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Abstract

We study the responsiveness of small and medium-sized firms to corporate income taxes using population-wide administrative data from South Africa. We find sizable bunching of firms at the corporate income thresholds where the corporate tax rate increases, implying active responses to corporate income taxes. The observed bunching is very sharp, and reacts immediately to changes in the location of the kink points. These observations suggest that a sizable part of the response is driven by reporting responses rather than real economic behavior. We find indicative evidence that reporting behavior is linked with underreporting of sales and legal tax planning activities.

Key words: corporate taxation, small firms, emerging economies, bunching

JEL classes: H21, H25, H32, O12

Tiivistelmä

Tässä tutkimuksessa tarkastellaan yritysverotuksen vaikutusta pienten ja keskisuurten yritysten toimintaan. Tutkimuksessa käytetään kokonaisaineistoa eteläafrikkalaisista yrityksistä. Tutkimuksessa havaitaan, että yritykset kasautuvat niihin kohtiin, joissa Etelä-Afrikan yritysveroasteet portaittain nousevat. Tämä tulos tarkoittaa sitä, että yritysverolla on selvä vaikutus yritysten käyttäytymiseen. Tutkimuksen tulokset viittaavat siihen, että yritysten reagointi on pääosin selitettävissä raportointikäyttämisellä, eikä yritysverolla havaita olevan selkeää yhteyttä yrityksen reaalitaloudellisiin tai tuotannollisiin päätöksiin. Tulosten perusteella voidaan myös todeta, että raportointi-käyttäytyminen linkittyy sekä myyntien aliraportoimiseen että lailliseen verosuunnitteluun.

Asiasanat: yritysverotus, pienet ja keskisuuret yritykset, kasvavat taloudet

JEL-luokat: H21, H25, H32, O12

1 Introduction

Emerging or transition economies such as South Africa need to secure a sufficient revenue base to finance developmental activities by the state and fight poverty and inequality. At the same time, these countries need to make sure that the distortions created by the tax system are kept at bay so that the tax burden does not hinder job creation and productivity growth. An essential element in understanding the welfare consequences of the tax system is to have reliable evidence of the behavioral impact of taxes. In developed countries, what is nowadays regarded as credible evidence is studies that use comprehensive taxpayer register data to examine the consequences of exogenous changes in tax legislation over time or between similar taxpayers. Such 'New Tax Responsiveness' literature has been summarized by, for example, Saez, Slemrod, and Giertz (2012) and Kleven (2016).

However, the literature providing similar micro-level evidence with credible identification strategies using data from developing countries or emerging economies is scarce, with two studies on Pakistani data being the prime exceptions (see Kleven and Waseem (2013) and Best, Brockmeyer, Kleven, Spinnewijn, and Waseem (2015)). The need for more evidence is quite pressing, as it is likely that elasticity estimates may well differ across countries. For example, low and middle income countries typically have lower revenue-raising capacity, and this impacts the possibilities for tax avoidance and evasion. The elasticity estimates for reported income from these types of countries can therefore be greater than in developed countries, at least for this reason.

One particular avenue where emerging economies need to make progress is job and value creation in the formal sector. Much of this is bound to arise from small and medium-sized enterprises. Guidance on how tax policies affect the behavior of such firms is yet harder to find, even from developed countries. The body of research on the impacts of taxes on small business behavior, including tax avoidance and potential growth impacts, is still relatively small, although currently expanding.

In this paper we examine the impact of corporate income taxation on small and medium-sized firms using population-wide, high-quality tax register data from the South African Revenue Service. We utilize discontinuous changes in tax incentives created by the graduated, progressive corporate income tax (CIT) schedule for small and medium-sized firms to identify the causal effect of taxes on firm behavior. Recent literature, starting from Saez (2010) and summarized in Kleven (2016), shows that these kink points create incentives for firms to locate just at them, and this so-called bunching phenomenon can be used to estimate the extent of the distortions caused by the tax system. Intuitively, the more firms bunch at these tax rate thresholds, the more elastic the tax base is, and the greater the distortions are.

This paper contributes to the literature in the following ways. The paper is one of the

first to provide evidence of the elasticity of corporate income in emerging economies. This is the first time such evidence has been generated using tax register data from Africa.[1] Second, we utilize changes in the location of the CIT kink points to characterize the role of reporting responses (evasion/avoidance) and real economic responses in explaining observed behavior. It is true that for the revenue consequence of the current system it does not actually matter what is the underlying reason for the response. However, the decomposition is of great importance when considering policy reforms, particularly aiming at increasing the efficiency of tax revenue collection. In general, avoidance responses are less detrimental to welfare, compared to changes in the extent of real economic behavior.[2] Third, the paper provides a detailed analysis of firm-level factors around the kink points, which can be used to examine the plausible drivers of responses.

We find very large responses to discontinuities in the CIT schedule. There is sizeable excess bunching at the kink points, and the corresponding local corporate taxable income elasticities with respect to the CIT rate are 0.17 at the upper CIT kink (350,000 Rand or around 26,000 USD) and 0.7 at the lower kink (60,000). We find that a large part of the response is due to reporting responses rather than changes in real economic activity. We find immediate and very sharp responses to relocations of the kink points that are not consistent with real economic changes. Second, we find that the average sales responses of firms that precisely follow the kink point reforms are inconsistent with real sales responses. Given the dominance of reporting responses, the graduated corporate tax rate schedule does not appear to be an efficient policy for an emerging economy with an increased demand for tax revenue, such as South Africa.[3]

Our paper is closely related to the analysis of progressive corporate income taxation by Devereux, Liu, and Loretz (2014), who show that bunching at corporate income tax schedule kinks identifies the elasticity of the corporate income tax base. They find that firms in the UK bunch significantly and sharply at the discontinuous jumps in the CIT rate, and find evidence of income-shifting between corporate and personal tax bases that largely explains the behavioral response. Naturally, the work on taxation and development, surveyed recently by Keen (2012) and Besley and Persson (2013), is also closely

[1] After writing the first version of the paper (Boonzaaier, Harju, Matikka, and Pirttilä 2016), we learnt about the still incomplete and unpublished working paper by Lediga, Riedel, and Stohmaier (2016), who also use South African data and examine the responses to kink points. While there are similarities with the analyses (they also find significant responses to CIT kink points), the focus of the two papers is different. Lediga, Riedel, and Stohmaier (2016) mainly concentrate on the auditing strategies of the revenue authority, whereas our paper looks in detail at the changes in kink points and the anatomy of the response.

[2] For example, part of the evasion/avoidance responses typically entail transfers to other agents in the economy or transferring of reported income over time between different tax years, and thus the welfare costs of taxation are smaller if evasion/avoidance drives the response rather than real economic behavior (see e.g. Chetty (2009)).

[3] Nevertheless, we acknowledge that the graduated CIT schedule might affect extensive margin decisions, such as setting up or formalizing small corporations. However, it is not obvious that a graduated tax rate schedule is an optimal tool for increasing formalization.

related. In addition to the studies on Pakistani data by Kleven and Waseem (2013) and Best, Brockmeyer, Kleven, Spinnewijn, and Waseem (2015), a few other papers study taxes in developing countries utilizing register-based data. A closely related paper is that of Bachas and Soto (2015), who estimate the distortions caused by the peculiar Costa Rican corporate income tax system where the *average* tax rate increases at certain income thresholds. Using additional data from tax audits, they argue that the response to these tax notches is almost entirely due to evasion. The Costa Rican and Pakistani notch-based tax systems are, of course, highly interesting, but since they are not typically applied elsewhere, seeking additional evidence on the impacts of more traditional types of taxes on individual and corporate behavior in developing countries is of great importance, and holds the promise of considerable external validity.

In addition, Carrillo, Pomeranz, and Singhal (2014) and Pomeranz (2015) use taxpayer register data from Ecuador and Chile and combine these data with field or natural experiments to examine how tax evasion can be combated in developing countries. The focus in these types of experimental papers, surveyed by Mascagni (2014), is different from ours: they concentrate on avoidance and evasion rather than studying more conventional sufficient statistics for determining overall behavioral responses. There is no doubt that experimental evidence of the possibilities for influencing evasion is of key importance, but it remains equally useful to know more about the overall extent of the distortions that current tax systems induce.

The paper proceeds as follows: Section 2 presents the institutional framework of the South African tax system. Section 3 outlines the conceptual background for the analysis and the empirical strategy we use in the estimations. Section 4 describes the data and includes some descriptive material. The results are presented in Section 5, and Section 6 concludes.

2 Institutions

2.1 South Africa

South Africa is an upper-middle-income country (GNI per capita was USD6,800 in 2014) and a member of the BRICS (Brazil, Russia, India, China, and South Africa), a group of major emerging economies. According to the figures in the data set of Prichard, Cobham, and Goodall (2014), the total tax revenue including social security payments was 27% of GDP in 2012, whereas the average for upper-middle-income countries was 23%. In particular, revenues from corporate income tax are a significant source in South Africa, 5.5% of GDP as opposed to 3% in the comparison group of other upper-middle-income countries. Taxes on goods and services, including revenue from value-added tax, stood at 10% and 9% of GDP in South Africa and other upper-middle-income countries,

respectively.

While the revenue-raising capacity in South Africa appears stronger than in other developing countries, the need for revenue is also significant in order to enable the government to finance social protection and other activities which are needed to combat the high inequality level in society.[4] The high inequality is reflected in a considerable share of absolutely poor people, with a headcount ratio of approximately 17 % using the new 1.9 USD per day poverty line of the World Bank.[5] Finally, in comparison to other countries in sub-Saharan Africa, in South Africa the informal sector is estimated to be a smaller share of the economy. Estimates of the size of the informal sector in South Africa as a proportion of GDP range between 5 and 12%. Recent estimates for other African countries are scarce, but a study by the African Development Bank and the OECD (2008) notes that the informal sector constituted almost a third of GDP in 2002 (on average). This proportion is even higher for countries such as Zimbabwe, Tanzania, and Nigeria.

2.2 Corporate income tax system

The South African Revenue Service (SARS) is the tax authority in the Republic of South Africa and, among other taxes, it collects corporate income tax (CIT). Resident companies, with the exception of gold-mining companies, small business corporations and micro businesses, are currently subject to a flat tax rate of 28%. In addition, dividends are taxed at the shareholder level at a 15% rate.

The focus of this paper is on small business corporations (SBC). The South African government has implemented a graduated, progressive corporate income tax rate schedule for small businesses in order to stimulate activity. In order to be eligible for this graduated tax regime, the following conditions must be met:

- Company shareholders or members of the cooperative or close corporation must be natural persons
- The shareholders or members are not allowed to own shares or any interest in the equity of any other company, with the exception of other SBCs
- Gross income should not exceed R20 million for the year of assessment. The threshold was R14 million before 2013.
- A limit of 20% is placed on the amount of non-capital receipts and accruals as well as capital gains that can be collectively classified as investment income and income from rendering a personal service

[4]The Gini coefficient for consumption stood at 0.64 according to Leibbrandt, Finn, and Oosthuizen, 2016.

[5]Source: World Bank, http://data.worldbank.org/indicator/SI.POV.DDAY?locations=ZA (accessed 22.3.2017).

- Entities classified as a personal service provider as defined in the Fourth Schedule of the Income Tax Act do not qualify for the SBC regime

The tax rates and threshold values of the small business income tax regime are presented in Table 1. During the years we examine, there have been two baseline threshold values: around R60,000 of taxable corporate income where the CIT rate jumps from 0 to 10%, and around R300,000 where the CIT rate further increases to 28%. These tax rate thresholds have changed over the years. The lower threshold has increased annually by approximately R3,000. The upper threshold has remained constant even in nominal terms, but it was increased to R350,000 in the beginning of April 2012. Also, the lower rate was slightly reduced from 10% to 7% at the same time. In addition, starting from 2014, a third kink was introduced, but the data we use do not cover the years when this new system has been in place.[6]

In general, taxable corporate income in a tax year includes all generated income (e.g. business profits and interest payments) less non-capital expenses, allowable deductions and reserves, and incurred losses. A tax loss incurred in any business activity in earlier tax years may be carried forward indefinitely and set off against future corporate income (provided that the company remains active during the whole assessment period). Naturally, if a firm's owners pay themselves salaries, they would need to pay the progressive earned income tax out on this income. The CIT thresholds and the personal income tax kink points are not aligned, creating room for income shifting incentives between salaries and dividends.[7]

Assessment period	Taxable corporate income (Rand)	Marginal tax rate (MTR)
01/04/2009 – 31/03/2010	R1 – R54,200	0%
	R54,201 – R300,000	10%
	R300,001 and above	28%
01/04/2010 – 31/03/2011	R1 – R57,000	0%
	R57,000 – R300,000	10%
	R300,001 and above	28%
01/04/2011 – 31/03/2012	R1 – R59,750	0%
	R59,751 – R300,000	10%
	R300,001 and above	28%
01/04/2012 – 31/03/2013	R1 – R63,556	0%
	R63,557 – R350,000	7%
	R350,001 and above	28%

Notes: Table shows the marginal corporate income tax rates in different assessment periods for firms that are eligible for the small business corporation (SBC) tax regime.

Table 1: Corporate income tax rates for small business corporations

[6]The system has been operational since 2001, but the number of brackets has increased and the rates and thresholds have been changed.

[7]Unfortunately, matched owner and corporate income tax data is not available. While regrettable, such data is not necessarily readily available in high-income countries either.

In addition to these tax incentives, micro businesses with a turnover below R1 million have been able to choose whether they are taxed according to the CIT schedule or according to a presumptive turnover tax, where the tax is levied using a progressive turnover scale. However, data on turnover tax returns is not available for research purposes, and we cannot therefore examine responses to the turnover tax. This can be considered a minor issue, since the turnover tax has not been very popular. As an illustration of this, revenue collected from the turnover tax in the 2014–2015 financial year amounted to only R17.5 million, or 0.2% of total tax revenue. The corresponding figure for revenue collected from other companies was R185 billion (18.7% of total tax revenue), of which 1.6 billion came from SBCs.

All entities classified as a company or close corporation need to register as a taxpayer within 21 business days of becoming liable for income tax or liable for submitting a tax return. All incorporated companies, excluding entities that have opted to make use of the turnover tax regime, have to complete the Income Tax Return for Companies (ITR14-form), and submit it within 12 months of the end of the tax year.

3 Conceptual framework

3.1 Firm responses to the graduated CIT schedule

Next, we present a simple model of how firms can respond to corporate income taxes. This model will also help us to understand the anatomy behind the response: what part of the potential response is due to changes in real economic activity and what represents merely reporting behavior.

The utility of the firm owner(s)[8] is given by

$$U = y - c_i(y) - e_i(y) - T - \phi_y(\delta_y) - \phi_c(\delta_c) - \phi_a(\delta_a), \tag{1}$$

where $c_i(y)$ depicts the minimum costs needed to reach real gross sales y, and $c_i' > 0$, $c_i'' > 0$. The effort of the owner needed to reach y is denoted by $e_i(y)$, and $e_i' > 0$, $e_i'' > 0$. The main difference between $c_i(y)$ and $e_i(y)$ is that the latter is assumed to be non tax-deductible. T denotes the corporate taxes paid, which we discuss in more detail below. The firm owner can hide part of taxable sales income, δ_y, at a cost of $\phi_y(\delta_y)$, and also exaggerate reported costs at a cost of $\phi_c(\delta_c)$, where δ_c depicts the fabricated costs. The owner can also utilize various tax avoidance and tax planning measures to reduce CIT payments in a current tax year, such as loss carry-forward, at a cost of $\phi_a(\delta_a)$, where δ_a denotes the avoided amount.

[8]We assume that firm owners make all the relevant firm-level decisions. However, for simplicity, in the remaining of the paper we assume that firms respond to tax incentives.

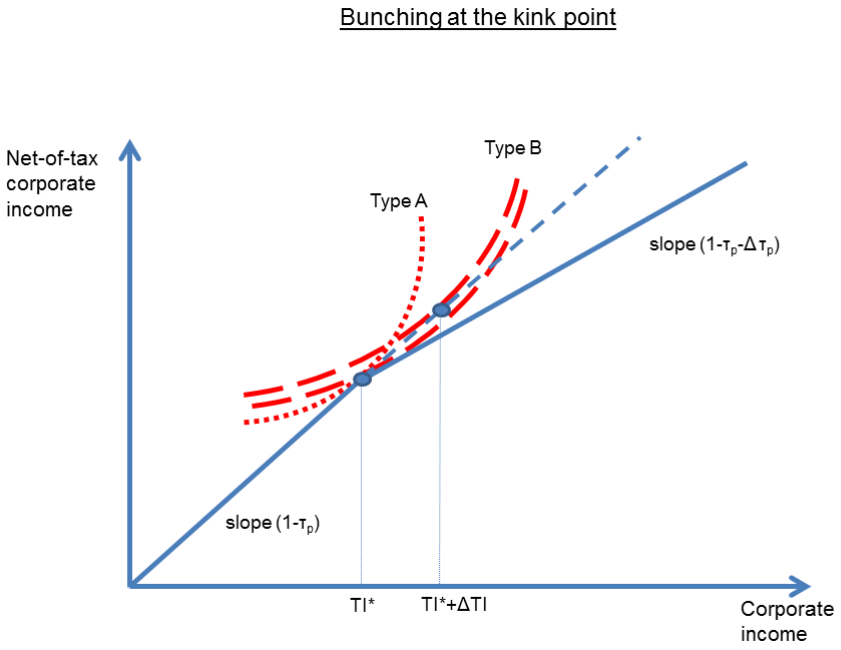
The main focus of our study is on the behavioral responses caused by T. The corporate tax function is $T = \tau_p TI + \triangle\tau_p(TI - TI^*) \cdot \mathbf{1}(TI > TI^*)$, where TI is taxable corporate income (corporate income tax base), TI^* is the corporate tax kink point, and τ_p is the marginal corporate tax rate below the kink and $\tau_p + \triangle\tau_p$ above the kink. Taxable corporate income in a tax year is determined by

$$TI = y - c_i(y) - \delta_y - \delta_c - \delta_a \tag{2}$$

First, consider a flat tax regime where $\triangle\tau_p = 0$. The firm owner maximizes utility with respect to sales y and the extent of evasion (δ_y,δ_c) and avoidance (δ_a). This yields the following first-order conditions: $(1-c_i'(y))(1-\tau_p) = e_i'(y)$, and $\phi_y'(\delta_y) = \phi_a'(\delta_a) = \phi_c'(\delta_c) = \tau_p$. The reporting effects imply that the sales of the firm can be underreported and costs overreported, and that firms can utilize legal avoidance measures to reduce reported corporate income, taking into account the marginal costs of these various measures.

Next, we consider firm responses to the kink point TI^* where the tax rate increases from τ_p to $\tau_p + \triangle\tau_p$ in a discontinuous manner. Intuitively, when the kink point is introduced, firms have incentives to adjust their taxable corporate income such that they locate exactly at the kink point, as marginal net-of-tax profits are lower above the kink. Therefore, if the average tax responsiveness of firms is significant, this will lead to an excess mass of firms located at the kink point, compared to a smooth counterfactual distribution that would prevail in the absence of the kink. This excess bunching can be translated into a local tax rate elasticity, explained in more detail in Section 3.2.

The bunching framework is illustrated in Figure 1. Firms originally at or below TI^* do not change their behavior when the kink is introduced (Type A), but a fraction of firms located above TI^* will bunch at the threshold (Type B). The extent of the bunching response depends on the underlying responsiveness to the corporate income tax rate, illustrated by the dashed indifference curves in the figure.



Notes: Figure demonstrates bunching behavior in a graduated tax rate schedule. The solid (blue) lines illustrate the tax rates below and above the kink point TI^*. The dashed curvy lines (red) represent the indifference curves of different types of firms (or firm owners).

Figure 1: Bunching at corporate income tax rate kink

Bunching firms can reduce their reported taxable corporate income either by lowering their true level of production, or by engaging in tax evasion or avoidance measures. Responses to the kink point along the real behavioral margin (production responses) are likely to produce a cluster of firms around the kink point, rather than a sharp spike exactly at TI^*. This is due to that fact the real sales and expenses are likely to be uncertain, and are at least to some extent imperfectly controlled by the firm because of, for example, unpredictable demand side effects and other frictions in the market. In contrast, various reporting responses are likely to be less scattered around the kink, as they involve less uncertainty and can be more precisely governed by the firm at the end of the tax year. Therefore, following Best, Brockmeyer, Kleven, Spinnewijn, and Waseem (2015), studying the sharpness of bunching behavior can provide initial evidence of the nature of the responses.[9]

Finally, we can modify equation (2) to distinguish between different types of responses that comprise the overall change in taxable corporate income due to a change in the corporate income tax rate:

$$\frac{dTI}{d(1-\tau_P)} = [1 - c_i'(y)] \frac{dy}{d(1-\tau_P)} - \frac{d\delta_y}{d(1-\tau_P)} - \frac{d\delta_c}{d(1-\tau_P)} - \frac{d\delta_a}{d(1-\tau_P)} \tag{3}$$

[9] According to Best et al. (2015), sharp bunching and the fact that the excess mass closely follows the changes in the kink point are suggestive of evasion-driven responses in their setting.

This formula emphasizes that the overall response is characterized by both the real production elasticity and various reporting elasticities: $\varepsilon^{TI}_{(1-\tau)} = (\varepsilon^{y}_{(1-\tau)}, \varepsilon^{\delta_y}_{(1-\tau)}, \varepsilon^{\delta_c}_{(1-\tau)}, \varepsilon^{\delta_a}_{(1-\tau)})$, where $\varepsilon^{TI}_{(1-\tau)} = \frac{dTI}{d(1-\tau_p)} \frac{(1-\tau_p)}{TI}$ is the elasticity of taxable corporate income, and $\varepsilon^{\delta_y}_{(1-\tau)}$, $\varepsilon^{\delta_c}_{(1-\tau)}$, and $\varepsilon^{\delta_a}_{(1-\tau)}$ denote various reporting elasticities. In our empirical analysis, we utilize variation created by changes in the location of the kinks and study firm-level characteristics in the neighborhood of the kink points to offer further evidence of different types of responses.

3.2 Empirical strategy

We estimate the excess mass at corporate income tax kinks following earlier bunching literature (e.g. Chetty, Friedman, Olsen, and Pistaferri (2011)). First, we estimate a counterfactual corporate income distribution that would exist in the absence of the kink point. The behavioral response to the kink point, i.e. the excess mass of firms at the kink, is then estimated by relating the actual number of firms around the kink point to this counterfactual density.

The counterfactual density is estimated by fitting a flexible polynomial function to the observed distribution, excluding an area around the kink point in the observed distribution:

$$c_j = \sum_{i=0}^{p} \beta_i (TI_j)^i + \sum_{i=TI_L}^{TI_H} \eta_i \cdot \mathbf{1}(TI_j = i) + \varepsilon_j, \tag{4}$$

where c_j is the count of firms in bin j, and TI_j denotes the corporate income level in bin j. The order of the polynomial is denoted by p. The fitted values for the counterfactual density are given by $\hat{c}_j = \sum_{i=0}^{p} \beta_i (TI_j)^i$, and $[TI_L, TI_H]$ denotes the area where the kink point affects the behavior of firms which thus need to be excluded when estimating the counterfactual density. As mentioned above, we hypothesize that responses along the real economic margin produce more scattered responses around the kink than avoidance or evasion responses would, due to the larger inherent uncertainty and more imperfect control over real economic variables such as demand-side effects and realized costs.

Excess bunching is estimated by relating the actual number of firms in the excluded range to the estimated counterfactual density in the same region:

$$\hat{b}(TI^*) = \frac{\sum_{i=TI_L}^{TI_H} (c_j - \hat{c}_j)}{\sum_{i=TI_L}^{TI_H} \hat{c}_j / N_j} \tag{5}$$

where N_j is the number of bins within $[TI_L, TI_H]$.

We follow a standard method in the literature where the excluded range is determined visually based on the shape of the observed distribution (Kleven (2016)). We define the upper limit to be as far from the kink point as the lower limit. We conduct several

robustness checks to study the sensitivity of our results by varying the choice of the excluded range and the order of the polynomial.

The excess bunching estimate can be translated into a local corporate tax rate elasticity estimate. The elasticity at the kink point is derived using the following formula (see e.g. Bastani and Selin 2014):

$$\varepsilon_{TI^*} = \frac{dTI}{d(1-\tau_p)} \frac{1-\tau_p}{TI} \simeq \frac{\hat{b}(TI^*)}{TI^* * \hat{c} * log\left(\frac{(1-\tau_P)}{(1-\tau_P-\triangle\tau_P)}\right)},$$

where τ_p is the corporate income tax rate that jumps at a kink point TI^* from τ_P to $\tau_P + \triangle\tau_P$, and $\widehat{c}$ depicts the counterfactual density at the kink in the absence of the kink point.

Finally, as is customary in the literature, we calculate standard errors for all the estimates using a residual-based bootstrap procedure. We generate a large number of distributions by randomly resampling the residuals from equation (4) with a replacement, and generate a large number of new estimates of the counterfactual density based on the resampled distributions. The standard errors for each estimate are defined as the standard deviation in the distribution of the estimate.

4 Data and descriptive statistics

The data used for this paper is obtained as part of the firm-level research program that forms part of the collaborative effort between the National Treasury of South Africa, the South African Revenue Service (SARS) and the World Institute for Development Economics Research of the United Nations University (UNU-WIDER). This program has made it possible for the first time to perform research on highly disaggregated firm-level tax register data over a multi-year time frame in Africa.

The company tax register information was extracted from the SARS core systems by the SARS Revenue Planning, Analysis, Research and Reporting (RPARR) division. The company tax register database is currently available from 2009 to 2013, but according to the SARS appraisal, the data from 2009 are incomplete and may be unrepresentative. Thus in this paper we concentrate on the years 2010–2013, and in our main analysis restrict the sample to those firms that fulfill the eligibility criteria of the SBC regime discussed above. Table 2 provides the summary statistics for the sample used to estimate the responses to the graduated CIT schedule. Note that while there is a lot of diversity in the firms in the data, for the actual statistical analysis we only use firms that are close to the kink points, and therefore also more homogeneous.

Stats	Taxable corp. income	Sales	Cost of sales	Labor costs	Expenditure
Mean	144,213	2,205,547	1,141,867	413,869	2,045,572
SD	184,694	2,767,375	2,029,449	645,742	2,794,875
N	214,249	214,249	214,249	214,249	214,249
	Balance sheet	Equity	Capital		
Mean	17,563,028	1,161,067	10,322,454		
SD	3,008,588,233	334,998,233	2,456,988,772		
N	214,249	214,249	214,249		

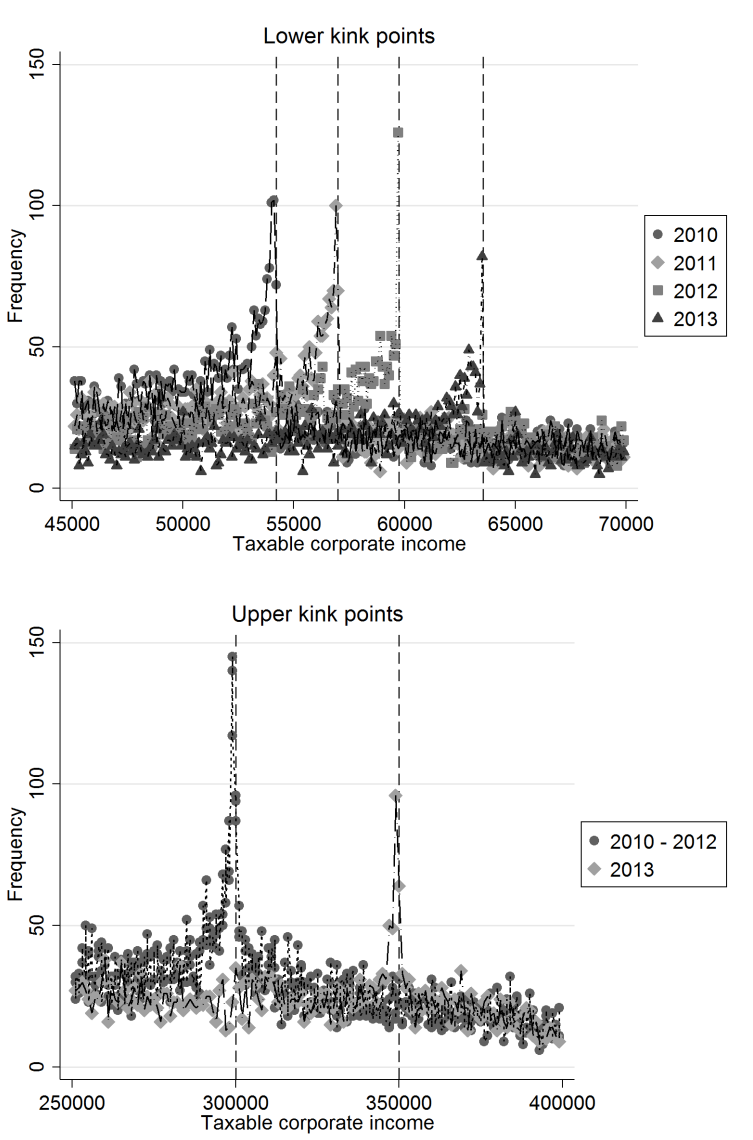
Notes: The table includes descriptive statistics for the firms qualifying for the SBC regime in 2010–2013. The sample is restricted such that firms have to have positive and less than R1,000,000 of taxable corporate income, and have less than R20,000,000 of annual sales. Expenditure includes all costs related to the firms' operations, such as labor costs and cost of sales.

Table 2: Summary statistics for the SBC sample

Figure 2 illustrates the distribution of taxable corporate income for small businesses in 2010–2013 in the neighborhood of the kink points. The vertical lines depict the kink points in the CIT schedule. The lower kink points (around R60,000) have been adjusted annually according to the inflation rate. The upper kink point, which in earlier years stood at R300,000, was raised to R350,000 in 2013.

It is evident already from Figure 2 that tax incentives matter. The distributions are otherwise rather smooth, but there is a clear concentration of firms close to the kink points, and the extent of this concentration appears to be large. In the following analysis, we study this bunching behavior in more detail.[10]

[10]In addition, the distributions of various firm-level factors, such as capital, wages and expenditures, are in general smooth and well-behaved, which underlines the high quality of the South African register data. This finding is not surprising given the relatively large extent of formalization in the South African business sector, in comparison to many other emerging economies.



Notes: Figure shows the distributions of taxable corporate income in bins of R100 (lower kink) and R1,000 (upper kink) in the neighborhoods of CIT kink points in 2010–2013. The lower kink points are 54,200, 57,000, 59,740, 63,556 Rands in 2010, 2011, 2012 and 2013, respectively. The upper kink point was R300,000 in 2010–2012, and R350,000 in 2013.

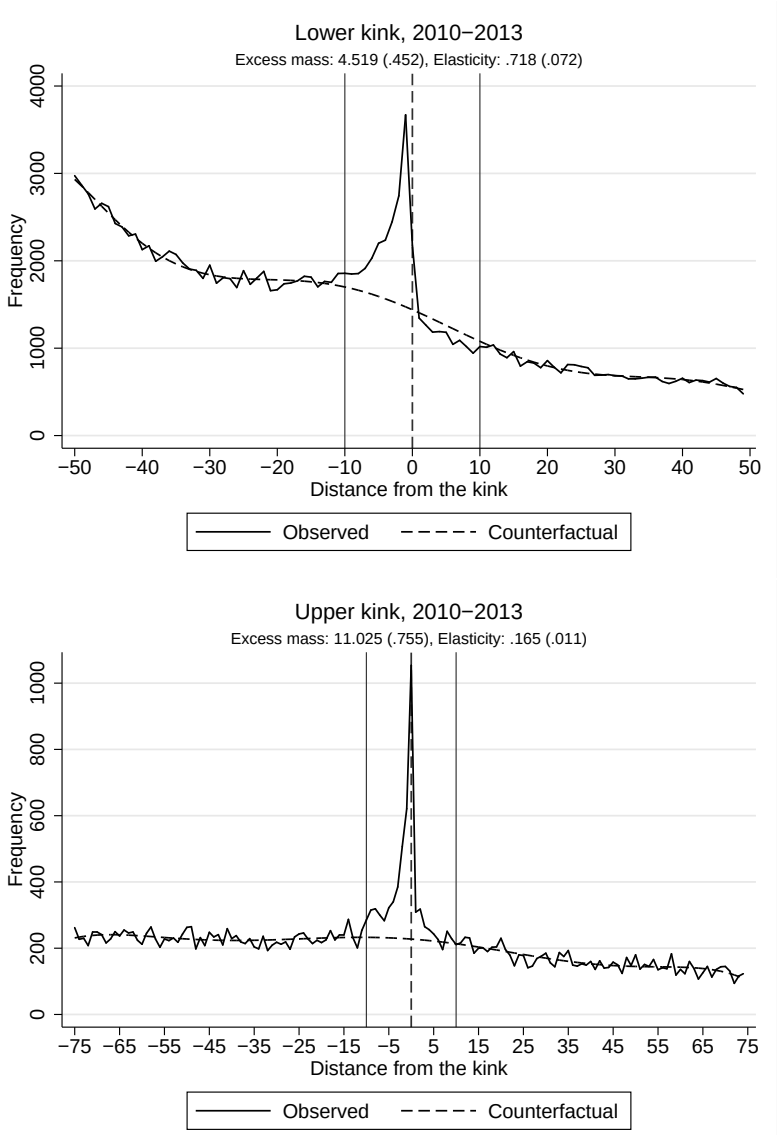
Figure 2: Distributions of taxable corporate income for small businesses, 2010-2013

5 Results

5.1 Baseline results

The upper and lower panels of Figure 3 show the distributions of taxable corporate income (solid line) and the counterfactual distributions (dashed line) around the lower and upper tax rate thresholds in bins of R1,000 using pooled data for 2010–2013. The threshold is

marked with dashed vertical lines, and the distributions for each year are centered such that zero denotes the kink point. Thus the x-axis denotes the distance from the kink point. The excluded region $[TI_L, TI_H]$ in the estimation of the counterfactual is marked with solid vertical lines.



Notes: Figure shows the distributions of taxable corporate income and the counterfactual distributions relative to the lower and upper corporate tax rate kinks in bins of R1,000, and the excess mass and local taxable corporate income elasticities at the kink points with bootstrapped standard errors using pooled data from 2010–2013. The threshold is marked with dashed vertical lines. The excluded region in the estimation of the counterfactual is marked with solid vertical lines.

Figure 3: Bunching at the corporate income tax rate kinks, 2010–2013

Figure 3 shows that the excess bunching is striking at both of these CIT kinks. A significant proportion of firms locate themselves around the thresholds. The estimates for excess bunching are very large and strongly significant statistically. Compared to the existing literature on corporate tax rate kinks in other countries (see e.g. Devereux, Liu,

and Loretz (2014)), the bunching estimates are among the largest, particularly at the upper kink point. Consequently, the implied elasticity estimates are also relatively large, 0.72 and 0.17 for the lower and upper kink points, respectively.[11] These results show that the corporate income tax kinks clearly affect the reported corporate income of small businesses.

One particular difference between the observed responses to the upper and lower kink emerge from Figure 3: the response to the lower kink occurs below the kink point, whereas, following the theoretical framework, firms scatter around both sides of the upper kink point. In general, there is no clear reason to assume bunching only below the threshold at the lower kink point. For example, there are no changes in reporting requirements or other regulations when the lower threshold is exceeded that would explain the nature of the response. However, it could be that the change from a zero corporate income tax rate to the 10% rate above the lower kink point creates increased incentives to remain below the threshold, compared to a discontinuous increase in a positive tax rate at the upper kink. One reason for this could be loss aversion if taxpayers regard zero tax payments as their reference point. A behavioral aspect of this type could thus explain the different observed patterns, but we cannot offer any causal evidence to support this hypothesis.[12]

In addition, estimating the excess bunching and the local elasticity at the lower kink is rather challenging. This is due to the curvature in the observed density below the kink point, which potentially hampers estimation of the correct counterfactual distribution, compared to the trapezoid-shaped distribution around the upper kink which enables a more straightforward approach to estimating excess bunching. In other words, non-linearities in the distribution close to the lower kink make it difficult to unambiguously define the bunching region and the correct curvature of the estimated counterfactual. Therefore, in the remainder of the paper, we derive our main evidence from behavioral responses to the upper CIT kink. In addition to the less controversial excess bunching estimation, changes in the location of the upper kink provide compelling variation to study the potential mechanisms behind behavioral responses. We discuss this issue in detail in the next subsection.

Table A1 in the Appendix shows the robustness checks for the bunching results when we vary the choice of the excluded range and the order of the polynomial. Overall, the point estimates for excess bunching vary when these choices are altered. In particular,

[11] Alternatively, we can calculate the elasticities using the changes in the effective dividend tax rate of the owner at the kink point. The effective dividend tax rate is defined as $\tau_p + (1 - \tau_p) * \tau_D$, where τ_D denotes the flat dividend tax rate (15%). Using these effective net-of-tax rates in the denominator of the elasticity formula does not change the results significantly, as the elasticities for the lower and upper kink points are 0.718 (0.077) and 0.165 (0.012).

[12] In addition, the elasticity estimate is larger at the lower kink point, even though the excess mass is smaller than at the upper kink. This is mainly due to the fact that the relative change in the net-of-tax rate is less than half at the lower kink point compared to the upper kink. Therefore, in addition to potential behavioral aspects, it could be that smaller firms are inherently more responsive to tax rates than larger firms.

the estimates are larger the lower is the order of the polynomial of the estimated counterfactual density. Nevertheless, the main conclusion of significant and visually distinctive excess mass at the kink points is not very sensitive to these choices.[13]

In addition, Figure A1 in the Appendix shows the shares of firms in different industries around the CIT kink points. The figure shows that none of the typical industries (manufacturing, services, construction, trade, financial services) are overrepresented in the bins just around the kink points, compared to other bins in the neighborhood of the thresholds. This suggests that bunching responses are not predominantly associated with certain types of firms operating in particular industries.

In addition to CIT kink points, firms could respond to the SBC regime eligibility rules by adjusting their gross income such that it does not exceed the eligibility threshold, which was R14 million in 2010–2012, and was increased to R20 million in 2013. By locating below the threshold, corporate income would be taxed at the progressive CIT schedule, in contrast to the flat tax rate of 28% for total taxable corporate income. Thus firms could reduce their average corporate tax payments by locating below the SBC threshold even if their taxable income exceeds the upper CIT kink point, as only corporate income exceeding the kink is subject to the 28% tax rate.

However, Figure A2 in the Appendix shows that responses to the SBC eligibility threshold are negligible. Nevertheless, there is visible and statistically significant excess mass at this threshold in 2010–2012 (0.20 (0.06)), but the extent of the response is very small, at least when compared to the sharp and distinctive responses to the CIT kinks. One plausible explanation for the small response is that only firms with a reported profit rate of less than 2.1% would be able to bunch below the upper CIT kink if they simultaneously bunch at the SBC gross income threshold. In addition, the monetary benefit of locating at the threshold in terms of tax savings reduces as the profit rate increases, which reduces the incentives to actively respond to this threshold.[14] Furthermore, responding to this threshold by avoidance or evasion is more difficult compared to the CIT kinks, as only gross income affects the eligibility rule, whereas taxable corporate income can also be adjusted utilizing reported costs and various avoidance measures.

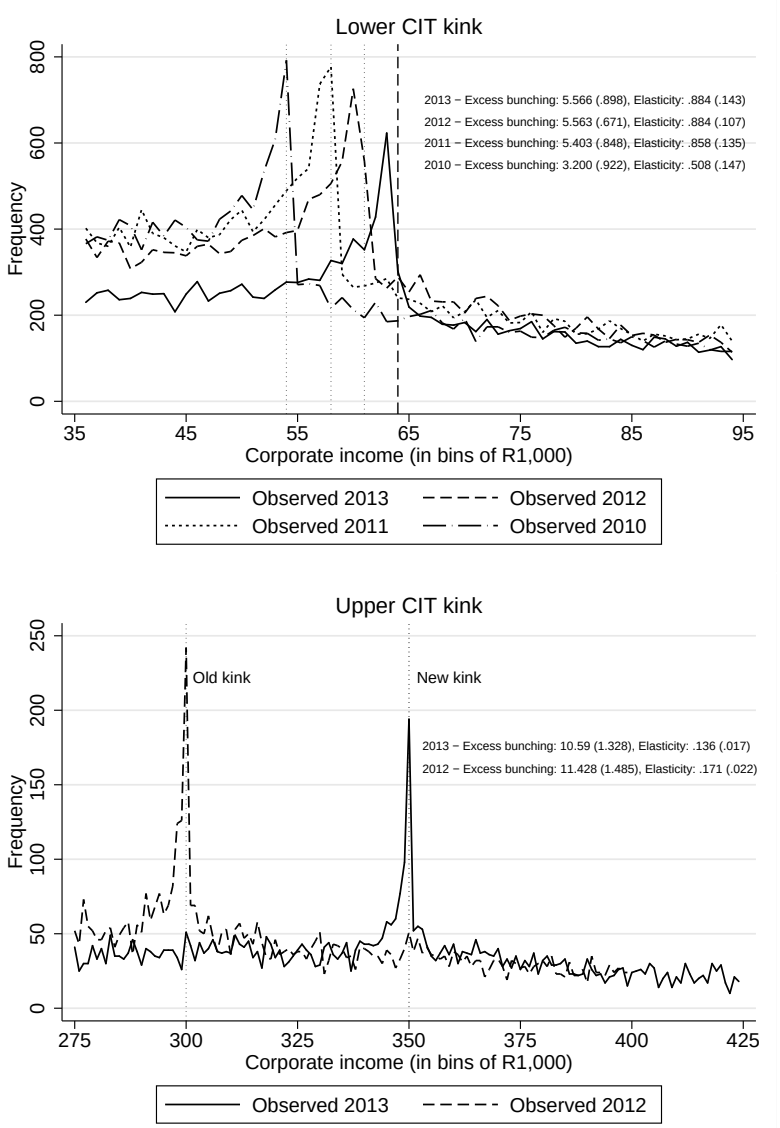
[13]When studying individual income tax rate kink points in Denmark, Chetty, Friedman, Olsen, and Pistaferri (2011) iteratively adjust the counterfactual density above the bunching window such that it includes the excess mass at the kink, making the estimated counterfactual density equal to the observed density. As an additional robustness check, we follow this procedure and estimate the excess mass to be 3.38 and 9.18 at the lower and upper kink points (respectively) using a 7th degree polynomial and a bunching window of +/- R10,000. The counterfactual density is adjusted up to the 50th and 75th income bin for the lower and upper kink points, respectively. Overall, this procedure reduces the excess mass estimates, but does not change the conclusion of significant behavioral responses to the CIT kink points.

[14]For example, for a firm with a R1 million profit, the monetary gain of bunching at the SBC eligibility threshold (R20 million) is 6% relative to total profits, whereas for a firm with a R5 million profit, the gain is only 1.2% relative to profits.

5.2 Real vs. reporting responses

The bunching results above show that firms respond very actively to tax schedule discontinuities, implying notable responsiveness to tax incentives. However, these results do not give us direct evidence of *how* firms actually respond, as the cross-sectional excess bunching estimate is a function of both real elasticity and reporting elasticity components, $\hat{b}(TI^*) = (\varepsilon^{y}_{(1-\tau)}, \varepsilon^{\delta_y}_{(1-\tau)}, \varepsilon^{\delta_c}_{(1-\tau)}, \varepsilon^{\delta_a}_{(1-\tau)})$. Next, we utilize the shape of the bunching responses and the changes in the location of the kink points to study the role of different types of responses.

Figure 4 shows the corporate income distributions in different years around the kink points. The kink points in different years are denoted by vertical lines. The upper and lower graphs show the lower and upper kink points, respectively. First, the figure shows that firms responded to the annual changes in the location of the lower kink point. The peak of the corporate income distribution follows the changes in the tax schedule rather precisely. However, as the changes in the location of the lower CIT kink are relatively small, this variation does not allow us to precisely characterize the mechanisms behind the observed behavior. This is because the observed excess mass in the distribution overlaps with the bunching regions of both future and past kink points, which at least partly prevents us from disentangling different types of responses.



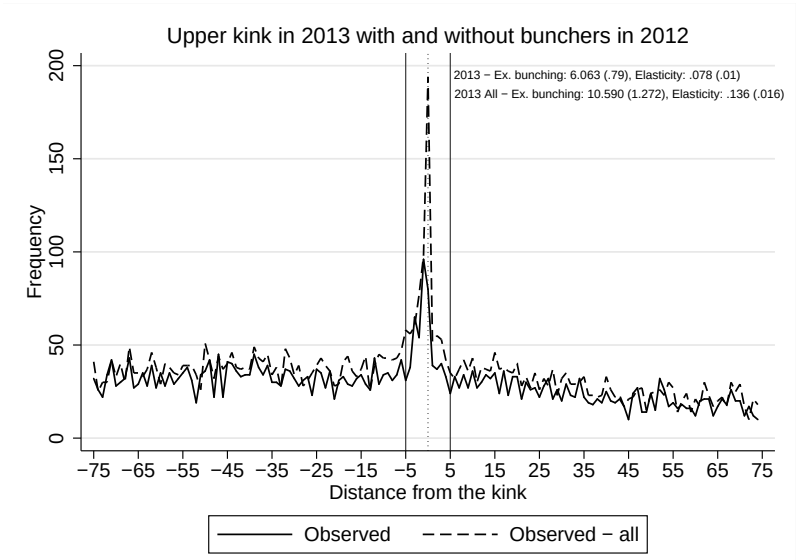
Notes: Figure shows the observed distributions of taxable corporate income around the lower and upper corporate tax rate kinks in bins of R1,000, and the excess mass and local taxable corporate income elasticities at the kink points with bootstrapped standard errors in different years in 2010–2013 for the lower kink, and for 2012 and 2013 for the upper kink. The kink points in different years are marked with dashed vertical lines. The lower kink points were 54,200, 57,000, 59,740, 63,556 Rands in 2010, 2011, 2012 and 2013, respectively. The upper kink point was R300,000 in 2010–2012, and R350,000 in 2013.

Figure 4: Changes in the location of the CIT kink points

Our main evidence comes from the change in the location of the upper kink point, illustrated in the lower graph of Figure 4. First, the figure shows that firms bunched very sharply and at a similar magnitude at the upper kink point in both 2012 and 2013. Second, the excess mass at the old kink point (R300,000) disappears immediately when the kink point is relocated to R350,000, implying that firms immediately adjust their corporate income to a new level after the reform. These instant changes in corporate income give us our first piece of indicative evidence of reporting responses. Sharp and distinctive responses to the relocation of the kink point are not consistent with a real increase in

sales. This type of response would require adjustments along many dimensions that are subject to uncertainty, such as realized expenses and labor input, other production investments, and demand side responses. Additionally, following the discussion above, the overall bunching responses at the upper kink are very sharp both before and after 2013. This evidence is more in line with reporting responses than real responses, which would entail a more scattered response around the kink point given the larger inherent uncertainty in many real economic outcomes.

To study the upper kink in more detail, Figure 5 shows the distribution around the kink point in 2013 with and without those firms that bunched at the kink in 2012, a year before it was relocated. The figure highlights that a large fraction of the response in 2013 comes from those firms that also bunched in 2012. The excess mass estimate reduces from 10.6 to 6 when excluding bunchers in the previous year. This implies that a large share of firms that bunched at the kink in 2012 increased their taxable corporate income by approximately 17% from around R300,000 to around R350,000 to match the new kink point. In comparison, the average annual growth rate of corporate income was approximately 1.5% for all firms around the kink (+/- R75,000). Further supporting these observations, Figure A3 in the Appendix shows that a large fraction of firms (30–35%) that located at the kink in 2013 were those that bunched at the R300,000 kink point in 2012 or 2011.



Notes: Figure shows the observed distributions of taxable corporate income relative to the upper corporate tax rate kink in bins of R1,000, and the excess mass and local taxable corporate income elasticities at the kink point with bootstrapped standard errors using data for 2013. The figure includes the distributions and estimates for the entire sample, and the sample excluding the firms that bunched at the old corporate tax rate at R300,000 kink in 2012.

Figure 5: Excess bunching at the upper CIT kink in 2013 with and without the firms that bunched at the kink in 2012

Next, following the evidence above, we characterize the extent of the feasible real

responses of firms that follow the change in the location of the upper kink point. For a truthfully reporting firm responding to an increase in the kink point, an increase in corporate income is only possible via a corresponding increase in sales, assuming no sudden changes in production technology, $c_i'(y)$. In contrast, taxable corporate income can increase with little increase in real sales or expenses if reporting responses dominate.

In the absence of any reporting responses ($d\delta_y = d\delta_c = d\delta_a = 0$), the overall response would be governed by real sales responses alone, $dTI = [1 - c'(y)]\, dy$ (see equation (3) in Section 3). For firms in the neighborhood of the upper kink before 2013, we approximate the average marginal increase in costs per an additional Rand of sales to be 0.64.[15] For the firms that relocated from R300,000 to R350,000 when the kink point was increased, we get $dTI = 0.154$ on average (see Table 3 below). Assuming that marginal sales costs are similar to other firms close to the kink (0.64) and plugging these figures into the real response formula above, we would need to observe a 43% increase in sales in order for the response to be fully explained with a real increase in sales. However, we find that the increase in reported sales for these relocating firms was only 14.5% on average, which is less than one third smaller than the real response model would imply. Alternatively, we would need to assume that the relocating firms were, on average, distinctively more productive than other similar-sized firms. However, in the simplified model without reporting responses, we would need to assume a negative $c'(y)$ in order to link the 14.5% increase in sales to the 15.4% increase in taxable profits.

Table 3 summarizes the descriptive statistics for firms locating in different parts of the corporate taxable income (CTI) distribution. The first group denotes firms that relocated themselves from the old kink to the new kink in 2012–2013. As noted above, for these firms the average increase in taxable income between 2012 and 2013 was 15.4% and the average increase in sales was 14.5%.

The table underlines clear differences in the behavior of relocating firms and other similar-sized firms. In addition to relocating firms, the table presents the statistics for firms with corporate taxable income between R150,000–250,000 in 2012, and firms that bunched at the upper kink in 2013 but not in 2012. Without claiming any causality, these are chosen to provide comparison groups to be able to take into account other changes that have taken place at the same time. Smaller firms should also be unaffected by the reform because of the underlying theoretical ideas in the bunching approach. First, when compared to the larger group of firms with CTI below the upper kink in 2012, we find that the relocating firms have a notably larger annual average increase in sales but a notably smaller average increase in both expenses and cost of sales. A similar pattern is also observed when comparing relocating firms to other bunching firms in 2013, which

[15] Average $c'(y)$ in the neighborhood of the upper kink (+/- R75,000) is approximated by utilizing an OLS estimation where we regress sales on expenses (including reported wages) in order to recover what is the marginal increase in costs when sales are increased by 1 Rand.

we observe to have an average annual sales increase of a similar magnitude (13.8%) as the relocating firms, but they also report significantly larger average increases in both expenses and cost of sales than the firms that also bunched in 2012.

Furthermore, one distinctive difference between relocating firms that follow the change in the upper kink point and the two comparison groups is the development of cash in the firms' balance sheet.[16] There is a clear increase in reported average cash holdings (35%) for the relocating firms between 2012–2013. In contrast, cash holdings increase much less in the other groups (6–8.5%). This finding tentatively suggests that part of the sales response of the relocating firms could stem from changes in the amount of reported revenue, without a similar response in the actual real sales of the firm. This mechanism is consistent with the earlier observation of lower reported changes in expenses despite the large increase in reported sales for the relocating firms.

These observations suggest that there are two types of bunchers: first, the immediate bunchers that respond by rapid reporting measures and second, other bunchers that respond by utilizing reporting responses to a lesser extent. In the next subchapter, we study the reporting behavior of bunching firms in more detail in order to further characterize the potential mechanisms behind the observed responses to the CIT kinks.

[16]Cash includes cash equivalents that are easily convertible into a known cash amount.

Bunchers in 2013 and 2012

△2013–2012	△Sales	△Cost of sales	△Expenses	△CTI	△Equity	△Cash
Mean	**.145**	.089	**.052**	**.154**	**.472**	**.351**
SE	.024	.068	.050	.001	.147	.149
N	185	118	193	194	157	160
levels in 2012	Sales	Cost of sales	Expenses	CTI	Equity	Cash
Mean	14.667	13.990	14.619	12.609	12.567	11.114
SE	.068	.133	.064	.001	.163	.175
N	186	123	194	194	191	170

CTI>150 & CTI<250 in 2012

△2013–2012	△Sales	△Cost of sales	△Expenses	△CTI	△Equity	△Cash
Mean	.090	.101	.166	.015	.338	.063
SE	.009	.018	.011	.006	.0287	.038
N	1841	1404	1916	1920	1518	1601
levels in 2012	Sales	Cost of sales	Expenses	CTI	Equity	Cash
Mean	14.575	13.839	14.425	12.169	12.851	11.267
SE	.021	.039	.020	.007	.036	0.045
N	1855	1456	1919	1920	1819	1695

Bunchers in 2013, not bunching in 2012

△2013–2012	△Sales	△Cost of sales	△Expenses	△CTI	△Equity	△Cash
Mean	.138	.134	.179	.121	.349	.086
SE	.024	.036	.031	.012	.067	.090
N	335	260	358	358	324	310
levels in 2012	Sales	Cost of sales	Expenses	CTI	Equity	Cash
Mean	14.906	14.163	14.782	12.643	13.249	11.467
SE	.048	.089	.044	.012	.072	.111
N	343	267	358	358	355	329

Notes: Table presents the descriptive statistics for firms locating in different parts of the corporate income distribution in 2012 and 2013. For all groups, the variables are presented in logs, and the data is restricted such that outliers with $\triangle\log(\text{CTI}) > 50\%$ are dropped from the sample. This limitation is selected in order to better compare relocating firms that follow the upper kink point to other similar types of firms in the distribution. In addition to the firms that bunch at the upper kink both in 2012 and 2013, the table includes two suggestive comparison groups: those with corporate taxable income of R150,000–250,000 in 2012, and those that bunched at the upper kink in 2013 but not in 2012. Cash includes cash equivalents that are easily convertible into a known cash amount.

Table 3: Descriptive statistics for firms in different parts of the corporate income distribution

Similarly as with the upper kink point, Figure A4 in the Appendix shows that a notable share of firms (30%) follow the movements of the lower kink point, but these estimates are at least partly affected by the fact that the changes in the location of the lower tax threshold have been rather small. Second, Figure A5 in the Appendix shows that the same firms tend to avoid moving from the kink point over time. The figure shows that the persistence rate of firms staying within a particular corporate income bin from

one year to another is larger at the kink point than elsewhere in the distribution around it. This provides additional evidence that firms adjust their behavior with respect to the kink point over time, which is consistent with the significant corporate income responses when the thresholds were increased.

To summarize, several empirical observations support the proposition that reporting responses largely explain the observed firm behavior. First, the bunching at the upper kink point is very sharp, which is not compatible with real economic adjustments along many different margins that are subject to uncertainty, such as demand side effects and actual total costs. Second, firms respond sharply and immediately to the relocations of the kink points, which further supports the earlier conclusion. In particular, the excess mass at the old kink point disappears instantly when the upper kink point is relocated. Third, the observed small change in sales of the firms that responded distinctly to the increase in the upper kink point is not consistent with such a large income increase to be due to an increase in true output, i.e. real responses, which adds our final piece of evidence towards significant reporting behavior.

5.3 Characterizing reporting behavior

The results above indicate that firms respond to the CIT kinks to a large extent by means of reporting measures. Next, we characterize these channels in more detail by utilizing the development of firm-level factors, such as sales, expenses and balance sheet information, around the CIT kinks. This examination can shed more light on how firms locate themselves at the kink point, and whether the firms that bunch at the kink differ from other firms located close to the kink. Nevertheless, this analysis does not offer causal evidence of behavioral patterns, but rather provides descriptive evidence of the potential mechanisms of reporting behavior.

Figure 6 shows the averages of sales, expenses (including cost of sales, other expenses and wages), sales minus expenses, and total balance sheet value, accumulated losses and cash holdings (including cash equivalents) in different bins of taxable corporate income around the upper CIT kink point. The figure includes the years 2010–2012, for which the more detailed balance sheet information was available in our data.

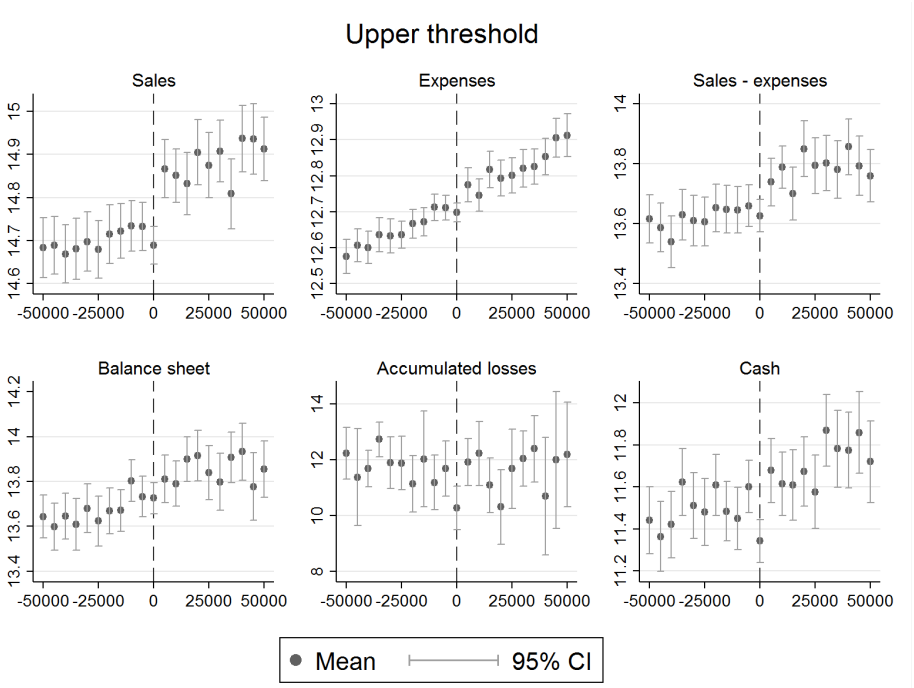
We observe that sales and sales–expenses are significantly smaller in the bins below the kink, and jump in a discontinuous manner above it. In the absence of the kink point and reporting responses, we would expect the firm-level variables to evolve smoothly as taxable corporate income increases. Thus this type of discontinuous development at the threshold gives indicative evidence that the kink point affects the behavior of firms, especially related to items that affect the level of taxable corporate income. In particular, the evidence suggests that underreporting of sales can at least partly explain the observed bunching behavior, rather than overrerporting of expenses, which develop

in a fairly continuous manner in the bins in the neighborhood of the kink. However, as this evidence is descriptive, we cannot consistently rule out misreporting of expenses.

Furthermore, the figure rejects the potential mechanism that the bunching is driven by real economic responses by more profitable firms. As discussed above, this could in theory explain the large taxable income responses when the upper kink point was relocated. In contrast, the evidence suggests that profitability, characterized by sales–expenses, is lower for firms just at the kink. However, we interpret this finding as stemming from underrreporting of income rather than providing evidence of the bunching firms being less productive (in real terms) compared to other firms with similar corporate income levels.

In addition, we find no significant differences in the total balance sheet value of the firms in the neighborhood of the kink, implying that there are no significant differences in the overall size of the firms around the kink. However, we find significant differences for bunching firms when looking at specific items of the balance sheet that can be utilized to adjust annual reported corporate income, namely accumulated losses. The figure shows that bunching firms have smaller accumulated losses, indicating that firms aim to locate themselves right at the kink point by utilizing these types of legal tax planning measures. By utilizing accumulated losses, firms can aim to adjust their reported taxable income over time such that they avoid exceeding the upper CIT kink and the higher marginal tax rate.[17] This behavior thus represents pure intertemporal legal tax avoidance behavior. Also, following the evidence in Table 3 above, we find that bunching firms have significantly less cash and cash equivalents in their balance sheet, compared to other firms close to the threshold. This evidence is consistent with income misreporting. For example, underreported sales implies less reported cash income for the firm, which translates into smaller cash holdings in the balance sheet.

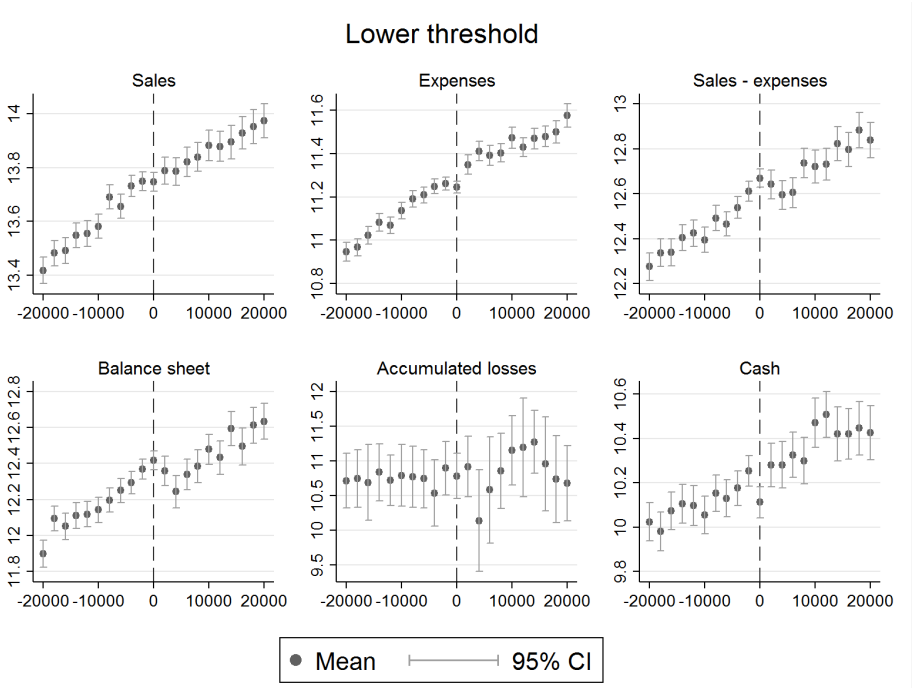
[17] A tax loss incurred in any business activity in earlier tax years may be carried forward indefinitely and set off against future positive corporate income, provided that the company remains active during the whole assessment period.



Notes: Figure shows the log averages with 95% confidence intervals for various firm-level factors around the upper kink point in bins of R5,000 in 2010–2012. Expenses include cost of sales, other expenses and wages. Balance sheet denotes the total balance sheet value of the firm. Cash includes cash equivalents that are easily convertible into a known cash amount.

Figure 6: Averages of firm-level factors in different taxable corporate income bins around the upper CIT threshold, 2010–2012

Figure 7 shows the development of firm-level factors around the lower kink point in 2010–2012. In contrast to the findings at the upper kink, we find no significant differences in sales or expenses for the bunching firms, except perhaps that expenses appear to be slightly smaller just below the kink. In addition, we find that total balance sheet values appear to be larger in a region below the kink where the bunching behavior also occurs, which suggests that firms are larger below the lower kink than just above it. This finding suggests that the persistent bunching behavior discussed above (see Figure A5 in the Appendix) could result in the "locking" of larger firms below the kink point. Nevertheless, we find no differences in accumulated losses for bunching firms, implying that this type of legal avoidance is not particularly significant for these smaller firms around the lower CIT kink. However, we find that cash holdings are smaller for firms just at the kink compared to other firms also at the lower kink, suggesting that underreporting of income explains at least some of the observed bunching behavior.



Notes: Figure shows the log averages with 95% confidence intervals for various firm-level factors around the lower kink point in bins of R2,000 in 2010–2012. Expenses includes cost of sales, other expenses and wages. Balance sheet denotes the total balance sheet value of the firm. Cash includes cash equivalents that are easily convertible to a known cash amount.

Figure 7: Averages of firm-level factors in different taxable corporate income bins around the lower CIT threshold, 2010–2012

Overall, the above evidence implies that both underreporting and avoidance measures explain the observed bunching responses at the upper kink point, which is consistent with sharp changes in bunching behavior when the kink point was relocated. However, the evidence is not as clear at the lower kink point, but we find that cash holdings are also lower for bunching firms at the lower kink, suggesting to active reporting responses. Nevertheless, it is likely that several types of reporting responses are occurring simultaneously, which makes it difficult to make more rigorous calculations or conclusions about the significance of various types of responses.

6 Conclusions

In this paper we study the responsiveness of small and medium-sized firms to corporate income tax rates using high-quality and population-wide administrative data from South Africa. Our results based on examining bunching behavior around CIT kink points show that firms clearly respond to these tax incentives. However, our evidence indicates that a large share of this response is caused by reporting effects rather than real economic changes in business activity. In particular, sharp excess bunching and immediate responses to changes in the locations of the kink point suggest a significant reporting

response. Those firms that locate exactly at an earlier kink point and at a new kink point at a higher income level do report increased sales, but the sales increase is much smaller than real economic behavior would indicate, suggesting that reporting behavior is a significant driver of the response.

A detailed examination of firm-level factors for firms just below and above the kink point reveals that firms below the kink point report lower sales and lower profitability. While this finding cannot be given a causal interpretation, it is compatible with the notion that firms are underreporting their sales in order to avoid paying higher taxes. Such firms also report lower cash holdings, another feature consistent with underreported sales.

These findings somewhat in counter the rationale of using turnover tax in developing economies to limit tax evasion opportunities. In a mandatory turnover tax system, evasion can be partly mitigated if underreporting of sales is more difficult than overreporting of costs. For example, Bachas and Soto (2015) find the revenue elasticity to be smaller than the cost elasticity in the Costa Rican context. Based on the (admittedly indirect) findings in this paper, the superiority of turnover tax in deterring evasion may not be a universal phenomenon. Nevertheless, turnover tax can, of course, entail lower compliance costs. This would favor applying it irrespective of its consequences for revenue efficiency.

An additional observation that emerges from detailed balance sheet analysis is that firms locating below the kink point report lower accumulated losses. This is consistent with (legal) tax planning if firms have utilized losses from previous years to lower their taxable income in the present tax year in order to avoid the higher marginal CIT rate. All this suggestive evidence points to significant reporting responses, but given the tax variation and information available, an exact decomposition of legal avoidance vs. evasion is not feasible.

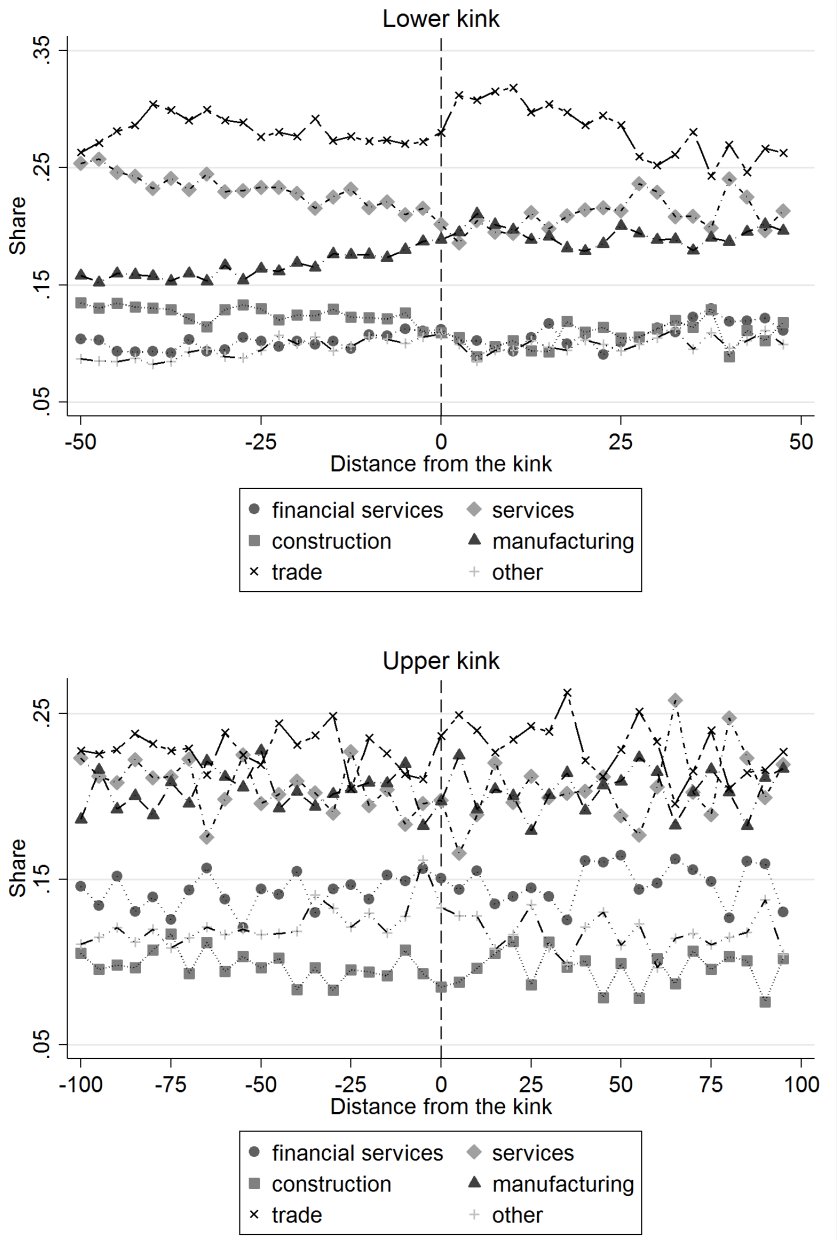
Given the clear pattern of various types of reporting responses, the graduated corporate tax rate schedule is not a particularly efficient policy for an emerging economy with a pressing need to collect more tax revenue, such as South Africa. We find no clear evidence that the corporate tax rate significantly affects the real economic decisions of firms, thus mitigating the original goal of encouraging greater economic activity and job creation by small and medium-sized firms by applying a graduated tax rate schedule. Therefore, the welfare losses are presumably smaller in the present context where reporting responses are a significant factor, compared to a case where all of the response would arise from changes in pure real economic behavior, even though the effects of reporting and real responses on government tax revenue are in principle similar (at least in the short run). A caveat to these conclusions is that lower effective average tax rates for small businesses may encourage the formalization of companies. This is an important topic for further analysis, perhaps not necessarily in the South African context where the extent of formalization is large, but probably is so in many other developing or emerging economies.

Appendix

Lower kink	Order of polynomial (baseline = 7)					
	1	2	4	6	8	10
Excess bunching	5.356	8.695	5.427	4.421	4.267	3.439
Std. error	.385	.676	.664	.553	.676	.774
	Bunching region (baseline = |10|)					
	|5|	|7|	|13|	|15|	|20|	|25|
Excess bunching	3.677	4.220	5.362	5.794	4.460	6.599
Std. error	.251	.308	.841	1.197	3.305	12.244
Upper kink	Order of polynomial (baseline = 7)					
	1	2	4	6	8	10
Excess bunching	16.179	13.864	12.687	11.032	9.565	8.845
Std. error	.408	.496	.660	.862	.842	1.004
	Bunching region (baseline = |10|)					
		|3|	|5|	|7|	|13|	|15|
Excess bunching		6.795	8.031	8.443	11.825	12.979
Std. error		.271	.380	.480	1.073	1.488

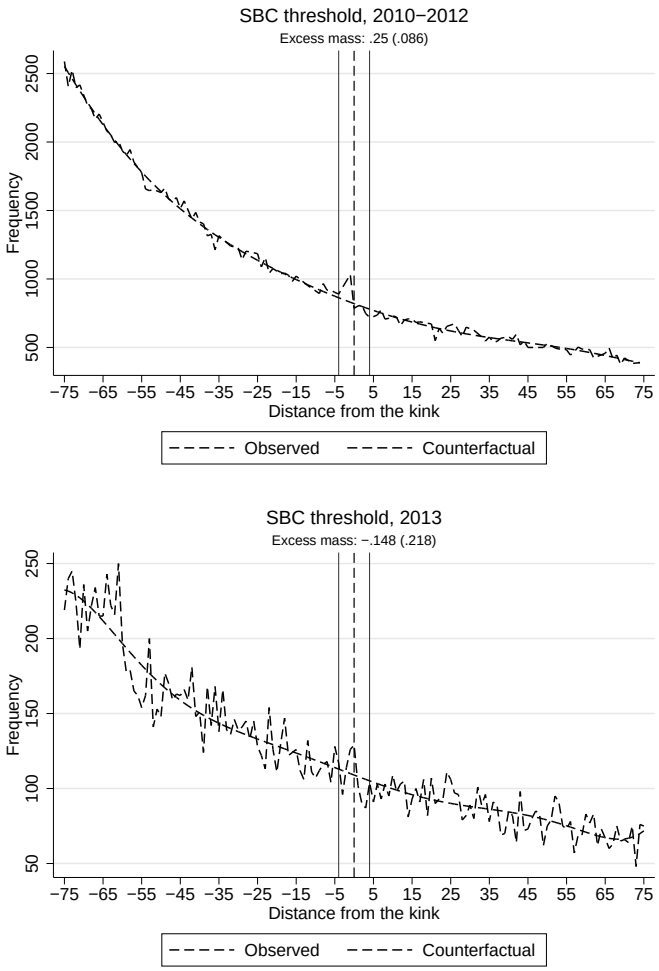
Notes: Table shows the excess bunching estimates and standard errors with different assumptions about the order of the polynomial and the bunching region. The baseline estimate is 4.519 (0.452) at the lower kink and 11.025 (0.755) at the upper kink. Increasing the degree of the polynomial in estimating the counterfactual distribution decreases the excess mass. Increasing the bunching region on both sides of the kink from 5 to 15 increases the excess bunching estimate, but the differences are not in general significant for values between 7–15.

Table A1: Excess bunching at the lower and upper CIT kinks with different assumptions about the excluded range and the order of the polynomial



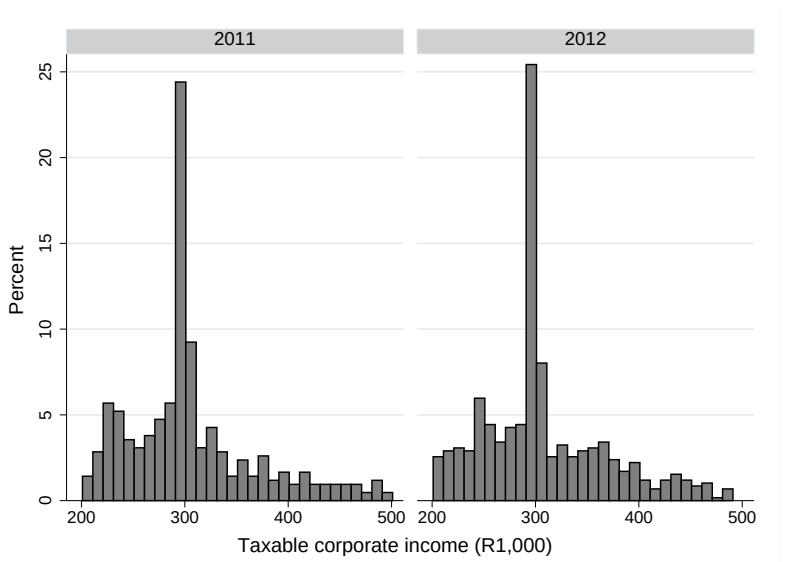
Notes: Figure shows the average shares of firms in different industry categories in bins of R2,500 around the lower kink and R5,000 around the upper kink in 2010–2013.

Figure A1: The share of firms in different industry categories around the CIT kink points, 2010–2013



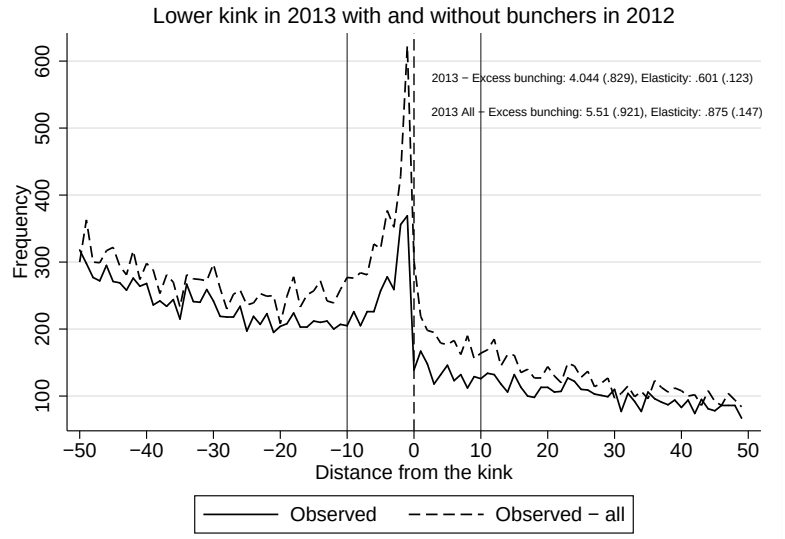
Notes: Figure shows the gross income distributions and estimated counterfactual distributions relative to the SBC eligibility threshold in bins of R1,000, and the excess mass estimates and bootstrapped standard errors in 2010–2012 and 2013. The eligibility threshold was R14 million in 2010–2012, and R20 million in 2013. The dashed line at zero denotes the threshold, and the solid lines around the threshold denote the excluded region when estimating the counterfactual.

Figure A2: Bunching at the SBC eligiblity threshold



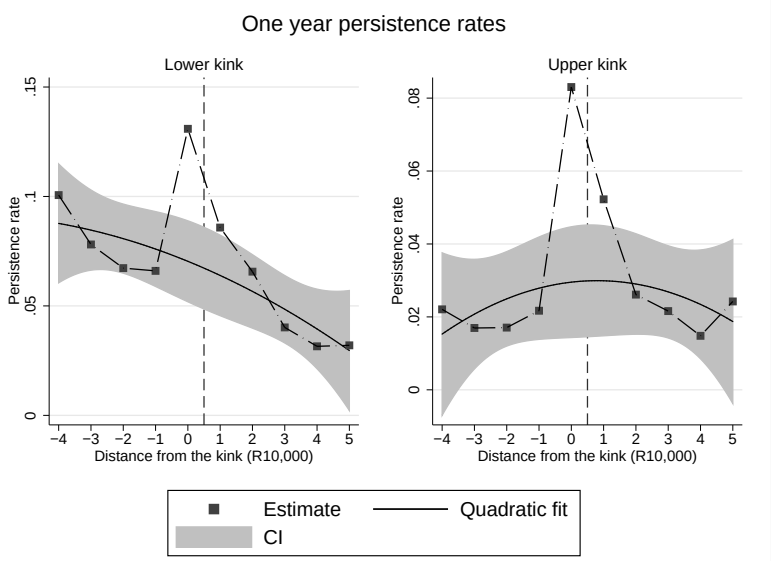
Notes: Figure shows the taxable income distributions in bins of R10,000 for the firms that were located at the R350,000 kink point in 2013 (within the bunching window of +/- R10,000) for the years 2011 and 2012. Before 2013, the corporate tax rate kink point was R300,000.

Figure A3: Taxable income distributions for the firms that bunched in 2013: years 2011 (left) and 2012 (right)



Notes: Figure shows the observed distributions of taxable corporate income relative to the lower corporate tax rate kink in bins of R1,000, and the excess mass and local taxable corporate income elasticities at the kink point with bootstrapped standard errors using data for 2013. The figure includes the distributions and estimates for the entire sample, and the sample excluding the firms that bunched at the lower kink in 2012. The lower kink was R59,740 in 2013, and R63,556 in 2012.

Figure A4: Excess bunching at the lower CIT kink in 2013 with and without the firms that bunched at the kink in 2012



Notes: Figure presents the persistence rates of firms within different bins of R10,000 around the lower and upper kink points in 2010–2013. The persistence rate denotes the probability that a firm remains in the same bin from one year to another.

Figure A5: One year persistence rates around lower and upper CIT kink points

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