to the distance to the threshold. Bin width is 500 euros.

In order to investigate whether there is a differential response of firms operating in specific sectors we plot taxable income bins relative to the distance to the threshold against the share of firms in each Nace industry code. Changes in the average share of firms in a given industry at the threshold compared to the average share below and above the kink could reflect greater ability of firms in a given industry to locate at the tax kink. Although we consider all Nace industry codes as listed in table A5, we only find evidence of this for firms operating in agriculture, forestry and fishing industries. Figure 3 shows that whereas above and below the threshold the average share of firms operating in these industries is about 2.5%, the share of firms reporting taxable income exactly at the threshold is over 10%. When we restrict the sample to firms operating in agriculture, forestry and fishing in figure A4 in the appendix, we find an elasticity estimate of 0.47, which implies a 3.1% reduction in reported corporate taxable income. Overall, agriculture, forestry and fishing are not traditionally thought

of as human-capital intensive sectors. Therefore, the responsiveness of these firms at the threshold may be driven by industry specific abilities to manipulate corporate taxable income or by highly-skilled tax advisors.³¹

Overall, firms responsiveness to the corporate income tax kink seems to be increasing in firms' size, as measured in terms of employees and assets. This may be due to the fact that larger firms have access to and can pay good tax advisors.³² The largest response however is found for firms operating in agriculture, forestry and fishing, which in turn may be able to manipulate corporate taxable income more than firms in other industries.

5.4 Tax incentives and loss offset

Companies can make use of tax incentives or loss offset to reduce corporate taxable income in the fiscal year. We investigate this in table 7. The first row reports results obtained when selecting firms that carry-forward losses from the previous tax year and deduct the amount from corporate taxable income. Only a small share of firms locating around the threshold use loss carry-forward, and for these firms responsiveness at the kink is only slightly larger. As very few firms around the threshold use R&D incentives, we select firms that in any year over the time span in which they are observed used them. The resulting estimate is in line with the baseline. Next, we look at firms that in a given year use charity donations. In this case the elasticity drops to 0.03, well below the baseline. We also look at pension provisions, which are used by many of the firms that are locating near the kink. The elasticity estimate increases only slightly in

³¹We do not observe whether corporations use a tax advisor or accountant to compile their tax returns. Anecdotal evidence suggests that the large majority of firms in the Netherlands hire at least a tax accountant (alternatively firms could also hire tax lawyers and/or tax advisors). If this is the case then variation in tax aggressiveness will depend on the advisor/accountant skills.

³²In the Netherlands, medium and large companies are required to have their annual report audited by independent, qualified and registered Dutch auditors. In order to be categorized under a given company size at least, two of three criteria must be met in two consecutive financial years. The criteria are (i) assets ≥ 6 million euros, (ii) turnover ≥ 12 million euros and (iii) employees ≥ 50 . These firms have an incentive to select very good tax advisors that can provide legal advice on tax planning. Given the small number of firms in the distribution that qualify for audits at any point in time, we have to increase the bin width to 900 euros in order to be able to implement bunching methods. The baseline E-CIT when using a 900 euros bin-width over the full sample is of 0.12. When restricting the sample to firms that at any point in time have qualified for an audit we find an E-CIT of 0.26, supporting the argument above.

comparison to the baseline estimate.

Table 7: *Targeted tax incentives and loss offset*

	b	se	N	Share of baseline N	E-CIT	Δ taxable income, %
Baseline	1.90	0.195	3255	1.00	0.07	0.48
Loss carry-forward	2.13	0.472	69	0.02	0.08	0.53
R&D incentives	1.84	0.578	50	0.02	0.07	0.46
Charity donations	0.78	0.349	111	0.03	0.03	0.19
Pension provisions	2.18	0.218	1525	0.47	0.08	0.55
Investment deductions	2.16	0.198	1115	0.34	0.08	0.54
Small investment deductions	1.80	0.205	1031	0.32	0.07	0.45
– Maximum deduction	2.91	0.349	342	0.11	0.11	0.73
EEI deductions	7.25	0.712	117	0.04	0.28	1.81

Notes: The table is based on bunching analysis conducted as in figure 2 but restricting the sample to the use of targeted incentives and loss offset in a given year. Results are based on pooled data over 2009-2018 and on bin width of 500 euros. Due to the small number of observations, R&D incentives selects firms that at any point in time have used the deduction and use a bin-width of 900 euros.

The remaining rows report results for firms using investment deductions in a given year. A substantial number of firms around the threshold use investment deductions. However, responsiveness of firms at the threshold, as measured by the elasticity, is only slightly larger in comparison to the baseline. Next, we investigate responsiveness of firms using small investment schemes for fixed assets. Although many firms around the threshold use these deductions, the elasticity remains unchanged in comparison to the baseline. As explained above, these investment schemes are capped at a maximum amount. This results in a large frequency of firms at the maximum deductible amount, as shown in figure A5. This can reflect firms' timing investments so as to obtain the maximum refund. When selecting firms that in a given year claim the maximum deduction, the elasticity estimate at the corporate income tax threshold increases to 0.11.

Finally, we look at firms that in a given year use energy and environment deductions. Firms using EEI deductions represent only a small fraction of the initial bunching sample, yet they are 7 times more present at the kink than we would have expected had there not been a kink. The elasticity for firms using EEI deductions is as large as 0.28. As mentioned in section 2, EEI deductions are available for specific types of investments which can be industry specific. In

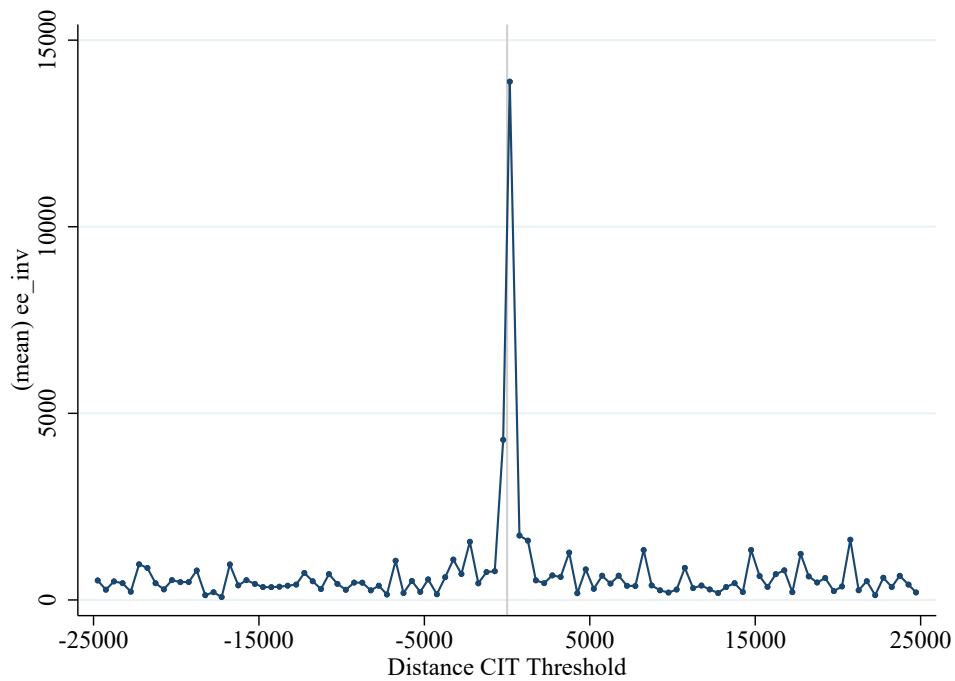
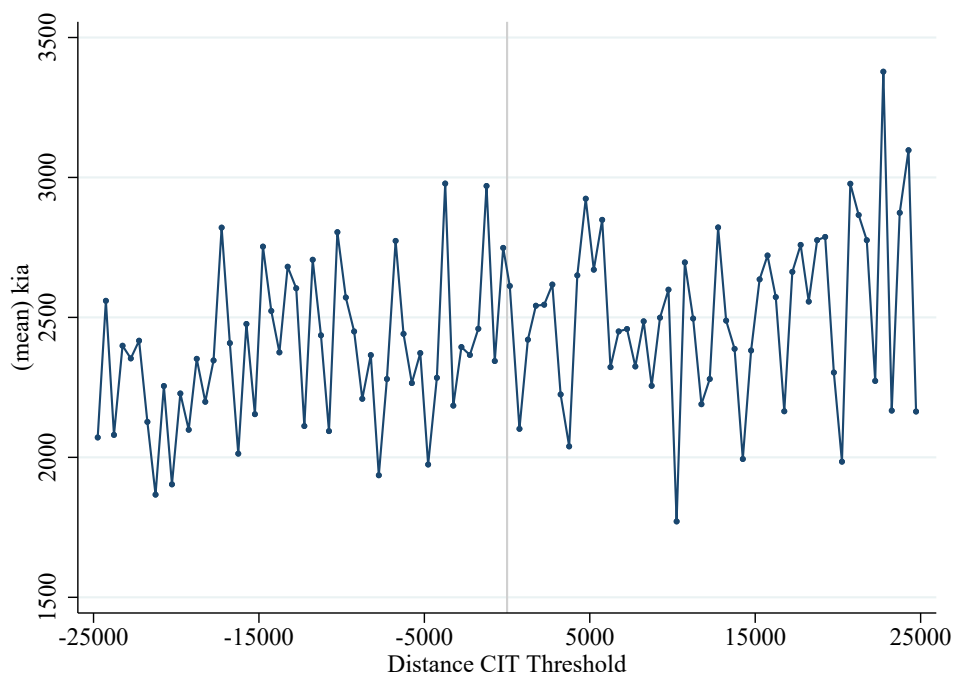
figure A7 we plot the share of firms operating in agriculture, forestry and fishing and that at any point in time have used EEI deductions for each taxable income bin. The figure shows that at the threshold approximately 10% of firms are in agriculture forestry and fishing and have used EEI deductions at some point in time. This is very similar to the result of figure 3, suggesting that most of the firms operating in these industries use EEI deductions. Restricting the sample to firms operating in agriculture, forestry and fishing and making use of investment deductions in a given year we find an elasticity of 0.55, which suggest that firms operating in these sectors may be able to access these investment deductions more easily than others.³³

5.4.1 Intensive and extensive margin responses

The results in table 7 suggest that EEI deductions are used at the extensive margin to locate near the kink. This is confirmed when looking at the large spike in the average number of times firms use EEI deductions for taxable income bins near the kink in figure A6 in the appendix. In order to check for intensive margins responses, we plot the mean investment deduction in each taxable income bin relative to the distance to the threshold in figure 4 for EEI and small investment deductions respectively. For EEI deductions, we find a large intensive margin response. Whereas above and below the threshold the average deduction is approximately zero, firms reporting taxable income at the 200,000 euros threshold deduct about 15,000 euros with energy and environment schemes. When looking at small investment deductions, however, we find that on average they lie between 2,000 and 3,000 euros but that the average deduction does not increase for firms locating at the corporate income tax threshold. These results hold – and are even more striking – when the figures are plotted excluding zero observations, as shown in figures A8 in the appendix.

Thus, we find evidence of an extensive and intensive margin response in the use of EEI deductions to bunch at the 200,000 euros kink. This is in contrast with Brockmeyer (2014), who did not find a response at the £300,000 kink in the UK corporate income tax schedule. We investigate intensive margin responses also

³³All investments are considered to obtain the result. This E-CIT estimate is based on a bin width of 900 euros due to observational needs. For comparison, using this bin-width the elasticity estimate on the baseline sample is 0.12.

Figure 4: *Mean investment deductions*(a) *EEI deductions*(b) *Small investment deductions*

Notes: The figures plot taxable income bins relative to the threshold against the mean EEI or small investment deductions over 2008-2018 in each taxable income bin (500 euros bin width). See figure A8 in the appendix for results excluding zero observations.

for pension provisions, charity donations and R&D incentives but we do not find any increase in average deductions for firms at the threshold.

5.4.2 Persistence

Next, we check whether firms use these deductions persistently. We restrict our sample to firms who have used EEI deductions at least once, at least two times or at least three times over the period we observe them. Results are reported in table 8 and show that the higher the number of years in which firms have used EEI deductions, the larger the response of firms at the threshold as measured by the elasticity estimate.³⁴ For firms using EEI deductions at least three times, the elasticity is as large as 0.49. This is associated with approximately a 3.2% reduction in corporate taxable income.

Table 8: *Persistence in the use of EEI deductions*

	b	se	N	Share of baseline N	E-CIT	Δ taxable income, %
Baseline sample	2.01	0.250	681	1.00	0.08	0.50
EEI deductions						
– Used at least once	6.24	0.476	467	0.14	0.24	1.56
– Used at least twice	8.96	0.742	299	0.09	0.35	2.24
– Used at least 3 times	10.52	0.885	113	0.03	0.49	3.16

Notes: The table is based on bunching analysis conducted as in figure 2 but restricting the sample to firms that have used EEI deductions repeatedly over 2008-2018. The bin width is of 500 euros except for firms using EEI deductions 3 times, for which it is increased to 600 euros in order to avoid holes in the distribution in the estimation. See main text for description.

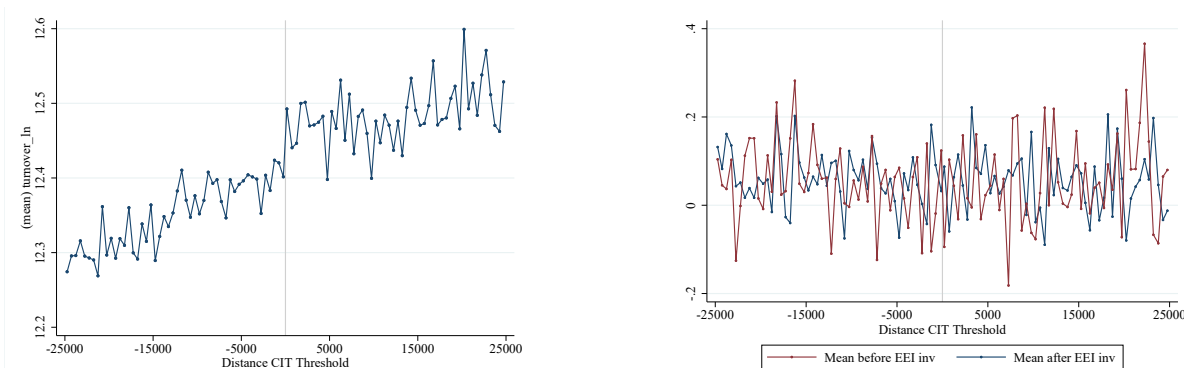
5.4.3 Discussion

Overall, the prevalence and persistence of EEI deductions for firms bunching at the kink is striking. As mentioned in the discussion in section 2, EEI deductions are for specific types of investments, and are subject to both automatic and random checks from the NEA. Thus, it seems unlikely (as very risky) that these

³⁴We do not find similar evidence when restricting the sample to firms using repeatedly small investment deductions or pension provisions. We do see a somewhat larger coefficient for the repeated use of the maximum deductible amount in the small investment scheme. See table A6 in the appendix.

investments could be phantom investments generated by fake receipts. Relabeling of other expenses seems also unlikely, given the specificity and requirements on the qualifying investments. Therefore the use of EEI deductions could correspond to real investments that are timed and planned in their amounts in order to bunch at the threshold.

Figure 5: *Turnover around the 200,000 euros threshold*



(a) *Mean $\ln(\text{turnover})$, all firms*

(b) *Mean $\ln(\text{turnover})$ growth, firms using EEI deductions*

Notes: (a) The figure plots taxable income bins relative to the threshold against the mean of $\ln(\text{turnover})$ for all firms. (b) The figure plots average turnover growth before and after the use of EEI deductions for firms that at any point in time have used the scheme. Bin width in both figures is 500 euros. See table A7 for results displaying all control variables.

If these are real investments, one question that arises is whether these are productive investments, i.e. whether using investments deductions results in positive externalities, such as firm growth. In figure 5a we plot average \ln turnover in each taxable income bin relative to the distance to the threshold for all firms. We do not see any significant change in turnover for firms at the threshold. In addition, in figure 5b we plot firm growth (measured as growth in the \ln of turnover) for companies that have at any point in time used EEI deductions. We plot growth separately for firms before the use of EEI deductions and after the use of EEI deductions. As shown by the figure, the patterns in firm growth cannot be distinguished from one another. Overall, this suggests that firms bunching at the threshold do not seem to be more productive nor to grow more after using investments. However, EEI deductions may not necessarily be designed to stimulate firm growth. That is, EEI may produce other positive externalities related to the greening of the economy and that we are not able to capture in our analysis.

5.5 Correlates in bunching

We established that certain characteristics and deductions indicate a greater responsiveness of firms at the corporate income tax threshold. In this section, we investigate the *joint* correlation of individual characteristics, firms characteristics and the use of deductions with the likelihood of reporting corporate taxable income near the 200,000 euros kink. Table 9 reports the results obtained when regressing a dummy indicating whether a firm is locating within [-1000,300] or [-300,300] euros of the kink on dummy variables of the characteristics and deductions discussed in the previous sections. We consider a range of plus and minus 10,000 or 5,000 euros of the kink.³⁵ For brevity only some of the most relevant controls are reported in the table and we report all variables in table A7 in the appendix.

Table 9 shows that using of energy and environment investment deductions in a given year is associated with a 3.5 to 6.3 percentage points increase in the likelihood of bunching at the corporate income tax threshold relative to the baseline bunching probability. In addition, firms that are using these deductions at least twice over time are also more likely to locate near the kink.³⁶ For firms operating in agriculture, forestry and fishing the likelihood of locating near the kink increases by 5.6 to 13.8 percentage points, depending on the specification.

Finally, there is a positive and significant correlation with the likelihood of bunching for firms that are more experienced (i.e. have been active for ten years or longer) and for firms that are large in terms of employees. In line with the bunching results of table 6, the larger the firm as measured in terms of employees, the higher the likelihood of locating near the corporate income tax kink.

³⁵The use of alternative ranges of 8,000 and 15,000 euros of the kink does not change substantially the patterns we find in our results. Table A7 in the appendix reports all the variables included as well as the results obtained when the dependent variable is equal to one if corporate taxable income is within 500 euros of the tax kink. Results are robust also to the inclusion of a full set of industry dummies. Controls included but not reported in the table in the main text are dummies for owners who locate within 500 euros of the reference wage, for women, 40-56 years old, with partner, main breadwinner, Dutch for two generations, for the use of pension provisions, R&D incentives, small investment deductions, for whether the firm reported the maximum amount of small investment deductions at least once or at least twice; for whether the firm has had a loss in the previous year.

³⁶The correlation with other deductions is mostly insignificant. There is however a negative and significant correlation with reporting small investment deductions and using charity donations. See table A7 in the appendix.

Table 9: *Characteristics and use of deductions of bunching taxpayers*

	Range ± 10000		Range ± 5000	
	[-1000,300]	[± 300]	[-1000,300]	[± 300]
EEl deduction	0.046*** (0.013)	0.035*** (0.008)	0.063*** (0.023)	0.054*** (0.015)
EEl deduction 2 years	0.048*** (0.011)	0.035*** (0.007)	0.072*** (0.019)	0.056*** (0.013)
Agriculture forestry and fishing	0.090*** (0.013)	0.056*** (0.009)	0.138*** (0.023)	0.088*** (0.016)
Consolidated	0.005 (0.006)	0.004 (0.005)	0.006 (0.011)	0.005 (0.008)
Firm active ≥ 10 years	0.018*** (0.007)	0.011** (0.005)	0.031*** (0.011)	0.018** (0.009)
Assets 1M-3M	-0.006 (0.007)	-0.007 (0.005)	-0.008 (0.012)	-0.011 (0.010)
Assets 3M-5M	-0.009 (0.010)	-0.005 (0.007)	-0.006 (0.017)	-0.004 (0.013)
Assets ≥ 5 M	0.001 (0.010)	0.011 (0.007)	0.004 (0.017)	0.022* (0.013)
10-49 employees	0.017** (0.007)	0.010* (0.006)	0.026** (0.013)	0.015 (0.010)
≥ 50 employees	0.049*** (0.016)	0.032*** (0.012)	0.079*** (0.029)	0.053** (0.022)
[-1000, 300] PIT threshold	0.017 (0.011)	0.010 (0.008)	0.016 (0.019)	0.010 (0.014)
[-1000, 300] PIT threshold 3 years	0.023 (0.015)	0.014 (0.013)	0.029 (0.026)	0.021 (0.022)
Observations	13,131	13,131	7,066	7,066
Year dummies	yes	yes	yes	yes
Clustering at taxpayer level	yes	yes	yes	yes
Additional control variables	yes	yes	yes	yes

Notes: The table reports probit results obtained when regressing an indicator for whether corporate taxable income is within [-1000,300] or [-300,300] euros of the 200,000 euros kink on dummies for individual characteristics, firms characteristics and the use of deductions. Errors are clustered at the taxpayer level. The sample is restricted to observations within a 5,000 or 10,000 euros of the kink. Additional control variables are included but not reported for brevity. See table A7 for all coefficients.

Taken together, bunching at the 200,000 euros threshold is more likely for firms that are more experienced and large in terms employees, for firms operating in agriculture, forestry and fishing sectors and for firms making (repeated) use of energy and environment investment deductions.

5.6 Persistence

Finally, we study the role of characteristics and deductions for firms that are persistently locating near the kink. We conduct the same analysis as in the previous section but replace the dependent variable with an indicator that equals one if the taxpayer is located within a [-1000,300] or [-300,300] euros range of the kink for at least two years over the sample period. Table 10 reports the results obtained for a selection of variables whereas table A8 in the appendix shows the results for all variables.³⁷

The role of characteristics changes to some extent when we consider firms that are persistent at the kink. Specifically, the role of firms operating in agriculture, forestry and fishing and using investment deductions repeatedly is still relevant yet reduced in size in comparison to table 9. In contrast to table 9, firms that are part of a group and report corporate taxable income at the consolidated level significantly correlate with the likelihood of bunching persistently at the kink. In addition, it is now firms that have large in terms of assets who are likely to bunch persistently at the kink, whereas the coefficient for firms with several employees now becomes insignificant in most specifications. We find that the likelihood of bunching persistently at the kink is increasing in firms' size, as measured by firms' assets. Finally, the last two rows of table 10 show that director-owners who bunch in a given year and for repeatedly (at least three times) in the personal income tax schedule are also more likely to bunch persistently at the corporate tax kink. This suggests that some firm-owners optimize repeatedly along multiple tax schedules. This may be driven either by the director-owner skills or by her ability to hire good tax accountants.

Taken together, this shows that firms persistently locating near tax kinks are making repeated use of investment deductions and operate in industries that

³⁷Table A8 also reports results obtained when defining the independent variable to be equal to one if within a range of 500 euros of the threshold. Results are robust also when the variable equals one if within a given range of the kink in two consecutive years.

Table 10: *Characteristics and use of deductions of persistent bunching taxpayers*

	Range 10000		Range 5000	
	[-1000,300]	[-300,300]	[-1000,300]	[-300,300]
EEl deduction	0.013*** (0.005)	0.008** (0.004)	0.012 (0.007)	0.012* (0.006)
EEl deduction 2 year	0.028*** (0.006)	0.019*** (0.005)	0.034*** (0.009)	0.032*** (0.008)
Agriculture forestry and fishing	0.035*** (0.006)	0.023*** (0.005)	0.045*** (0.009)	0.034*** (0.008)
Consolidated	0.008* (0.005)	0.009** (0.004)	0.018** (0.007)	0.017** (0.007)
Firm active ≥ 10 years	0.003 (0.005)	0.001 (0.004)	0.001 (0.007)	-0.001 (0.007)
Assets 1M-3M	0.016*** (0.006)	0.009* (0.005)	0.016* (0.009)	0.016* (0.008)
Assets 3M-5M	0.021*** (0.007)	0.016*** (0.006)	0.032*** (0.011)	0.029*** (0.010)
Assets ≥ 5 M	0.021*** (0.007)	0.017*** (0.006)	0.033*** (0.011)	0.029*** (0.010)
10-49 employees	0.003 (0.005)	0.002 (0.004)	0.002 (0.008)	0.002 (0.007)
≥ 50 employees	0.016* (0.010)	0.012 (0.007)	0.023 (0.015)	0.020 (0.013)
[-1000, 300] PIT threshold	0.013** (0.005)	0.012*** (0.004)	0.024*** (0.007)	0.021*** (0.007)
[-1000, 300] PIT threshold 3 years	0.023** (0.010)	0.017** (0.008)	0.025 (0.016)	0.028** (0.013)
Observations	13,131	13,131	7,066	7,066
Year dummies	yes	yes	yes	yes
Clustering at taxpayer level	yes	yes	yes	yes
Additional control variables	yes	yes	yes	yes

Notes: The table reports probit results obtained when regressing an indicator for firms that report corporate taxable income within [-1000,300] or [-300,300] euros of the 200,000 euros kink in at least two years on dummies for individual characteristics, firms characteristics and the use of deductions. Errors are clustered at the taxpayer level. The sample is restricted to observations within a 5,000 or 10,000 euros of the kink. Additional control variables are included but not reported for brevity. See table A8 for all coefficients.

can access these deductions easily. In addition, they are large, consolidated and owned by director-owners who repeatedly locate near personal taxable income thresholds.

6 Conclusions

We investigate bunching of closely held corporations in the Netherlands over 2009-2018 at the 200,000 euros corporate tax kink. We find an overall elasticity of corporate taxable income of 0.07, which implies that for the 5 percentage points difference in tax rates at the kink, reported taxable income is reduced by 0.5 percent.

We find that firms' responses to tax incentives are heterogeneous. The largest elasticity is found for firms operating in agriculture, forestry and fishing (E-CIT=0.45), for firms using investment deductions for energy and environmental investments (E-CIT=0.28) and for firms that use these deductions three times or more over the sample period (E-CIT=0.49). Large and more experienced firms are also more responsive to the tax system. Although the paper focuses on the 200,000 euros tax kink, in the appendix we document similar patterns for a subset of firms also at the zero threshold.

Overall, the elasticity estimate increases with firms' size and with the number of times firms use EEI deductions. We show that energy and environment investment deductions are used both at the extensive and at the intensive margin by firms to bunch (persistently) at the corporate income tax kink. However, there seems to be no evidence that the use of EEI deductions is associated with higher firm growth. This may reflect the fact that firms are using deductions inefficiently in order to bunch at the kink. Alternatively, it could simply reflect the fact that EEI deductions are not in place to foster firms' growth but rather to create societal positive externalities in terms of a greener economy.

Finally, we document persistence of firms bunching at the kink. These are large and consolidated firms which use repeatedly energy and environment investment deductions and operate in agriculture, fishing and forestry industries. In addition, they are owned by entrepreneurs who bunch (persistently) near the personal taxable income threshold, suggesting that some director-owners plan their taxes

aggressively along multiple tax schedules.

Our main contribution to the literature is as follows. We are the first to provide evidence that not only firms are persistent at corporate income tax kinks but that they use specific types of investment deductions to locate repeatedly at the threshold. In addition, we provide evidence that some firm-owners optimize along several margins, both at the corporate and at the personal income tax level. Finally, we are the first to investigate the role of firms characteristics, individuals characteristics and deductions in determining the E-CIT systematically. This enables us to show which are the most relevant adjustment channels underlying the E-CIT and the main predictors of responsiveness.

All in all, our results have at least two implications. First, the fact that firms use energy and environment investment deductions in order to locate at the kink suggests that the type and design of deductions available in the tax system can exacerbate distortions. In this sense, bunching analyses can be used by tax administrations to identify which features of the tax system generate large behavioral responses. Second, our results point out to the presence of substantial information frictions. In particular, information frictions can reconcile the findings of a small baseline elasticity together with the larger response of firms with certain characteristics and persistence of firms and individuals at kink points.

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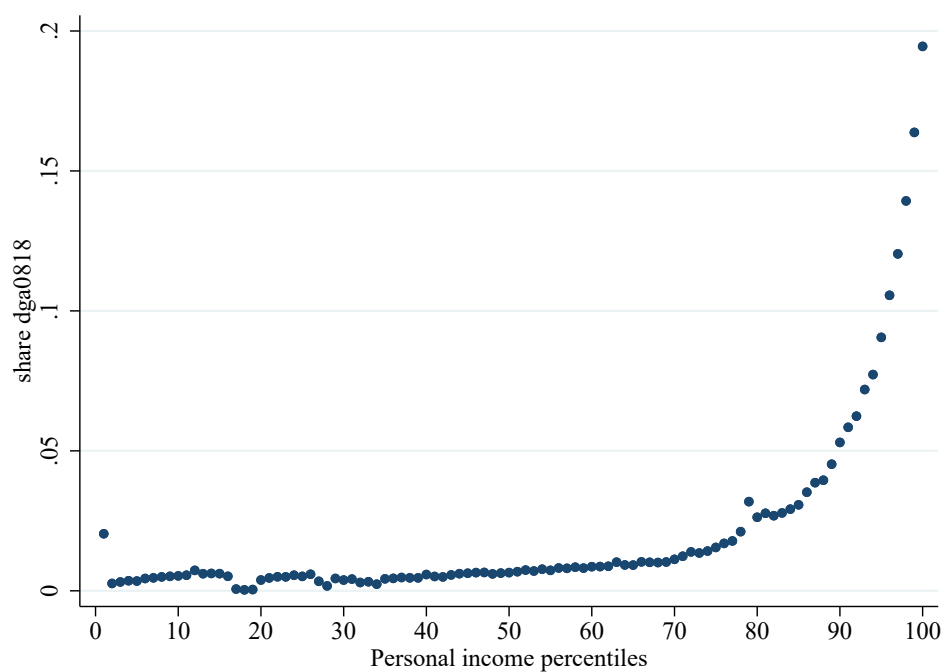
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Appendix

Figure A1: *Share of director-owners by personal income percentiles*



Source: Own calculations. *Notes:* The figure plots the share of individuals in the Dutch resident population who at any point in time between 2008-2018 have been directors-major shareholders (i.e. owning $\geq 5\%$ of shares) of a corporation by 2011 personal income percentiles.

Table A1: *Dutch personal and corporate tax system, 2007-2018*

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Corporate income tax												
<i>Brackets (in euros)</i>	25,000	275,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Medium bracket	60,000											
<i>Tax rates</i>												
1st bracket	20	20	20	20	20	20	20	20	20	20	20	20
Medium bracket	23.5											
2nd bracket	25.5	25.5	25.5	25.5	25	25	25	25	25	25	25	25
Personal income tax												
Box 1: Labour, rental income and benefits												
<i>Brackets (in euros)</i>												
1st bracket	17,319	17,579	17,878	18,218	18,628	18,945	19,645	19,645	19,822	19,922	19,982	20,142
2nd bracket	31,122	31,589	32,127	32,738	33,436	33,863	33,363	33,363	33,589	33,715	33,791	33,994
3rd bracket	53,064	53,860	54,776	54,367	55,694	56,491	55,991	56,531	57,585	66,421	67,072	68,507
<i>Tax rates</i>												
1st bracket*	33.65	33.6	33.5	33.45	33	33.10	37	36.25	36.5	36.55	36.55	36.55
2nd bracket*	41.4	41.85	42	41.95	41.95	41.95	42	42	42	40.4	40.8	40.85
3rd bracket	42	42	42	42	42	42	42	42	42	40.4	40.8	40.85
4th bracket	52	52	52	52	52	52	52	52	52	52	52	51.95
DGA reference salary (in euros)	40,000	40,000	40,000	41,000	41,000	42,000	42,000	44,000	44,000	44,000	45,000	45,000
Box 2: Income from substantial shareholding												
Bracket (in euros)	250,000							250,000				
Low rate	22							22				
Standard rate	25	25	25	25	25	25	25	25	25	25	25	25
Box 3: Wealth												
Exemption (in euros)**	20,014	20,315	20,661	20,661	20,785	21,139	21,139	21,139	21,330	24,437	25,000	30,000
<i>Brackets (in euros)</i>												
1st bracket											75,000	70,800
2nd bracket											975,000	978,000
<i>Presumed rate of return</i>												
1st bracket	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.02
2nd bracket											0.05	0.04
3rd bracket											0.05	0.05
<i>Tax rate</i>												
1st bracket	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
<i>Effective tax rate</i>												
1st bracket	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.9	0.6
2nd bracket											1.4	1.3
3rd bracket											1.6	1.6

Notes: The table describes the Dutch corporate and personal income tax schedule over 2007-2018. * The tax rate includes social security contributions.
 ** For a single individual (for fiscal partners the allowance doubles).

Table A2: *Investment deductions*

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
KIA deductions											
<i>Brackets (in euros)</i>											
1st bracket	2,100	2,200	2,200	2,200	2,300	2,300	2,300	2,300	2,300	2,300	2,300
2nd bracket	36,000	37,000	54,000	54,324	55,248	55,248	55,248	55,745	56,024	56,192	56,642
3rd bracket	70,000	71,000	100,000	100,600	102,311	102,311	102,311	103,231	103,748	104,059	104,891
4th bracket	102,000	104,000	300,000	301,800	306,931	306,931	306,931	309,693	311,242	312,176	314,673
5th bracket	135,000	138,000									
6th bracket	169,000	172,000									
7th bracket	201,000	205,000									
8th bracket	236,000	240,000									
<i>Allowance</i>											
1st bracket	0	0	0	0	0	0	0	0	0	0	0
2nd bracket	0.25	0.25	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
3rd bracket	0.21	0.21	15,120	15,211	15,470	15,470	15,470	15,609	15,687	15,734	15,863
4th bracket	0.12	0.12	15,120	15,211	15,470	15,470	15,470	15,609	15,687	15,734	15,863
			-(0.0756*X)	-(0.0756*X)	-(0.0756*X)	-(0.0756*X)	-(0.0756*X)	-(0.0756*X)	-(0.0756*X)	-(0.0756*X)	-(0.0756*X)
5th bracket	0.08	0.08	0	0	0	0	0	0	0	0	0
6th bracket	0.05	0.05									
7th bracket	0.02	0.02									
8th bracket	0.01	0.01									
9th bracket	0	0									
MIA deductions											
Minimum	2100	2200	2200	2200	2300	2,300	2,500	2,500	2,500	2,500	2,500
Maximum	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000	25,000,000
Asset category I	0.400	0.400	0.400	0.360	0.360	0.360	0.360	0.360	0.36	0.36	0.36
Asset category II	0.300	0.300	0.300	0.270	0.270	0.270	0.270	0.270	0.27	0.27	0.27
Asset category III	0.150	0.150	0.150	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135
EIA deductions											
Minimum	2,100	2,200	2,200	2,200	2,300	2,300	2,500	2,500	2,500	2,500	2,500
Maximum	111,000,000	113,000,000	115,000,000	116,000,000	118,000,000	118,000,000	118,000,000	119,000,000	120,000,000	120,000,000	121,000,000
Allowance	0.44	0.44	0.44	0.415	0.415	0.415	0.415	0.415	0.58	0.555	0.545

Notes: The table describes the schedule for small scale investment schemes (KIA) and energy (EIA) and environment (MIA) investment schemes. For KIA, each year there is a minimum amount to be invested below which the deduction is not granted. The allowance is given on total investments, where only investments or more than 450 euros are totaled to determine the allowance. From 2010 onward, the deduction decreases for amounts between the third and fourth bracket and is zero above the fourth bracket.

Table A3: *Sample selection*

Sample selection	Share of initial sample
All owners, all corporations	1
All owners, single corporation	0.960
Max. 2 owners, all corporations	0.972
Max. 2 owners, single corporation	0.935
Single owner, all corporations	0.720
Single owner, single corporation	0.693

Notes: The table shows what are the shares of the initial sample implied by different sample selections (based on firm-year observations). The initial sample includes approximately 2.6 million of observations.

Table A4: *Robustness of baseline estimate*

	b	se	E-CIT
Single owner, single corporation	1.90	0.195	0.07
Bin width 200	3.90	0.316	0.06
Bin width 300	3.12	0.279	0.07
Bin width 600	1.89	0.173	0.09
Polynomial order 6	1.92	0.198	0.07
Polynomial order 5	2.01	0.192	0.08

Notes: The table shows results obtained with different bin widths and polynomial orders and how they compare to the baseline estimate reported at the top of the table.

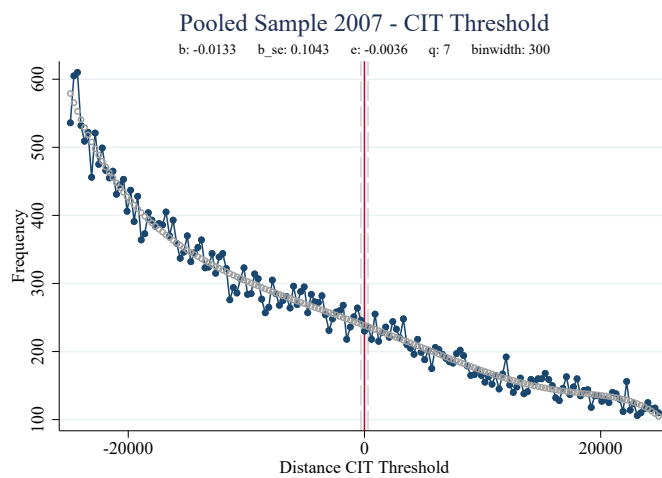
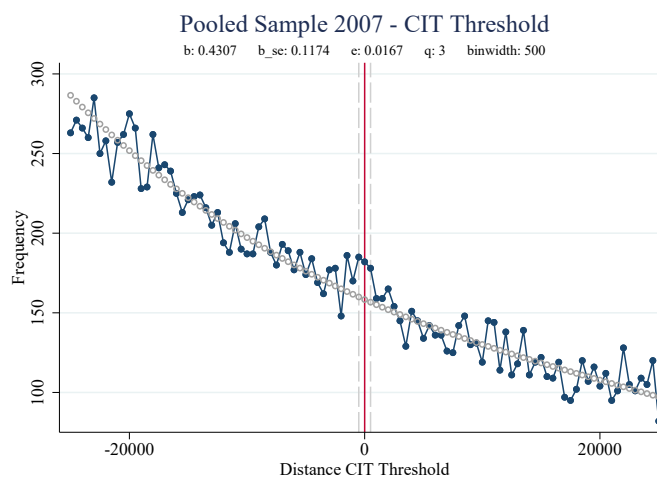
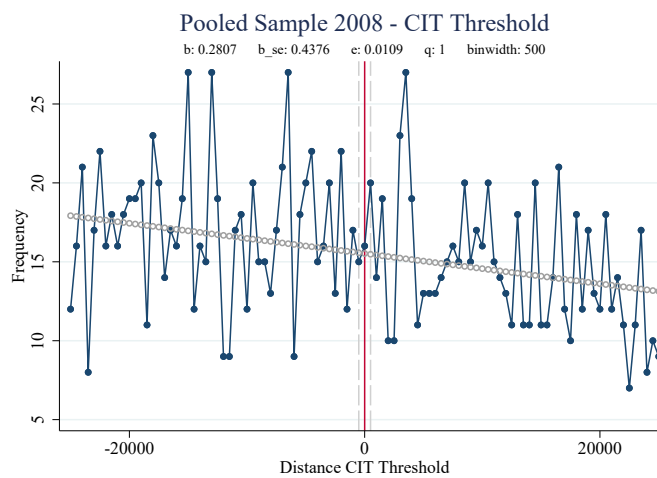
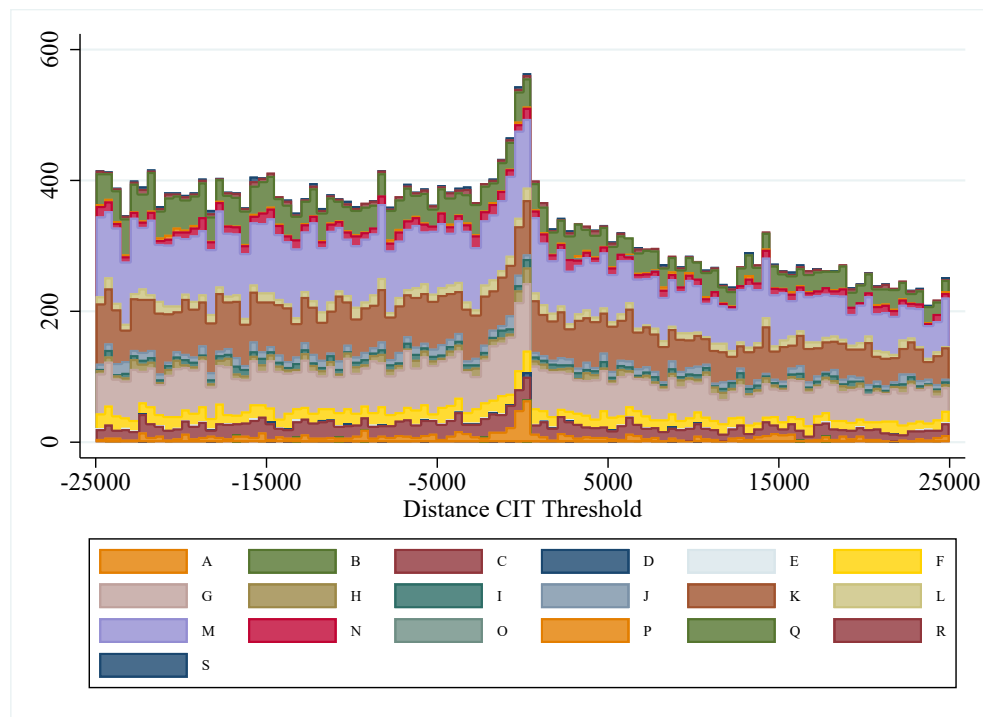
Figure A2: *Bunching in 2007 and 2008*(a) *25,000 euros threshold in 2007*(b) *60,000 euros threshold in 2007*(c) *275,000 euros threshold in 2008*

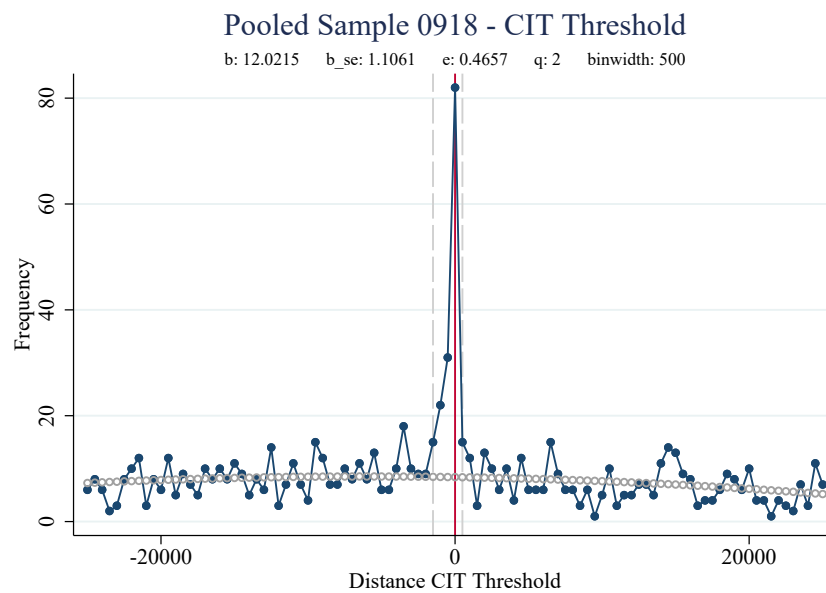
Figure A3: *Frequency of firms by Nace industry code at the 200,000 euros threshold*



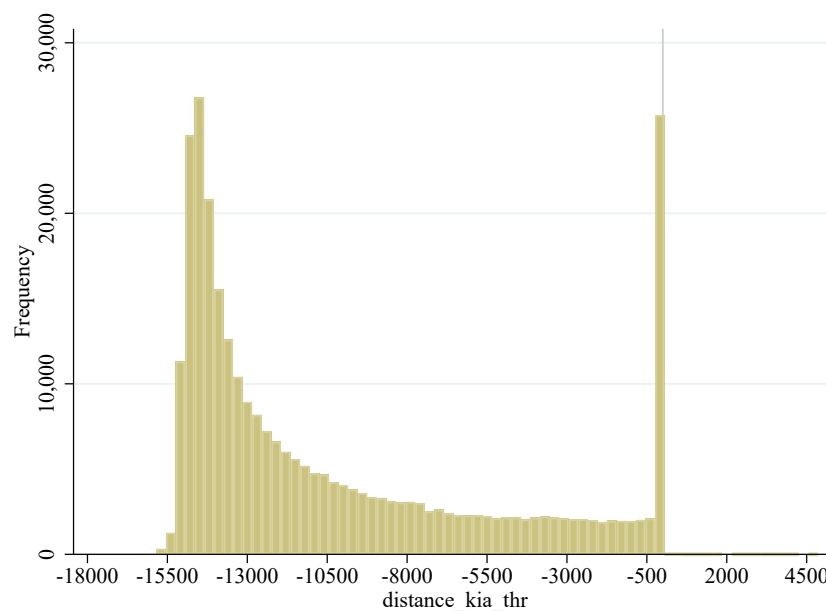
Source: Own calculations. *Notes:* The figures plots the frequency of firms in each taxable income bin by Nace industry code. Sample is pooled over 2009-2018. Bin width is 500 euros.

Table A5: *Nace industry codes and definitions*

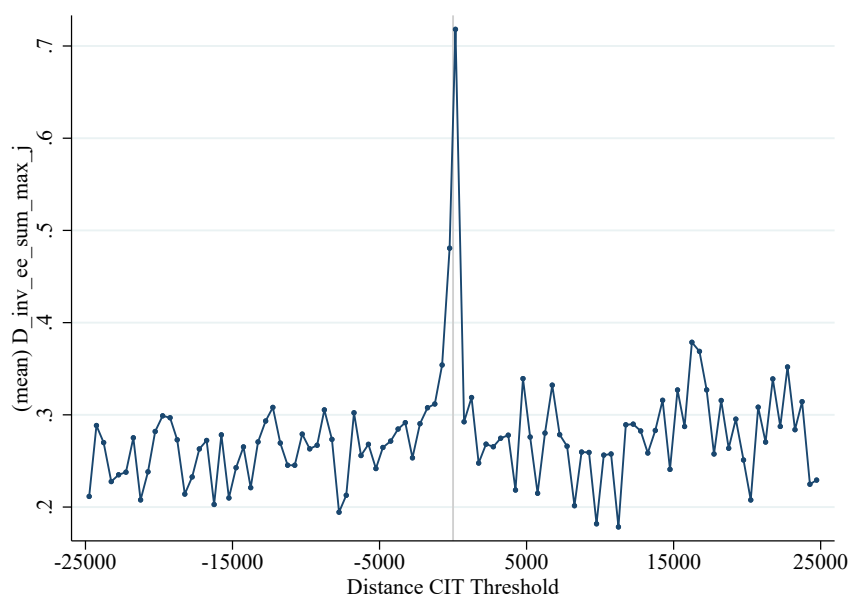
Nace code	Definition
A	Agriculture, Forestry and Fishing
B	Mining and Quarrying
C	Manufacturing
D	Electricity, Gas, Steam and Air Conditioning Supply
E	Water Supply; Sewerage, Waste Management and Remediation Activities
F	Construction
G	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
H	Transportation and Storage
I	Accommodation and Food Service Activities
J	Information and Communication
K	Financial and Insurance Activities
L	Real Estate Activities
M	Professional, Scientific and Technical Activities
N	Administrative and Support Service Activities
O	Public Administration and Defence; Compulsory Social Security
P	Education
Q	Human Health and Social Work Activities
R	Arts, Entertainment and Recreation
S	Other Service Activities

Figure A4: *Firms operating in agriculture, forestry and fishing*

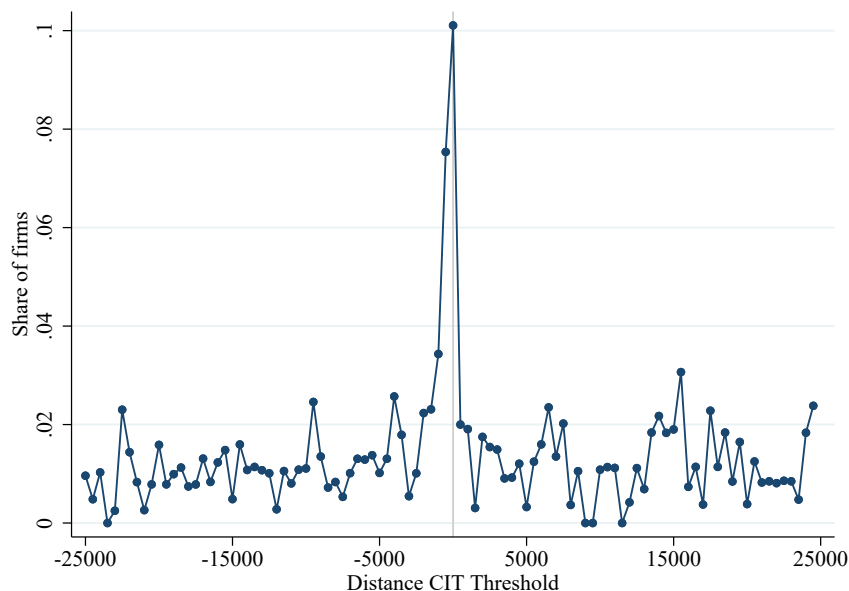
Source: Own calculations. *Notes:* Bunching analysis of firms in Nace industry A over 2009-2018.

Figure A5: *Small investment deductions, 2010-2018*

Source: Own calculations. *Notes:* The figure plots the frequency of small investment deductions for fixed assets over 2010-2018 relative to the distance to the maximum deduction. Bin width is 300 euros.

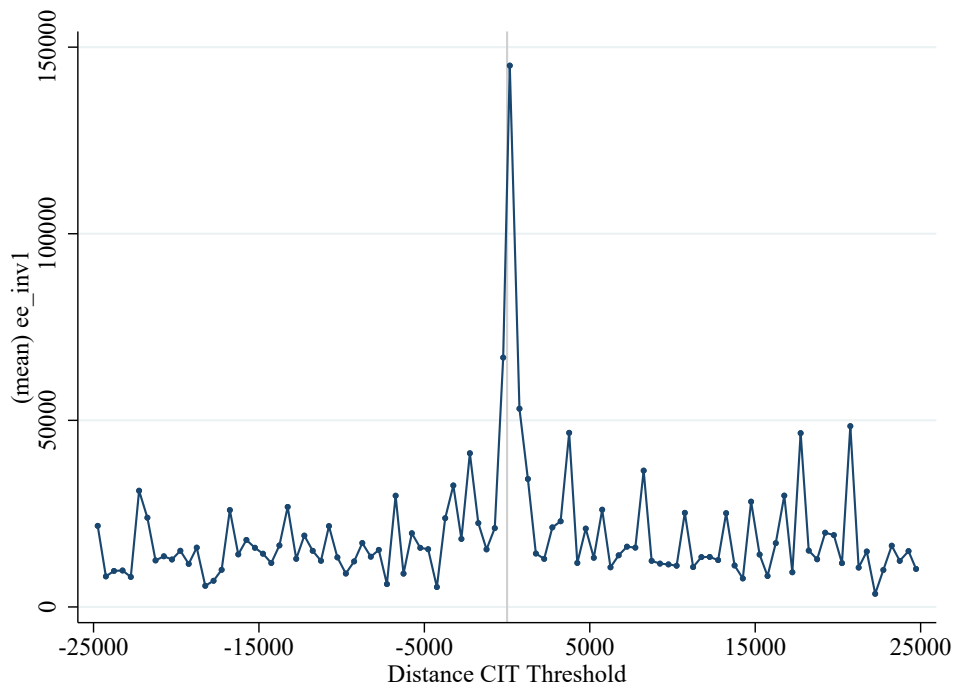
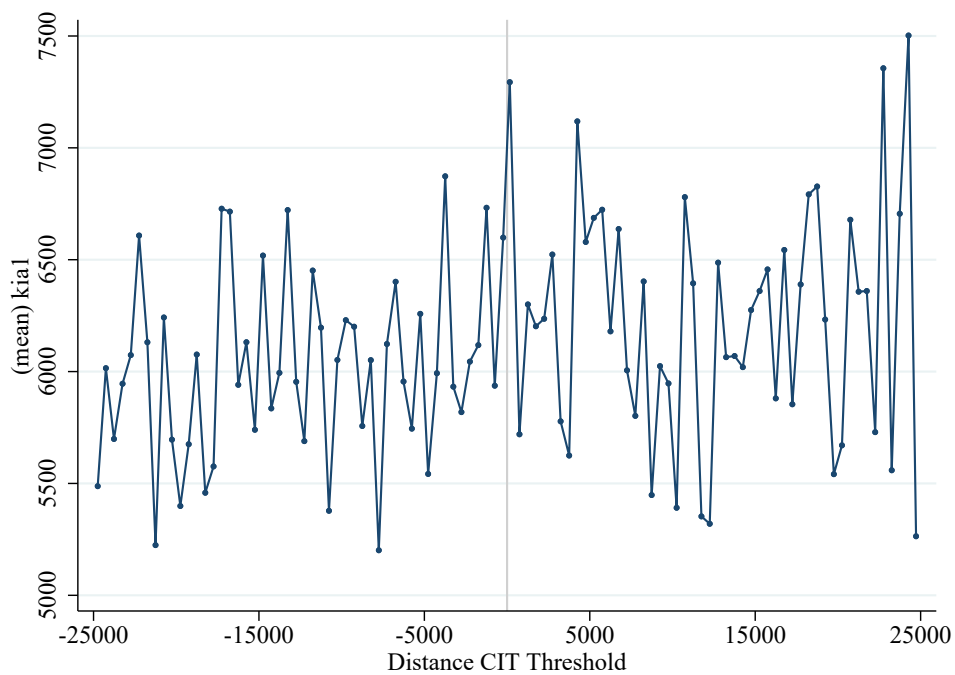
Figure A6: *Average use of EEI deductions*

Source: Own calculations. *Notes:* The figure plots the average number of times per firm that EEI deductions have been used in each taxable income bin. The bin width is 500 euros.

Figure A7: *Share of firms operating in agriculture, forestry and fishing that have used EEI deductions*

Source: Own calculations. *Notes:* The figure plots the share of firms in Nace industry A which at any point in time have used EEI deductions. Data is pooled over 2009-2018. The bin width is 500 euros.

Figure A8: Mean non-zero investment deductions

(a) *EEI deductions*(b) *Small investment deductions*

Source: Own calculations. *Notes:* The figures plot taxable income bins relative to the threshold against the mean non-zero EEI or small investment deduction over 2009-2018 in each taxable income bin (width of 500 euros).

Table A6: *Persistent use of deductions*

	<i>b</i>	<i>se</i>	N	Share of baseline N	E-CIT	Δ taxable income, %
Baseline	1.90	0.195	3255	1.00	0.07	0.48
Small investment deductions						
– Used at least once	2.15	0.239	440	0.14	0.08	0.54
– Used at least twice	2.09	0.210	370	0.11	0.08	0.52
– Used at least 3 times	2.31	0.245	324	0.10	0.09	0.58
Max. small investment deduction						
– Used at least once	3.19	0.332	516	0.16	0.12	0.80
– Used at least twice	3.66	0.508	196	0.06	0.14	0.92
– Used at least 3 times	2.99	0.619	51	0.02	0.12	0.75
Pension provisions						
– Used at least once	2.03	0.210	417	0.13	0.08	0.51
– Used at least twice	2.05	0.210	412	0.13	0.08	0.51
– Used at least 3 times	2.08	0.212	399	0.12	0.08	0.52

Notes: Results obtained by applying bunching techniques as in figure 2 over 2009-2018. The bin-width is 500 euros.

Table A7: *Characteristics and use of deductions of bunching taxpayers*

	Range 10000			Range 5000		
	[-1000,300]	[-300,300]	[-500,500]	[-1000,300]	[-300,300]	[-500,500]
EEl deduction	0.046*** (0.013)	0.035*** (0.008)	0.042*** (0.011)	0.063*** (0.023)	0.054*** (0.015)	0.062*** (0.019)
EEl deduction 2 year	0.048*** (0.011)	0.035*** (0.007)	0.041*** (0.009)	0.072*** (0.019)	0.056*** (0.013)	0.061*** (0.016)
Agriculture forestry and fishing	0.090*** (0.013)	0.056*** (0.009)	0.077*** (0.011)	0.138*** (0.023)	0.088*** (0.016)	0.120*** (0.020)
Consolidated	0.005 (0.006)	0.004 (0.005)	0.006 (0.005)	0.006 (0.011)	0.005 (0.008)	0.008 (0.010)
Firm active more10 years	0.018*** (0.007)	0.011** (0.005)	0.015*** (0.006)	0.031*** (0.011)	0.018** (0.009)	0.025** (0.010)
Assets 1M-3M	-0.006 (0.007)	-0.007 (0.005)	-0.008 (0.006)	-0.008 (0.012)	-0.011 (0.010)	-0.011 (0.011)
Assets 3M-5M	-0.009 (0.010)	-0.005 (0.007)	-0.008 (0.009)	-0.006 (0.017)	-0.004 (0.013)	-0.006 (0.016)
Assets ≥5M	0.001 (0.010)	0.011 (0.007)	0.007 (0.009)	0.004 (0.017)	0.022* (0.013)	0.014 (0.015)
10-49 employees	0.017** (0.007)	0.010* (0.006)	0.015** (0.007)	0.026** (0.013)	0.015 (0.010)	0.023* (0.012)
≥50 employees	0.049*** (0.016)	0.032*** (0.012)	0.042*** (0.015)	0.079*** (0.029)	0.053** (0.022)	0.068*** (0.026)
Loss t-1	0.007 (0.012)	0.019** (0.008)	0.006 (0.005)	0.020 (0.021)	0.041*** (0.014)	0.034* (0.018)
Small investment deductions	-0.017*** (0.006)	-0.016*** (0.005)	-0.021*** (0.006)	-0.023** (0.011)	-0.025*** (0.008)	-0.031*** (0.010)
Pension provisions	0.009 (0.007)	0.000 (0.005)	0.001 (0.006)	0.016 (0.012)	0.000 (0.009)	0.002 (0.011)
Charity donations	-0.025*** (0.010)	-0.022*** (0.008)	-0.026*** (0.009)	-0.050*** (0.017)	-0.042*** (0.013)	-0.051*** (0.016)
R&D deductions	0.008 (0.026)	0.010 (0.018)	0.012 (0.023)	0.008 (0.045)	0.016 (0.031)	0.016 (0.040)
Max. small investment deduction	0.004 (0.009)	0.004 (0.007)	0.009 (0.008)	0.007 (0.015)	0.007 (0.012)	0.017 (0.014)
Max. small investment deduction 2 years	0.002 (0.013)	0.003 (0.010)	0.005 (0.011)	-0.004 (0.022)	0.003 (0.017)	0.005 (0.020)
40-56 year old	0.004 (0.006)	0.005 (0.004)	0.006 (0.005)	0.001 (0.010)	0.005 (0.007)	0.007 (0.009)
Woman	0.022** (0.010)	0.015** (0.008)	0.013 (0.009)	0.031* (0.017)	0.022 (0.013)	0.015 (0.016)
With partner	0.017** (0.008)	0.008 (0.006)	0.007 (0.007)	0.033** (0.014)	0.015 (0.012)	0.014 (0.013)
Main breadwinner	0.007 (0.010)	0.010 (0.008)	0.006 (0.009)	0.012 (0.017)	0.017 (0.014)	0.012 (0.016)
Dutch (1st/2nd gen.)	-0.002 (0.010)	0.002 (0.008)	-0.000 (0.009)	-0.004 (0.017)	0.003 (0.014)	-0.001 (0.016)
[-500, 500] reference wage	-0.000 (0.015)	-0.007 (0.012)	-0.006 (0.014)	-0.019 (0.026)	-0.022 (0.021)	-0.026 (0.025)
[-1000, 300] PIT threshold	0.017 (0.011)	0.010 (0.008)	0.004 (0.010)	0.016 (0.019)	0.010 (0.014)	-0.004 (0.017)
[-1000, 300] PIT threshold 3 years	0.023 (0.015)	0.014 (0.013)	0.008 (0.015)	0.029 (0.026)	0.021 (0.022)	0.005 (0.025)
Observations	13,131	13,131	13,131	7,066	7,066	7,066
Year dummies	yes	yes	yes	yes	yes	yes
Clustering at taxpayer level	yes	yes	no	yes	yes	no

Notes: The table reports probit results obtained when regressing an indicator for whether corporate taxable income is within [-1000,300], [-300,300] or [-500,500] euros of the 200,000 euros kink on dummies for individual characteristics, firms characteristics and the use of deductions. Errors are clustered at the taxpayer level. The sample is restricted to observations within a 5,000 or 10,000 euros of the kink.

Table A8: *Characteristics and use of deductions of persistent bunching taxpayers*

	Range 10000			Range 5000		
	[-1000,300]	[-300,300]	[-500,500]	[-1000,300]	[-300,300]	[-500,500]
EEI deduction	0.013*** (0.005)	0.008** (0.004)	0.009** (0.004)	0.012 (0.007)	0.012* (0.006)	0.012 (0.007)
EEI deduction 2 year	0.028*** (0.006)	0.019*** (0.005)	0.021*** (0.005)	0.034*** (0.009)	0.032*** (0.008)	0.034*** (0.009)
Agriculture forestry and fishing	0.035*** (0.006)	0.023*** (0.005)	0.030*** (0.006)	0.045*** (0.009)	0.034*** (0.008)	0.045*** (0.009)
Consolidated	0.008* (0.005)	0.009** (0.004)	0.009** (0.004)	0.018** (0.007)	0.017** (0.007)	0.018** (0.007)
Firm active ≥ 10 years	0.003 (0.005)	0.001 (0.004)	0.002 (0.005)	0.001 (0.007)	-0.001 (0.007)	0.001 (0.007)
Assets 1M-3M	0.016*** (0.006)	0.009* (0.005)	0.010* (0.005)	0.016* (0.009)	0.016* (0.008)	0.016* (0.009)
Assets 3M-5M	0.021*** (0.007)	0.016*** (0.006)	0.019*** (0.006)	0.032*** (0.011)	0.029*** (0.010)	0.032*** (0.011)
Assets ≥ 5 M	0.021*** (0.007)	0.017*** (0.006)	0.020*** (0.006)	0.033*** (0.011)	0.029*** (0.010)	0.033*** (0.011)
10-49 employees	0.003 (0.005)	0.002 (0.004)	0.002 (0.005)	0.002 (0.008)	0.002 (0.007)	0.002 (0.008)
≥ 50 employees	0.016* (0.010)	0.012 (0.007)	0.015* (0.009)	0.023 (0.015)	0.020 (0.013)	0.023 (0.015)
Loss t-1	-0.013** (0.007)	-0.006 (0.005)	-0.013** (0.007)	-0.019* (0.011)	-0.009 (0.009)	-0.019* (0.011)
Small investment deductions	-0.020*** (0.004)	-0.013*** (0.004)	-0.016*** (0.004)	-0.025*** (0.007)	-0.021*** (0.006)	-0.025*** (0.007)
Pension provisions	-0.002 (0.005)	-0.003 (0.004)	-0.001 (0.005)	-0.003 (0.008)	-0.005 (0.007)	-0.003 (0.008)
Charity donations	-0.021*** (0.008)	-0.010 (0.006)	-0.013* (0.007)	-0.026** (0.012)	-0.022** (0.011)	-0.026** (0.012)
R&D deductions	-0.003 (0.011)	0.004 (0.008)	0.001 (0.009)	-0.007 (0.017)	-0.000 (0.014)	-0.007 (0.017)
Max. small investment deduction	0.003 (0.006)	0.004 (0.005)	0.005 (0.006)	0.012 (0.009)	0.009 (0.009)	0.012 (0.009)
Max. small investment deduction 2 years	0.013 (0.009)	0.004 (0.007)	0.009 (0.008)	0.010 (0.013)	0.003 (0.012)	0.010 (0.013)
40-56 year old	0.010** (0.004)	0.006* (0.003)	0.008** (0.004)	0.007 (0.006)	0.006 (0.006)	0.007 (0.006)
Woman	0.012 (0.009)	0.003 (0.007)	0.003 (0.008)	0.001 (0.013)	0.002 (0.012)	0.001 (0.013)
With partner	0.007 (0.006)	0.010 (0.007)	0.006 (0.006)	0.010 (0.011)	0.018 (0.012)	0.010 (0.011)
Main breadwinner	0.004 (0.008)	0.000 (0.006)	0.000 (0.007)	-0.003 (0.011)	-0.001 (0.010)	-0.003 (0.011)
Dutch (1st/2nd gen.)	-0.012 (0.008)	-0.007 (0.007)	-0.008 (0.008)	-0.013 (0.013)	-0.011 (0.012)	-0.013 (0.013)
[-500, 500] reference wage	-0.008 (0.011)	-0.004 (0.009)	-0.006 (0.010)	-0.011 (0.017)	-0.008 (0.016)	-0.011 (0.017)
[-1000, 300] PIT threshold	0.013** (0.005)	0.012*** (0.004)	0.014*** (0.004)	0.024*** (0.007)	0.021*** (0.007)	0.024*** (0.007)
[-1000, 300] PIT threshold 3 years	0.023** (0.010)	0.017** (0.008)	0.015 (0.010)	0.025 (0.016)	0.028** (0.013)	0.025 (0.016)
Observations	13,131	13,131	13,131	7,066	7,066	7,066
Year dummies	yes	yes	yes	yes	yes	yes
Clustering at taxpayer level	yes	yes	yes	yes	yes	yes
Additional control variables	yes	yes	yes	yes	yes	yes

Notes: The table reports probit results obtained when regressing an indicator for firms that report corporate taxable income within [-1000,300] or [-300,300] euros of the 200,000 euros kink in at least two years on dummies for individual characteristics, firms characteristics and the use of deductions. Errors are clustered at the taxpayer level. The sample is restricted to observations within a 5,000 or 10,000 euros of the kink.

A1 Evidence from the zero tax kink

A1.1 Baseline results

Identification of bunching at the zero taxable income threshold is more complex as some firms will likely try to minimize their losses. In addition, firms are likely to maximize their loss carry-forward refunds, which in turn imply firm-specific kinks and effective tax rates below 20 percent.³⁸ Thus, we expect a greater density of firms to the left and to the right of the zero threshold. This in turn will result in large lower and upper bounds of the bunching window. Lacking better knowledge of the loss carry-back, we are not able to compute a straightforward quantitative interpretation at the zero threshold.

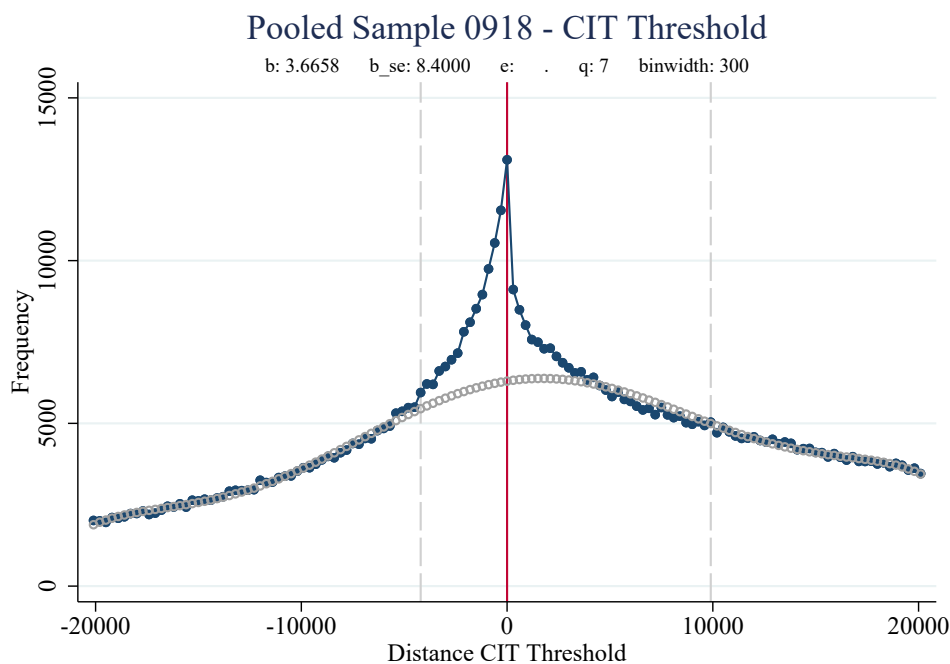


Figure A9: *Bunching of firms at the zero threshold*

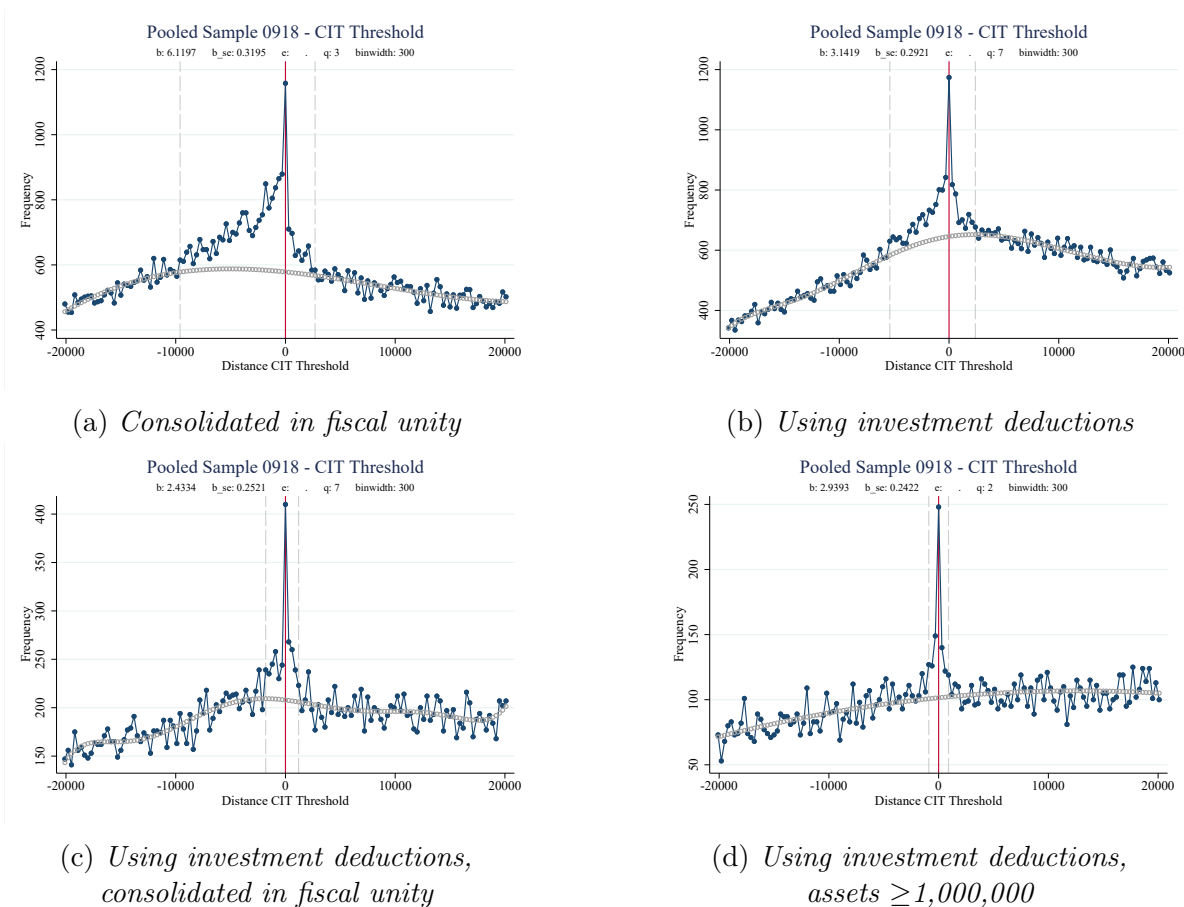
Figure A9 shows bunching behavior for firms at the zero threshold. As expected, there is a large mass of firms on the left-hand-side of the threshold. Even though we cannot consider this clear evidence of bunching, there seems to be an accumulation of approximately 14,000 firms exactly at zero. The number of firms

³⁸This is shown for the US case by Coles et al. (2019). Our data as it currently stands does not contain information on the loss carry-back.

around the zero taxable income threshold is much higher than that of those at the first threshold displayed in figure 2. As the analysis focuses on firms with one corporate declaration and one entrepreneur, only few firms have levels of taxable income that reach the 200,000 threshold.

A1.2 Characteristics and targeted tax incentives

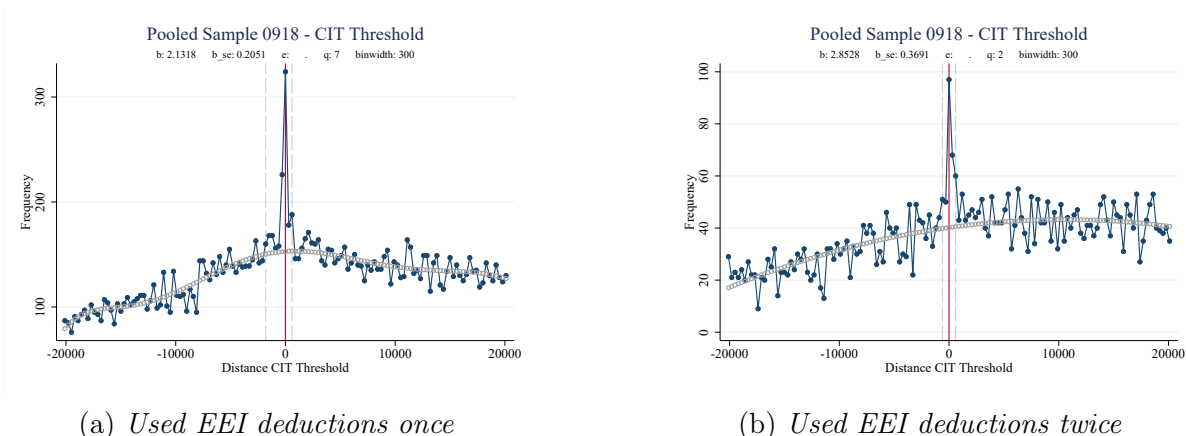
Figure A10: *Bunching of firms at the zero threshold*



As for the 200,000 euros threshold, we look at firms characteristics, at the use of targeted tax incentives and a combination of incentives and characteristics to distinguish firms that are likely to engage in tax planning from firms consistently trying to minimize losses. When looking at firms consolidated in fiscal unity in figure A10a, we can see how these represent less than 10% of those reported in the baseline of figure A9. Yet for these firms, bunching is sharper, with a narrower bunching window and an excess mass of three. This is also the case

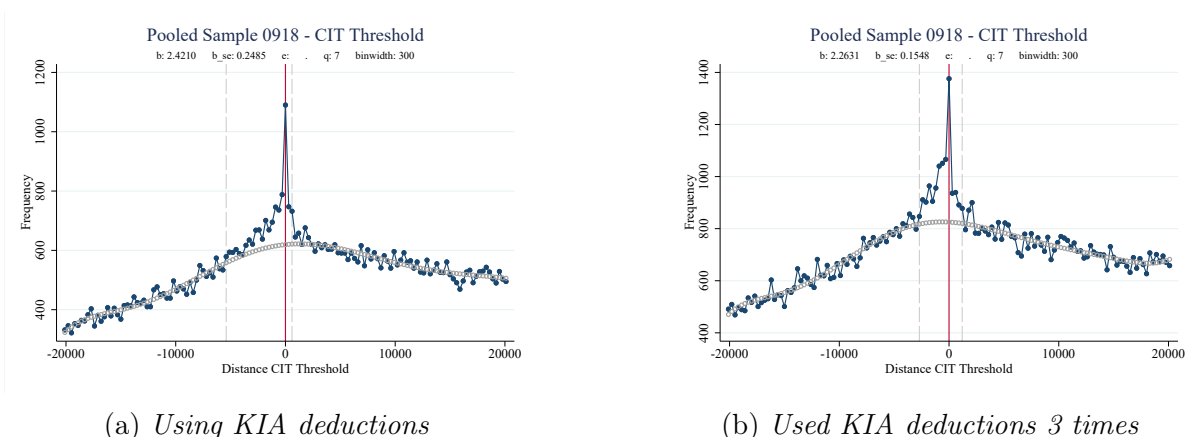
when restricting the sample to firms using investment deductions (figure A10b), firms using investment deductions and in fiscal unity (figure A10c) and firms using investment deductions and with assets of one million or more (figure A10d).

Figure A11: *Bunching of firms at the zero threshold, EEI deductions*



Next, we look at the use of EEI deductions. When focusing on firms that have at any point in time used these incentives in figure A11a, bunching is sharp and pronounced. The number of firms at the threshold however is substantially reduced. Yet, we interpret this as evidence of the use of EEI deductions by firms to bunch at the zero threshold. In addition, figure A11b shows bunching of firms that have used EEI deductions at least twice. The relative excess mass increase in comparison to figure A11a.

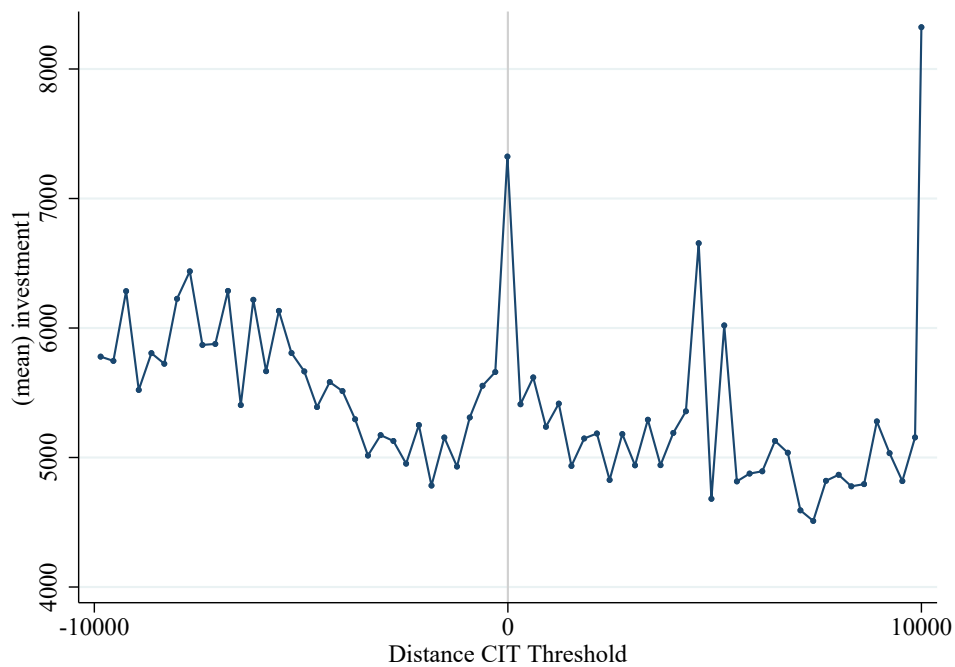
Figure A12: *Bunching of firms at the zero threshold, KIA deductions*



Finally, we also look at small investment deductions. Given that these deductions are usually possible for smaller amounts, they may be used more at the

zero threshold rather than at the 200,000 euros kink as firms may need smaller amounts there to reach the kink. In the bunching analysis we find a sharper reaction of firms at the kink that make use of these deductions (figure A12a) in comparison to the baseline in figure A9. We also see that firms using these deductions repeatedly (figure A12b) also show a clear pattern in bunching at zero. Finally, figure A13 shows that there is an increase in the average (non-zero) investment deduction for firms at zero threshold, although not as pronounced as in the case of the 200,000 euros kink.

Figure A13: *Average non-zero investment deduction at the zero threshold*



Taken together, our bunching analysis suggests that firms large in size and using investment deductions may not only target the 200,000 euros threshold but also the zero taxable income tax kink.