Do Small and Medium-Sized Enterprises respond to the Corporate Tax System?

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Abstract

This paper uses micro-data based on Dutch Corporate Income Tax Returns between 2000 and 2009 to study the effect of changes in the Corporate Income Tax Code on the investment and financing decisions of Small and Medium-Sized Enterprises. The tax returns are filled in by all Small and Medium-Sized Enterprises liable for corporate tax, which yields a total of almost two million observations. In light of a variety of changes in the Corporate Income Tax System between 2004 and 2009, both tax rates and brackets have been adjusted, this data set provides an excellent opportunity to identify the effect of the Corporate Tax System on the choices by Small and Medium-Sized Enterprises. Besides identifying the effect of changes in the tax by using both difference-in-difference analyses around bracket-ends and standard panel data methods, the paper studies whether bunching can be observed around the bracket-ends. With respect to the marginal tax rate, I find an average investment elasticity of 0.4 and an average elasticity of the debt-asset-ratio of 0.38. Furthermore, I find significant bunching only at the highest bracket-end of 200k.

JEL codes: H25, G32

Keywords: Corporate Tax, Micro-Data, Leverage, Investment, Bunching, Small-Medium-Sized Enterprises

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1 Introduction

This paper studies how Small and Medium-Sized Enterprises (SMEs) respond to the Corporate Income Tax (CIT) system using micro-data on Non-Financial Firms (the so-called NFO database) which is based on Dutch CIT Returns between 2000 and 2009. The data come from Statistics Netherlands (CBS) and are very well suited to study the impact of the CIT on investment and financing decision of SMEs. I focus on the heterogeneity in the response to changes in the CIT by firms, by differentiating between Young and Mature firms and between Credit-Constrained and Unconstrained firms.[1]

Large firms (mainly Multinational Enterprises, or MNEs) are the focus of research in many papers that study corporate taxation (see e.g. Hubbard, 1997, and de Mooij, 2011 for overview articles). The low effective tax rates of MNEs cause discomfort and heated discussions within society and amongst politicians. Stricter rules, fundamental reforms towards either a Comprehensive Business Income Tax or an Allowance for Corporate Equity System or even introducing and EU-wide Common Comprehensive Corporate Tax Base (CCCTB) are suggested as solutions for these problems (see e.g. de Mooij and Devereux, 2011, for a discussion).

However, these discussions often overlook the heterogeneity in the population of firms. Even stronger: from welfare economic principles Hong and Smart (2010) make clear that the an important role of the CIT is redistribution between domestic citizens. That is, the CIT should tax SMEs, not the footloose MNEs. By doing so, it serves as the backstop of the income tax system and redistributes income from high-income self-employed (owners of the SMEs) to low-income individuals. From this point of view, the welfare effects of taxing SMEs are fundamental to the desirability, and the optimal shape of, CIT schedules. The CIT is expected to affect both investment and financing decisions of SMEs. Still, despite the importance of SMEs in the design of the CIT, the literature on the efficiency costs of taxing SMEs is small. This paper contributes to this literature. Furthermore, governments often intend to stimulate SMEs as they are thought to promote innovation and competitiveness. Although this argument is often dismissed (see Crawford and Freedman, 2010 and Holtz-

[1]See Vrijburg (2013) for a related analyses that focusses exclusively on the financing choice of SMEs.

Eakin, 2000), an important first question is whether stimulating SMEs via the CIT is effective after-all.

When focusing on the financing choice by SMEs, this study provides insight into which firms are particularly responsive to the tax advantage of debt. Welfare effects from a tax reform that removes the asymmetry in the treatment of debt and equity crucially depend on the question whether the asymmetry has indeed affected choices by MNEs and SMEs. For MNEs this is already well established, for SMEs only scarce evidence is available. The data set used allows an exploration of this question.

Furthermore, the heterogeneity in the population of firms is interesting. For example, larger firms, might respond differently to changes in the CIT compared to smaller firms due to being better informed or facing lower compliance costs. In principle, the CIT should optimally be conditioned on the observed heterogeneity in responses. Studying the heterogeneity is therefore important in thinking about re-designing the CIT system. Recall in this respect that most countries in the European Union apply a progressive corporate tax scheme, where larger companies are taxed at higher rates compared to smaller companies. This study provides insights into whether this is efficient. Also it is important to evaluate whether the level of taxable income at which a kink is introduced in the CIT matters from an efficiency point of view.

The data set provides abundant identification opportunities. The tax returns used are filled in by all SMEs liable for corporate tax, which yields a total of almost two million observations. Important is the variety of changes in the CIT system in the Netherlands between 2004 and 2009, both tax rates and brackets have been adjusted, such that this data set provides an excellent opportunity to identify the effect of the CIT on investment and financing decisions of SMEs. I use two methodologies to estimate the same effect. First, I a difference-in-difference methodology is employed to focus on some specific tax bracket adjustments in isolation. This methodology comes close to capturing a causal effect. Thereafter, I use standard panel data methods to estimate the average effect of all changes in the CIT. A third methodology follows Devereux, Liu and Loretz (2013) in studying bunching around the kinks in the CIT-system. Bunching around the kinks would rule out clean identification for the difference-in-difference methodology. Furthermore, the results of the bunching analysis are interesting in itself as they underly an estimate for the Elasticity of Taxable Income and might inform the government on whether the kink-point itself affects bunching. I show significant effects of changes in the marginal tax rate on both investment and financing finding an average investment elasticity of 0.4 and an average elasticity of the debt-asset-ratio of 0.38. Furthermore, I find significant bunching only at the highest bracket-end of 200k and none at the remaining kinks. Results on average taxes are mixed.

This paper is organized as follows. Section 2 discusses briefly the existing literature on this topic. This discussion is for sure incomplete as there exists an overwhelming literature that attempts to explain the financing and investment decisions by firms. Section 3 introduces a small theoretical model. Section 5 provides a description of the data used. Section 6 outlines the three methodologies used in this paper and discusses the results. Section 7 concludes.

2 Review of the Literature

A natural starting point for any paper into taxation is the Mirrlees Review edited by the Institute of Fiscal Studies of Oxford University. Especially Chapter 11 on Small Business Taxation by Crawford and Freedman (Crawford and Freedman, 2011), is important for the present study. The chapter starts by discussing the problem of how to define SMEs. Various variables can be used: assets, sales, employees, or legal status. It is not clear which definition is most useful for tax purposes or from a welfare perspective (see as well Holtz-Eakin, 2000). It is important to keep in mind that the current project only focusses on SMEs that pay corporate tax, self-employed that pay income tax are not observed.

Crawford and Freedman point out that legal status is not a proxy for size; incorporated SMEs are very heterogeneous indeed. Most incorporated SMEs are typically very small, these firms do not generate enough income to be the sole income source for their owner. In the UK three quarters only has one employee: the owner-manager. The large number of SMEs however implies that they still constitute a large part of employment. The most important lessons from Crawford and Freedman are related to the insight that the corporate tax status is a choice that is made deliberately and which is sometimes influenced by taxation. This argument is widely studied by economists; see amongst others de Mooij and Nicodeme (2008) and the before-mentioned paper by Devereux *et al.* (2013). Crawford and Freedman add to this discussion that the choice between being incorporated or remain unincorporated is directly linked with the choice of being employed in a firm or being self-employed. These arguments are at first left aside during the project as I do not observe whether new corporations are formed by former employees or former self-employed.

In a note to the chapter, Crawford and Freedman discuss whether the tax system should favor SMEs for arguments related to SMEs being 'the engine for growth', their difficulties of obtaining sufficient external finance, the regressivity of compliance costs and for ensuring business continuity by facilitating business transfers within families. Crawford and Freedman claim that governments should be very careful with using the tax system to address these issues as the tax system often lacks the flexibility to carefully differentiate between differing demands from various types of firms with respect to these concerns. The government might end up subsidizing projects that the market correctly anticipated as being destined to fail. Furthermore, Crawford and Freedman suggest (p. 1078) that capital market failures might not be as large a problem as often suggested. Holtz-Eaking (2000) comes to a similar conclusion by claiming that: '[...] it is surprisingly difficult to construct a case in favor of systematically favoring small businesses [Holtz-Eakin, 2000, p. 283]'. Overall, the literature on the optimal taxation of SMEs is scarce. Henrekson and Sanandaji (2011) claim that the literature on the taxation of capital often disregards the special nature of entrepreneurial income and suggest that entrepreneurship should be added as a third production factor, because the income from entrepreneurship potentially responds different to taxation compared to labor and capital income.

2.1 Investment

There is voluminous literature on investment by firms in relation to capital market imperfections (see Hubbard, 1997; and Stein, 2003 for excellent overview articles). Scholars have studied the relationship between measures of credit-constraints (such as, the lack of, cash-flow) and investment; and the effect of investment opportunities (measured by Tobin's Q, see Tobin, 1969) on actual investment. A classic reference is Cummins, Hassett and Hubbart (1996) who use cross-country tax reforms to identify the effect of Tobin's Q on investment, finding significant positive effects. However, Cummins *et al.* study listed companies as opposed to the SMEs that are the topic of research in this paper. The literature on the effect of the CIT on investments by SMEs is surprisingly small. In general, one must differentiate between a neo-classical model in which investment is determined by the cost-of-capital and a model where credit-constraints cause firms not to invest until the marginal rate of return equals the marginal cost-of-capital (see amongst others Stein, 2003, for a discussion). In the latter model, which seems most relevant for SMEs, also average taxes will impact on investment. Some papers that study the impact of a reform in the CIT-system in Chile between 1981 and 1996 come close to the analysis proposed in this paper (see Vergara, 2010 and Cerda and Larrain, 2010), generally finding that lowering corporate taxes increases investments in particular for financially constrained firms.

2.2 Financing

The starting point of research into the financing and investment choices of firms is the famous Modigliani and Miller (1958) result that under the assumption of perfectly functioning competitive markets and in the absence of taxes the value of the firm should depend solely on it's real operations. Modigliani and Miller (1963) introduce taxes in combination with the asymmetric treatment of debt and equity which characterizes the most CIT-systems (including the Dutch. The introduction of taxes established the trade-off theory of corporate finance that states that firms, when deciding on trading a unit of equity against a unit of debt, compare the marginal benefits of this exchange, being lower net capital costs as interest can be deducted from taxable income, to the marginal costs, being more financial distress following a higher probability of bankruptcy on the margin. The latter argument relies on the idea that interest payments are less flexible than dividend payments. In a bad year, a firm can postpone paying dividends without going bankrupt whereas postponing interest payments is far more disruptive. The trade-off theory is further developed by Kraus and

Litzenberger (1973), Miller (1977) and De Angelo and Masulis (1980). A competing theory is the pecking-order theory that follows from information asymmetry (see Donaldson, 1961; Myers and Majluf, 1984). Following the pecking-order theory firms have a specific ordering in the sources of finance they use. First retained earnings for which they do not have to go to the market. Next, the pecking-order theory claims that issuing equity is very unattractive. Prospective investors realize that, in pursuing the interest of existing shareholder, the managers of the firm are most likely to issue equity when shares are overvalued at the moment. The announcement to issue equity can therefore be very costly when it causes share prices to drop. The firm will therefore first try to borrow the necessary funds. Information asymmetry between the owners of the firm and potential investors is especially important for SMEs. Only very few firms in the data-set will have access to the Dutch Stock markets, most will be dependent on a few large investors and/or relatives. Related to this, SMEs will not in general sell their own bonds, but will be dependent on bank loans for debt financing. These banks might on the other hand have valuable information on the firms characteristics due to a past experience with the same firm. A third theory often mentioned in explaining the financing structure of firms is the agency-cost or free-cash flow theory (see a.o. Jensen, and Meckling, 1976) both dealing with principal-agent problems within a firm. Debt might be an instrument to discipline the managers of the firm, who might act in their own interest when they have too much freedom (see a.o. Myers, 2001 for a nice introduction into this literature). As opposed to the pecking-order theory, the free-cash flow theory might be less relevant for the firms in the data set used for the empirical analysis in this paper. This because SMEs can be expected to have relatively "flat" managing structures including short (or non-existing) distances between owners and managers. De meta-analysis by De Mooij (2011) provides an excellent overview of the empirical literature on this topic.

Studies focusing on SMEs are rather scarce. Amongst the few articles on SMEs in this literature are Van der Wijst and Thurik (1993), Michaelas, Chittenden and Poutziouris (1999) and recently Bartholdy and Mateus (2006) using Portuguese data and López-Garcia and Sogorb-Mira (2008) who study SMEs in Spain. Both recent papers find evidence for a positive relationship between the Debt-Asset ratio and the Effective Corporate Tax Rate whereas the former two papers find the opposite result. The data available for the current project offers much better opportunities for identification. First of all, we have more data: Bartholdy and Mateus use 770 firms per year on average, López-Garcia and Sogorb-Mira some 3600 firms per year, whereas a balanced panel with 10 years of data already yields 34000 firms in our database. Second, the statutory corporate tax rate has changed numerous times, including changes in tax brackets, whereas only the rate changed two times in Portugal during the period studied by Bartholdy and Mateus, and López-Garcia and Sogorb-Mira do not mention any change in the corporate tax code in Spain.

3 A Theoretical Model of SME choices

In this section I present a simple model of SME choice. From this model, I infer some hypotheses which are tested in the remainder of the paper. The model is descriptive, I do not solve for the equilibrium. The model deviates from the standard neoclassical model by allowing capital market frictions, which are crucial when thinking about the choices made by SME's (see also Henrekson and Sanadaji, 2011) who are constrained in obtaining finance and, possibly, in hiring labor. Whereas under perfect capital markets one can split-up the investment and the financing decision for the standard neo-classical firm (although both interact), this no longer holds for the SME entrepreneur who is, in general, faced with a strick pecking-order for his or her choice of financing due to credit-constraints. Furthermore, the labor input by the entrepreneur is like a fixed factor. He or she will typically work the maximum number of hours, as income from the firm is a significant source of income to the entrepreneur. That is, entrepreneurs do not only earn the marginal return to their labor, but also the pure profits which are a remuneration to both effort and risk-taking. Outside labor might again be constrained. Although workers might be available at some wage, they posses an enormous risk in terms of loss of flexibility, a firm with an employee is significantly more vulnerable in a country with strick rules on employment protection.

Imagine N entrepreneurs that have an endowment of labor L and K_j units of capital, where j indexes the different entrepreneurs. This capital can be invested in the market, yielding a return of r or it can be invested in their own firm (when at least part of the labor endowment is as well invested in the firm). Each entrepreur maximizes after-tax income which equals

$$\Pi_j = f(i_j, l_j, \sigma_j) - i_j(1 + r) - (1 + r)\theta_j C(e_j) - T(i_j, l_j), \tag{1}$$

which is an application of Stein (2003) to entrepreneurial choices. Output prices are normalized to unity ($p_j = 1$). $f_j(.)$ denotes total income, with $i_j = k_j + e_j$ capturing investment that equals capital invested by the entrepreneur himself ($k_j < K_j$) plus external funds (e_j) which I interpret as bank-loans. $l_j \in L$, representing a set of *fixed* labor supply choices for the entrepreneur (think of either full-time or part-time). I do not allow the entrepreneurs to adjust labor effort now. The return received by the entrepreneur equals: $\Pi_j + k_j(1 + r)$. The function $f(.)$ follows the standard assumptions leading to complementarities between i_j and l_j. The parameter σ_j captures differences in productivity or investment opportunities amongst firms, with $\partial f(.)/\partial i \partial\sigma > 0$ and $\partial f(.)/(\partial i)^2\partial\sigma < 0$, firms with higher values of σ_j are more productive on the margin but the marginal revenue curve becomes flatter (more sensitive to marginal cost).[2] The distribution of σ_j across firms is characterized by density function $h_\sigma(\sigma_j)$. r denotes opportunity cost of capital, which is the same for all entrepreneurs. Labor earns the after-tax return Π_j. For now I abstract from adjustment costs with respect to investment. Whereas these costs do matter in the empirical application below, they mainly affect the speed of adjustment, not the expected signs of the comparative statics studied below.

$\theta_j C_j(e_j)$ captures deadweight costs associated with funds raised externally, with $0 \leq \theta_j \leq 1$ capturing the "degree of financing friction" (see Stein, 2003) and $C(e_j)$ describes the "lemons-premium" that external investors demand for investing in firm j, see e.g. Fazzari, Hubbard and Petersen (1987). $C(.)$ is a convex function with $C(.)' > 0$, $C(.)'' > 0$. By assuming $C(0) = 0$ and $C(\epsilon) > 0$ for arbitrarily small ϵ, I implicitly impose a strict pecking-order upon the entrepreneur. In the absence of taxes, he or she strictly prefers his own capital

[2]Note that these conditions hold in case of for example a Cobb-Douglas production function: $f(i) = \sigma_j i^\alpha$, where α is capital's share in output.

over bank-loans. The parameter θ_j reflects the fraction of external investors that suffer from insufficient information, the parameter is heterogeneous over firms with density $h_\theta(\theta_j)$. One might think of a loan from a relative that does not feature the convex costs that are assumed for bank-loans.[3]

$T(.)$ denotes the tax liability. I follow Devereux *et al.* (2013) in defining the total tax liability due by firm j as

$$T(.) = \tau_j(B_j - A) + E_j, \tag{2}$$

where B_j is total taxable income of firm j and A is the lowest income in the relevant tax-bracket in which B_j is taxed, τ_j is the marginal tax rate faced by company j. $E_j \geq 0$ denotes residual taxes paid in other tax brackets (if any). Total taxable income is defined as

$$B_j = f(i_j, l_j, \sigma_j) - (1 + r)[e_j + \theta_j C(e_j)], \tag{3}$$

where I assume that only (but the total) return paid to external funds can be deducted from tax, which is the case for the Dutch CIT-system. I differentiate from Devereux *et al.* (2013) by endogenizing the share of capital costs that are deductible. As we will see, this share will depend on τ_j.[4]

For now I abstract from the discussion of income shifting, as for Dutch SMEs there is a strict rule on the labor earnings that should be reported, it should be a reasonable salary. That is, I assume that the marginal euro earned will be a return to the capital invested by the entrepreneur.[5] I also abstract from arbitrage through changes in legal form form now, to justify this I want to remark that alongside the changes in the CIT-system the government

[3]For now I abstract from compliance costs, which would be another channel in which SMEs might differ, especially when these compliance costs decrease with size.

[4]Alternatively one might take θ_j outside the brackets such that also e_j is multiplied with it. This is the interpretation when only *uninformed* external sources are tax deductible. This might be the case when loans from relatives are treated as equity instead of debt.

[5]This implies (in the notation of Devereux *et al.*, 2013, and abstracting from the firm index) that B_p is fixed (or maximized) in the Netherlands and, hence, the marginal tax rate is just t_c, whereas the average tax rate is indeed $\tau_a = t_c(1 - B_p/B) + t_p(B_p/B)$ which tends to t_c when B grows.

has extended credits to the unincorporated self-employed such as to retain rough neutrality in the choice of legal form.

The tax system interacts with the convex cost of external financing. Consider a small perturbation in the use of bank loans ($\partial e_j > 0$) which is compensated by a reduction in own capital invested ($\partial k_j = -\partial e_j < 0$) such that investment remains constant ($\partial i_j = 0$), such that

$$\frac{\partial \Pi_j}{\partial e_j} = -(1+r)\theta_j C'(.) + \tau_j(1+r)[1+\theta_j C'(.)] \tag{4}$$

where the first-term captures the additional external costs and the second-term captures the tax benefit of using debt. I will differentiate between two cases. First, there are firms which experience a substantial lemons premium. These can be characterized by

$$\tau_j < \frac{\theta_j C'(\epsilon)}{1+\theta_j C'(\epsilon)} \tag{5}$$

that is, the marginal tax does not fully subsidize the lemons premium for the first unit of bank loans. I denotes these as the "Young" firms in the remainder of the paper. This because the information asymmetry leading to a high value of θ_j is typically severe for young firms without a good track-record.

However, there might be a (substantial) group of firm in the data for which

$$\tau_j > \frac{\theta_j C'(\epsilon)}{1+\theta_j C'(\epsilon)} \tag{6}$$

such that at least some units of bank loan are *strictly* preferred over own capital, an increase in the tax rate will make bank loans even more attractive for these firms at the margin, the pecking-order theory yields a trade-off theory for this group of firms: $\partial e_j/\partial \tau_j > 0$. These firms are typically not constrained as long as the financing constrained is slack: $\hat{i_j} < k_j + \tilde{e}_j$, where $\tilde{e}_j$ is implicitly defined by:

$$1 = (1-\tau_j)[1+\theta_j C'(\tilde{e}_j)] \tag{7}$$

and $\hat{i}_j$ is the desired level of investment to be defined below. I will call these firms "Mature" in the remainder of this paper as for mature firms it should typically be the case that θ_j becomes smaller ones banks get familiar with the entrepreneur and the entrepreneurial business.[6]

Each entrepreneur chooses i_j to maximize Eq. 1 subject to $i_j = k_j + e_j$. For Young firms I distinquish three types: Y1) $\hat{i}_j < k_j$, Y2) $\hat{i}_j = k_j$, and Y3) $\hat{i}_j > k_j$ where the types have been defined by increasing investment opportunities relative to own capital k_j and θ_j. The first-order-conditions (FOCs) can be characterized as follows (using $\partial e_j/\partial i_j = 1, \epsilon \approx 0$)

$$\text{type Y1:} \quad \left.\frac{\partial \Pi_j}{\partial i_j}\right|_{\hat{i}_j<k_j} = 0 \leftrightarrow f'(\hat{i}_j, \sigma_1) = \frac{1+r}{1-\tau_j}, \tag{8}$$

$$\text{type Y2:} \quad \left.\frac{\partial \Pi_j}{\partial i_j}\right|_{\hat{i}_j=k_j} \leftrightarrow \frac{1+r}{1-\tau_j} + (1+r)\theta_j C'(\epsilon) > f'(k_j, \sigma_2) > \frac{1+r}{1-\tau_j}, \tag{9}$$

$$\text{type Y3:} \quad \left.\frac{\partial \Pi_j}{\partial i_j}\right|_{\hat{i}_j>k_j} = 0 \leftrightarrow f'(k_j + e_j, \sigma_3) = (1+r)[1 + \theta_j C'(e_j)], \tag{10}$$

with $\sigma_1 < \sigma_2 < \sigma_3$. The FOCs define the optimal investment level *and* the optimal debt-asset ratio (e_j/i_j, henceforth DAR). These three different types of firms not only differ in their use of external financing (only type $Y3$ uses some e_j), but also in their investment choices. All of them under-invest, but for entirely different reasons. Type $Y1$ is fully unconstrained due to abundant capital (k_j) but under-invests because of a lack of further after-tax investment opportunities. Type $Y2$ under-invests because of the lemons premium, the information-asymmetry makes a further investment impossible. Type $Y3$ under-invests only relative to a hypothetical first-best without information asymmetry. In the empirical analysis I am interested in how these firms respond to a marginal change in the CIT-rate. Studying the effect of a change in the marginal tax on these types leads to the following conclusions

Y1) This type has a DAR equal (or close to) zero ($e_j/i_j = 0$), the firm only uses equity invested by the entrepreneur himself. Note, this can both be the case when the entrepreneur is very wealthy or when investment opportunities are simply very low. I

[6] For now I exclude from the analysis knife-edge cases ($\tau_j = \theta_j C'(\epsilon)/[1 + \theta_j C'(\epsilon)]$) and cases where firms switch between being Young and Mature due to the progressivity of the CIT-system. That is, for some firms with a marginal value of θ_j it might be the case that they are Young when just below the bracket and, hence, strictly preferring own capital, whereas they are Mature after investing another unit of their own capital due to the increased marginal subsidy of external finance. Which makes they want to substitute own capital for bank-loans, such that they move back across the kink again.

find that investments decrease with an increase in the *marginal tax rate* ($\partial i_j/\partial \tau_j = (-1/f''(.,\sigma_1))[(1+r)/(1-\tau_j)^2] < 0$). The marginal source of finance is own capital (k_j).

Y2) This type has more investment opportunities than own capital but is strictly financing constrained: it cannot enter the market for bank loans due to the effective lemmons premium. This class is characterized by a marginal return to capital above the marginal cost of capital. Hence, the DAR equals $e_j/i_j = 0$ and investments, and bank-loans, do not respond to changes in the *marginal tax rate* ($\partial i_j/\partial \tau_j = 0$, $\partial e_j/\partial \tau_j = 0$), as long as this change does not cause the effective lemmons premium to become negative (a case which I exclude for now).

Y3) This type has abundant investment opportunities compared to own capital (k_j), such that it does takes on debt: $e_j/i_j > 0$. This implies that the marginal source of finance is a bank-loan (e_j) causing investments to be unresponsive to changes in the *marginal tax rate* as both the marginal revenues and costs are treated symmetrically by the tax system. Hence, also the DAR is unaffected by the marginal tax rate: $\partial e_j/\partial \tau_j = 0$.

For Mature firms, we can define a similar set of FOCs: M1) $\hat{i}_j < \tilde{e}_j$, M2) $\hat{i}_j < k_j + \tilde{e}_j$, and M3) $\hat{i}_j > k_j + \tilde{e}_j$ where the types have again been defined by increasing investment opportunities relative to own capital k_j. The FOCs can be characterized as follows (using the definition of $\tilde{e}_j$ above)

$$\text{type M1:} \quad \left.\frac{\partial \Pi_j}{\partial i_j}\right|_{\hat{i}_j < \tilde{e}_j} = 0 \leftrightarrow f'(e_i, \sigma_1) = (1+r)[1+\theta_i C'(e_j)] \tag{11}$$

$$\text{type M2:} \quad \left.\frac{\partial \Pi_j}{\partial i_j}\right|_{\hat{i}_j < \tilde{e}_j + k_j} = 0 \leftrightarrow f'(i_j, \sigma_2) = \frac{1+r}{1-\tau_j} \tag{12}$$

$$\text{type M3:} \quad \left.\frac{\partial \Pi_j}{\partial i_j}\right|_{\hat{i}_j > \tilde{e}_j + k_j} = 0 \leftrightarrow f'(k_j + e_j, \sigma_3) = (1+r)[1+\theta_j C'(e_j)] \tag{13}$$

with $\sigma_1 < \sigma_2 < \sigma_3$ where it is interesting to remark that type $M1$ is completely undistorted, it chooses the first-best investment level. There are no kinks in the schedule for the mature firm. I can again study the sensitivity of the investment and financing decision to changes in taxes

M1) The firm uses "cheap" external funds to finance it's scarce investment opportunities ($e_j/i_j = 1$). As debt is the marginal source of finance, both investments and the DAR do not respond to the marginal tax rate (τ_j): $\partial i_j/\partial\tau_j = 0$ and $\partial e_j/\partial\tau_j = 0$.

M2) This firm has more investment opportunities than cheap external funds and hence the entrepreneur invests some of it's own capital implying that k_j is the marginal source of finance, investments therefore respond to the marginal tax rate ($\partial i_j/\partial\tau_j = (-1/f''(., \sigma_2))[(1+r)/(1-\tau_j)^2] < 0$). Furthermore, note that $\partial\tilde{e}_j/\partial\tau_j = [1+\theta_j C'(\tilde{e}_j)]/[1+\theta_j C''(\tilde{e}_j)] > 0$, causing the DAR to increase with the marginal tax rate: $\partial(e_j/i_j)/\partial\tau_j) > 0$; the trade-off theory is relevant for type $M2$.

M3) This is a mature firm that has depleted the available cheap external funds and own capital holdings and, hence, goes onto the market for bank-loans to finance the remaining investment opportunities. The firm has a positive DAR ($e_j/I_j > 0$) but does not respond to changes in the marginal tax rate as the marginal source of finance are bank-loans ($\partial i_j/\partial\tau_j = 0$). With respect to the DAR, I again find that $\partial\tilde{e}_j/\partial\tau_j = [1+\theta_j C'(\tilde{e}_j)]/[1+\theta_j C''(\tilde{e}_j)] > 0$, such that $\partial(e_j/i_j)/\partial\tau_j) > 0$, the trade-off theory is relevant for type $M3$ as well.

As the model is static, or studies a long-run steady state, investment decisions and financing decisions are determined only by marginal tax rates. A change in the average tax, for example by changing E_i will lead to an adjustment of pure profits which is collected by the entrepreneur. However, it is important to understand how *average* taxes might affect investment and financing decisions in a dynamic setting because the changes in the CIT studied below will also have implications for average taxes and, hence, for retained earings. Instead of setting up a full dynamic model, I choose to simulate an increase in k_i as a signal for *retained earnings*, this will yield some intuitive insights. We can see that a small increase in k_i will cause an increase in investments for types $Y2$, $Y3$ and $M3$ and a reduction in the DAR (when initially positive). From here onwards these firms are therefore called "constrained" (C) firms,

Table 1: Firm types and characteristics

	Y1 (UC)	Y2 (C)	Y3 (C)	M1 (UC)	M2 (UC)	M3 (C)
DAR (e_i/I_i)	0	0	>0	>0	>0	>0
$\partial I_i/\partial\tau_i$	-	0	0	0	- -	0
$\partial e_i/\partial\tau_i$	0	0	0	0	+	+
$\partial DAR/\partial\tau_i$	+	0	0	0	++	+
$\partial I_i/\partial k_i$	0	+	+	0	0	+
$\partial e_i/\partial k_i$	0	0	-	0	0	-
$\partial DAR/\partial k_i$	0	-	-	0	0	-

Y denotes young firms. M denotes mature firms. C denotes constrained firms (they do not pay dividends), UC denotes unconstrained firms (the do payout dividends). DAR stands for the Debt-Asset-Ratio (e_j/i_j) where e_j stands for bank-loans and i_j stands for firm investment.

because they respond when cheap funds become available. I do not expect these firms to pay any dividends as these funds could be used more productive. The remaining types ($Y1$, $M1$ and $M2$) are labeled 'unconstrained'(UC), they will not respond to additional free-cash flow, and I expect them to pay dividends.

Table (1) summarizes the discussion above. It shows that although the model above implies a strict pecking-order theory in absence of taxes, a myriad of types can be identified after taxes have been introduced. Moreover, the distributions $h_\sigma(.)$ and $h_\theta(.)$ imply a distribution $h_B(.)$ over taxable income.[7] Assuming a uniform distribution over types, I can establish a number of hypotheses which can be tested in the upcoming sections.

Hypothesis 1 *Investments by Mature Unconstrained firms respond more to the Marginal Tax Rate than the investments of Young Unconstrained firms.*

This hypothesis follows from the assumptions on $f(.)$: $(f''(.,\sigma_2))/f''(.,\sigma_1)) > 1$. It is crucial to see that types $Y1$ and $M2$ face the same marginal cost of finance r. Note that this result is reinforced when marginal tax rates of Mature firms are generally above marginal tax rates of Young firms.

Hypothesis 2 *a) The DAR of Mature firms responds stronger to changes in the Marginal Tax Rate compared to the DAR of Young firms; b) the DAR of both constrained and unconstrained firms responds to changes in the Marginal Tax Rate.*

[7]Note that at this point I do not make assumptions regarding a possible correlation between σ and θ, I have treated both dimensions as being orthogonal, which might of course not be the case.

The first statement follows from the observation that the trade-off theory only holds for Mature firms $M2$ and $M3$. The DAR of type $Y1$ is only increased due to a reduction in assets (i_j). Following Hypothesis 1, at least the response by $M2$ must therefore be larger. It is in general impossible to predict whether the DAR of $M2$ or $M3$ is more responsive to the marginal tax rate, this because the increase in $\tilde{e}_i$ is identical (assuming both have the same marginal tax rate). Finally, by definition the following hypothesis can be defined for changes in own capital

Hypothesis 3 *Investments in constrained firms are strictly increasing in own capital k_i, whereas the DAR is decreasing in k_i. Unconstrained firms are not affected at all by changes in own capital k_i.*

4 Dutch Corporate Tax system between 2000 and 2009

This section discusses the changes in the CIT-law in the Netherlands between 2000 and 2009 and the motivations behind these changes. Furthermore, I will briefly touch upon some other institutional details relevant for SMEs. The CIT-law has been introduced in 1969 and can be classified as a Classical Corporate Tax System that only allows the return on debt to be tax deductible. The changes to the CIT-law discussed below are mostly announced and discussed in a yearly report by the Dutch Government that contains the intended changes in the Tax-Code. This report is published on the third Tuesday in September of every year, with the changes being effective from January onwards.

A tax law authorized on December 22, 1999, and effective on January 1st, 2000 established the regular CIT-rate in the Netherlands equal to 35 %, identical to the CIT-tax rate in 1999, on income above 50.000 guilders. Simultaneously a tax bracket below 50.000 guilders was introduced with a tax rate equal to 30 %.[8] The reduction in the lower-rate is motivated from the report "*Ondernemerspakket 21e eeuw*" which urges the government to reduce the regulatory constraints for entrepreneurs. Government decided on a kink instead of an overall

[8]Interestingly, from 1988 until 1998 the Dutch CIT-code contained a *higher* tax rate, although the tax rate varied, on the first 100.000 guilders.

Table 2: Corporate Income tax rates in the Netherlands between 2000 and 2009

Year	Taxable Income	Tax Rate	Taxable Income	Tax Rate	Taxable Income	Tax Rate
2000	0-22.689	30.0 %			> 22.689	35.0 %
2001	0-22.689	30.0 %			> 22.689	35.0 %
2002	0-22.689	29.0 %			> 22.689	34.5 %
2003	0-22.689	29.0 %			> 22.689	34.5 %
2004	0-22.689	29.0 %			> 22.689	34.5 %
2005	0-22.689	27.0 %			> 22.689	31.5 %
2006	0-22.689	25.5 %			> 22.689	29.6 %
2007	0-25.000	20.0 %	25.000-60.000	23.5 %	> 60.000	25.5 %
2008	0-40.000	20.0 %	40.000-200.000	23 %	> 200.000	25.5 %
2009	0-200.000	20.0 %			> 200.000	25.5 %

Notes: as part of a policy package to stimulate the Dutch economy, the Dutch government announced on September 18, 2008 a one-time reduction (with retroactive effect) in the corporate income tax towards 20 % in the year 2008 for firms with taxable income below 275.000 euros. However, this proposal was not finalized until December 18, which effectively implies that it worked as a lump-sum subsidy instead of having an effect on financial policy.

reduction in order to: i) curtail the forgone tax revenues, and ii) target the reduction only on SMEs. The choice of tax rate and bracket-end are guided by budgetary arguments mainly.[9]

On January 1, 2002, these rates are adjusted downwards into 34.5 % for the general CIT-rate and 29 % for the lower bracket. These reductions are part of a broader policy change aimed at "strengthening entrepreneurship" which was deemed necessary. The reduction in the general rate was further motivated by a concern that, from an international perspective, the competitiveness of the CIT-system needed to be improved. This turned out to be a major driving force behind changes in the following years.

On December 16th, 2004, parliament authorized a reduction in the general CIT-rate to 31.5 %, whereas the rate over the lower bracket was reduced to 27 %, to be effective at January 1st 2005. The adjustment is a first step in the so-called "werken aan winst" initiative, and intended to lead to a 30 % general tax rate in 2007 and a 25 % lower rate. This is combined with a more generous tax credit for self-employed, to ensure a roughly neutral effect on the choice of legal form. In a press-release on April 29, 2005 the Dutch Ministry of Finance states that the tax on profit will be modernized in order to ensure that firms will remain in the Netherlands, or will decide invest in the Netherlands. The modernization is therefore mainly aimed at internationally oriented firms, although again the reduction in the lower

[9]See "Memoire van toelichting" included with the "Belastingplan", 2000, vergaderjaar 1999-2000, Kamerstuk: 26820, nr.3.

rate is motivated as an improvement to for the business environment of SMEs.[10] Following upon this first step, the CIT-tax law is adjusted again in 2006. This resulted in a general tax rate of 29.6 % and a lower rate of 25.5 %. Again these changes are motivated primarily by international considerations in the form of comparisons with statutory tax rates in neighboring countries. Interestingly, the politicians seem very eager to adjust the tax rates downwards, as in 2005 they planned a general CIT-rate for 2006 of 30.5 % combined with an SME-rate of 26 %. Also, at this point the originally planned rates (according to the "Belastingplan 2005") for 2007 where 30 % and 25 %, respectively. These intended rates are adjusted downwards in 2006 into 29.1 % and 24.5 % for 2007, respectively. However, during 2006, these rates are further revised downwards and the actual CIT-law for 2007 contains a 25.5 % general CIT-rate and a 20 % lower rate. This, although there is already considerable discussion in 2005 and 2006 concerning the need to reduce the tax rates further. The government expects that general CIT-rates of other EU countries will not go below 25.5 % as this would cause conflicts with the various Controlled-Foreign-Company (CFC) rules in place. It does however stress the need to stimulate the SMEs. It expands the first bracket in order to stimulate more SMEs with a lower CIT-rate and creates a new tax bracket such as to obtain a smooth increase in the tax rate for medium-sized companies as well.[11] In 2008, the second-bracket is extended and the lower-rate is further reduced, again to promote entrepreneurship.[12]

Due to an ongoing discussion with the European Commission (EC), the Dutch government cannot introduce the desired "interest-box" into the CIT-law. Within this interest box, companies could choose to let their net interest income be taxed (or be deducted) against 5 %. The optional character of the box makes it unacceptable for the EC. But, the Dutch government had reserved a budget for this interest box (apparently not expecting any revenues from it). Therefore, during December 2008 the government allowed a one time reduction in the tax rate for income below 250.000 euros towards 20 % for the year 2008,[13] which acts as a lump-sum subsidy. The discussion with the EC continues in 2009 and 2010, leading to a "temporary" (but announced) bracket-end of 200.000 with a tax rate of 20 % (this while

[10]See Kamerstukken II, 2004/2005, 29767, nr 3. p. 2.
[11]See Kamerstukken II 2005/06, 30572, nr. 3. p. 8-9.
[12]See Kamerstukken II, 2007/08, 31 206, nr. 3. p.2.
[13]See Kamerstukken II 2008/09, 31 704, nr. 3, p. 54.

the CIT-law still mentions a tax rate of 23 % between 40.000 and 200.000), which is made permanent for 2011, when it become clear that the EC will not accept the interest-box. Furthermore, the general tax rate is reduced to 20 % in 2011.[14]

In the empirical analysis I do not control for the personal income taxes on capital income. In the Netherlands, an investor in a corporation can be taxed in two ways. A normal investor with an ownership share smaller then 5 %, is taxed in Box 3 of the Dutch Tax Code. In Box 3, a presumptive return on capital (whether invested in equity or debt) is taxed at 30 %. There is a dividend tax in the Netherlands (15 % since 2001), but this can be credited against the tax liability in Box 3 (the investor only has to pay the difference between the tax liability in Box 3 and the dividend taxes already paid). For investors that have a large share in a corporation (larger then 5 %), the rules are different. The capital income (dividends and capital gains) of these investors is taxed in Box 2 against 25 % percent. I do not control for personal tax rates for two reasons. First, I do not observe which companies are owned by a few large shareholders, and which companies are owned mostly by small investors. Secondly, the rules have not changed during the years studied. Finally, there have been changes in the Thin-Capitalization rules in the Netherlands have (partly) also affected some SMEs, which might therefore be a relevant concern. The current version of the paper does not take this into account yet.

5 Data

I use micro data on Non-Financial Firms (the so-called NFO database) obtained from Statistics Netherlands (CBS) to test the hypotheses defined. The data set contains information from all firms with a balance sheet total smaller than 22 million that are liable corporate tax in the Netherlands. The data entries are collected from the tax returns filled in by the firm's representatives. Not all details are available, unfortunately some posts have been aggregated. The entries that I need in order to study the financing structure and investment are available, though. The data is available for the period 2000 till 2009, leading to a total number of 1.967.495 observations.

[14]See Belastingplan, 2011 and Kamerstukken, 2010/11, 32 504, nr, 3. p. 10-11.

Table 3: Raw Data

Variable	Obs.	Selection	Variable	Obs.	Selection
Assets: Tangible Assets	133	yes	Liabilities: Reserves	586	yes
Assets: Intangible Assets	0	yes	Liabilities: Long-term Debt	552	yes
Assets: Investment in Subsidiaries	13725	no	Liabilities: Short-term Debt	5680	yes
Assets: Long-term Accounts Receivable	3869	yes	Liabilities: Trade Account Creditors	1872	yes
Assets: Short-term Accounts Receivable	811	yes	Balance-Sheet Total ≤ 0	6050	yes
Assets: Cash	23284	no	Balance-Sheet Total ≥ 22 mil.	14445	yes
P & L Statement: Revenue	7605	yes	P & L Statement: Interest Received	1936	yes
P & L Statement: Salary Costs *	6100	yes	P & L Statement: Interest Payments*	10311	yes
P & L Statement: Depreciation Allowances*	54	yes	P & L Statement: Dividend	321	no

Notes: Besides the bottom two row and the entries with a star, the entries reflect the number of negative observations for the variable mentioned. The variables with a star should be negative, as they reflect an expense, hence we report the number of positive observations for these variables.

5.1 Data Selection

In this subsection I describe how the total number of 1.967.405 observations in the raw data is reduced into the final sample used for the statistical analysis. The first selection criteria employed is to throw away all observations with a Balance-Sheet Total of more than 22 million. The reason for this selection criterium is that the data set is a merger of two separate databases, one for small and medium-sized firms (size less than 23 million) and one for larger firms. The data collection for both databases was very different. For SMEs the CIT returns are used such that the data obtained complies with the Dutch Fiscal Accounting Standards, whereas for the larger firms questionnaires are used and the data complies with International Commercial Accounting Standards. To be sure that my data includes solely the SMEs, and not by accident some large firms, I decided to also drop the firms between 22 million and 23 million.

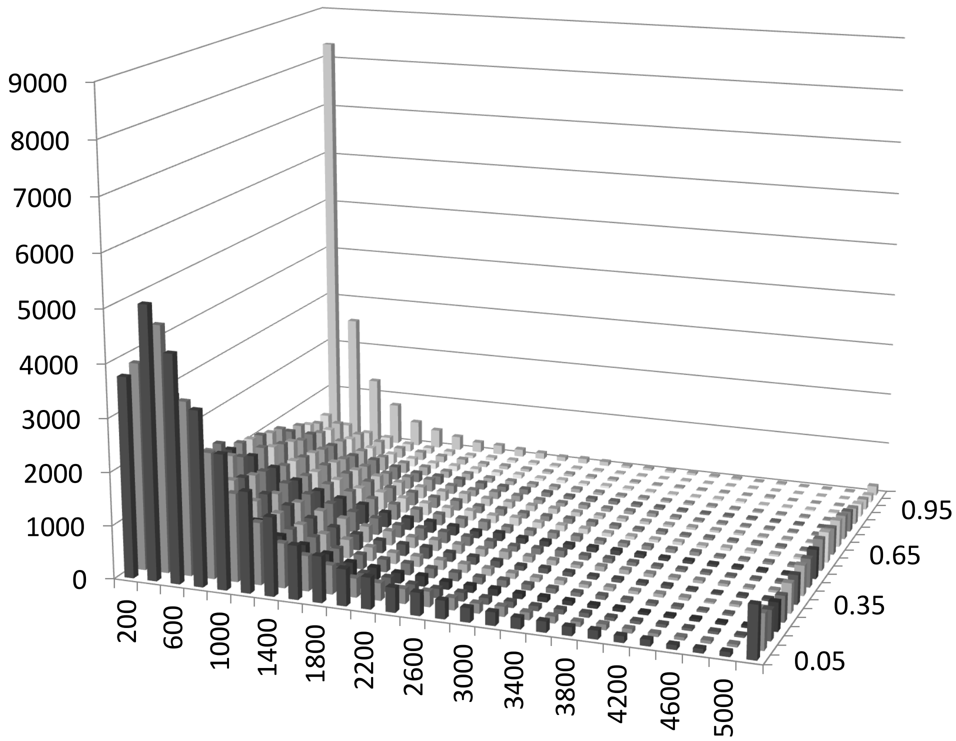
A second problem is that some of the entries are unlikely to be correct (notice that the figures have not been checked by the tax authorities prior to the data gathering by CBS). Table 3 reports some suspicious observations. The table shows for some variables the number of negative data entries in the raw data when positive would be expected, and the number of positive entries when negative would be expected (the latter are indicated by a star). For example, I find in total 6050 observations with a Total Balance-Sheet equal to are smaller then zero. As this would blow up the Debt-Asset-Ratio (DAR), I remove these observations. As a second example, note that there are 6100 observations with negative Salary Cost, as this also contradicts with intuition, I remove these observations. To summarize, the column on the right-hand side indicates whether the respective variable is used for data-selection. All the suspicious observations have been removed. Note that most of those are overlapping, so fewer then the sum of the suspicious observations where deleted.

With respect to the Raw Data, an interesting statistic to mention is the percentage of negative entries for Earnings Before Tax and *before* Loss Compensation, EBT. On average almost one-third of the firms reports a loss. The largest share of losses have been obtained in 2003, while also in 2002 and 2009 a large number of firms had negative EBT. After all suspicious observations are removed, I am left with a data set of 1.796.704 observations, representing an unbalanced panel. A single firm-year observation in this unbalanced panel is related to a so-called "tax-unit", which is supposed to fill in it's own tax form. Note that a broader definition of a firm might include a group of these tax-units, this is an issue that I ignore for now, implying that I assume that each tax-unit can choose it's own DAR and investment level.

There are bankruptcies and firm start-ups throughout the years. Some firms only exist for one year others exist over the full length of the panel. From this, I define two subgroups that will be analyses below. To start with, I define a firm as Mature when it is active in all years of the sample period yielding a balanced panel of a relative homogeneous group of firms. It turned out that only 34.088 firms exist from 2000 till 2009, implying a total of 340.880 observations, which is still substantial. Note that this not only excludes all the bankruptcies and newly created firms, it also excludes mergers and acquisitions, implying some sample selection biases. Also, I exclude highly successful firms that grow fast and therefore grow out of the sample range. In this reduced sample, 28 % reports a loss on average, which signals that I study firms that perform above average, completely unsuccessful firms did not survive these selection criteria. The group of Mature firms might also include relative young firms that started-up in 1999. However, the upcoming analyses will be performed on observations between 2004 and 2009 (see below), such that the minimum age of the firm is 5 years. A second group that I identify are the Young firms that have less than or equal to 5 years of observations in the data. This class contains both firms that left the data set because of either bankruptcy or mergers, and firms that just entered "late". The group of Young firms is much larger than the groups of Mature firms, 1.4 million compared to roughly 340.000 for mature firms.

As a first look at the heterogeneity in the data. Figure 1 shows the joint distribution of the Debt-Asset-Rate (DAR) and Balance-Sheet-Total (Size) for the firms. DAR is computed as the ratio of the sum of Long-Term Debt and Short-Term Debt to Balance-Sheet Total. Firms have been counted per Size Class (bins of size 200.000) and DAR Class (bins of size 0.05). All firms with a DAR larger than 1.2 and Size larger than 5 million are lumped together to prevent individual cases being disclosed (a requirement from Statistics Netherlands). Note,

Figure 1: Joint Distribution



that while these Mature firms are supposed to be relatively homogeneous, we still see that most firms are relatively small with a smooth downward sloping distribution. On the other-hand, per size class we see a substantial group of firms with very low DARs but there is a significant density at all values, confirming the analysis in Section 3. Interestingly, DAR and size are almost uncorrelated with a correlation coefficient of 0.05. When comparing between Young and Mature firms, I observe that a larger fraction of the older firms show a low DAR compared to the Young firms, also Young firms show a larger fraction of observations in the high DAR classes. These observations seem not in accordance with the model. However, they might be reconsiled when k_i is very small for Young firms, leading to a large share of $Y3$ firms in the data. On the other hand, if k_i grows when firms grow older, Mature firms might be of type $M2$.

Table 4: Some Descriptive Statistics

	Mean	Median	St. Dev.	Max	Min
DAR, Total Data	0.92	0.44	13.30	6509.50	0.00
DAR, Mature	0.56	0.30	3.90	817.00	0.00
SDAR, Mature	0.47	0.21	3.58	817.00	0.00
Balance-Sheet Total, Mature	1167.15	560.00	1770.14	21914.00	1.00
Turnover, Mature	1868.58	543.00	4489.80	193653.00	0.00

Notes: The numbers for Balance-Sheet Total and Turnover are in thousands of euros.

The definition of DAR used as a dependent variable for the regressions below contains only Short-Term Debt to Total Assets. This measure is more easily adjusted than the former definition of the Debt-Asset-Ratio, for which I do not find significant results. Table 4 compares both measures for the "Raw" data (after suspicious observations are removed) and Mature firms. Most importantly, observe that the DAR for Mature firms is lower on average, but is also less skewed and more clustered around the mean (the standard deviation is substantially reduced). Very high DARs can be explained by a number of loss-making years on a row causing a sharp decline in Equity while Debt remains constant. The variable SDAR seems to behave very similar to DAR, it is a bit lower which is explained by the removal of Long-Term Debt from the numerator. Table 4 also reports the distribution of Balance-Sheet Total and turnover for Mature firms, which is skewed, most firms are very small (smaller than 560 thousand euros). With a return on assets of 4 %, this median firm earns around 22.400 euros in capital income a year (close to the end of the first bracket in the Dutch CIT before 2007).

Besides differentiating between Mature and Young firms, I also define a Constrained firms and Unconstrained firms following the definition of Fazzari, Hubbard and Petersen (1987). Firms are assigned into 7 classes by evaluating the highest dividend-to-income ratio (Div-Ratio) for each of the years the firm is in the data-set. Class 1 contains firms with a Div-Ratio smaller than 0.1 in all years. Classes 2 till 5 include firms with Div-Ratio smaller than 0.2 till 0.5, with steps of 0.1, respectively. Class 6 includes firms with Div-Ratio above 0.5 and Class 0 contains firms with a Div-Ratio smaller than zero. The firms in Class 1 are supposed to be Constrained (roughly 66 % of all firms), they do not pay out dividends, which might be a strong signal that they use their income as cheap funds. Firms in Class 4 and up are labeled Unconstrained firms in the remainder of this paper (roughly 25 % of all firms). I observe that when firms grow older, the fraction of constrained firms decreases and the fraction of unconstrained firms increases (75 % of the new firms are constrained, 19 % is unconstrained). It is interesting to observe that the higher is the DAR of a firm, the more often the firm is labeled a Constrained firm, and vice-versa for Unconstrained.

5.2 Earnings Before Tax but After Loss Compensation

To compute the contemporaneous marginal tax rate, which is one of the main variables in the analysis, I need to have a correct measure of taxable income (which is also crucial in itself). This is obtained by applying the loss compensation rules onto the Earnings Before Tax as reported in the database, as this is not yet corrected for Loss Compensation. These loss compensation rules have changed in the Netherlands in 2007. Before 2007, losses could be carried back for three years and carried forward indefinitely. After 2007 losses could only be carried back one year and carried forward nine years. Because I only have three years after 2007, the latter restriction on loss carry-forward is never effective. The loss carry-backward restriction is however relevant and is effectuated numerous times in the sample. When there is a profit in year t, assuming no loss carry forward at that time, the losses in the upcoming three years must be used to compensate this profit. If not, the uncompensated part is not entitled to future compensation anymore. However, when also $t-1$ was a year with positive profits, the hypothetical losses in years $t+1$ and $t+2$ are first used to compensate the profit in year $t-1$. It is therefore not sufficient to look at the sum of losses in the three years that follow year t in order to determine whether the profit in year t is fully compensated or not, the full history of profits and losses is important. After 2007 things become more straightforward as I only have to look at whether there is a profit in the year preceding a loss, any excess profit in this case cannot be used to reclaim taxes afterwards. A second complication arises because I do not have data prior to the year 2000. I therefore need to assume that there are neither positive profits, nor losses carried forward at the start of the sample period. This implies that especially in the first years of the sample, I cannot compute taxable income, and therefore the marginal tax rate, correctly. Initial profits carried forward are ignored in the years 2000, 2001 and 2002 but would have been ignored afterwards even if I had known them. Initial losses carried forward are a continuous treat for my computations. However, as time progresses it becomes less likely that any prior losses have not yet been compensated. These considerations lead me to decide to drop the first four years of the sample after I have computed Earnings Before Taxes but after Loss-Compensation (EBL) such that the sample period is shortened into 2004-2009. Note that Section 4 made clear that all the major changes in the corporate tax law occurred after 2004, such that dropping the first three years of observations does not affect the identification substantially.

6 Three Methodologies

In this section I discuss the methodologies used to measure whether investments and financing decisions by Dutch SMEs respond to the CIT-law. I use three methodologies. First, I follow e.g. Devereux *et al.* (2013) by studying bunching around the bracket-ends in the CIT-law between 2003 and 2009. Bunching analyses can be used to provide an estimate for the elasticity of corporate taxable income (see e.g. Saez (2010), Chetty, Friedman, Olsen and Pistaferri (2011)). However, I use the method first and foremost as a descriptive statistic.[15] This because the existence of bunching would rule out the use of the Difference-in-Difference (Dif-in-Dif) approach that focusses on specific changes in the CIT-law around bracket-ends. Given the assumption that firms in the treatment and control groups are roughly similar, Dif-in-Dif approaches a causal effect of the tax change on choices as good as possible. However, it has the drawback of a smaller sample size. Finally, a Panel Data estimator is therefore used to evaluate the effect of the CIT-rates on investment and financing on average over the whole sample. The latter methodology has the advantage of using the whole time period, but the drawback of an endogenous marginal tax rate (as discussed below). The estimates from this final methodology will in the end be the most informative to the government.

[15] In a follow-up paper I want to compute explicit welfare losses inferred from the elasticity of investment and the debt-asset ratio. I intend to compare this with the welfare loss obtained from using the Elasticity of Corporate Taxable Income obtained from the bunching analysis as a sufficient statistic.

6.1 Bunching Estimation Method

I follow the approach by and Devereux *et al.* (2013) by using bunching around bracket-ends as an identification strategy for estimating the elasticity of corporate taxable income. Conceptually, consider a small increase in the CIT-rate from τ^l to τ^h at taxable income A in some year. I compute the fraction of firms that has a taxable income *after* loss-compensation at the kink A as $H(\tau^l, \tau^h) \equiv \int_A^{A+\Delta B} h_B(B)dB$, where B denotes taxable income after loss-compensation (EBL), $h_B(B)$ denotes the density of firms with taxable income B *before* the kink in the CIT was introduced, while $A + \Delta B$ denotes those firms with the highest level of taxable income that bunches at A after the kink is introduced.[16] Intuitively, assuming that all firms are roughly equally responsive to the change in the tax, there will be a marginal type of firm (characterized by $B_i = A + \Delta B$) for which it is marginally attractive to re-arrange (some of) it's business affairs (while holding total income constant) such that it's taxable income is just equal to A. Now when I assume that $h_B(.)$ is uniform around the kink, and that only the change in the marginal tax affects the choices by the respective SME's, I can compute the elasticity of corporate taxable income as

$$\epsilon = \frac{dB/B}{d\tau/\tau} \approx \frac{H(\tau_l, \tau_h)/h_B(B)}{Bln\left(\frac{1-\tau_l}{1-\tau_h}\right)} \tag{14}$$

where the numerator gives the number of firms at the kink *after* the kink is introduced, as a fraction of the number of firms at the same taxable income *before* the kink is introduced, it proxies for the excess bunch EB which shows the change in taxable income due to the tax.

In order to determine EB we need to estimate the counterfactual density of B that would arise had there not been a kink in the CIT-law. For this, I use the actual density while excluding an interval of values for B around the kink (where I expect the density to be affected by the kink). For this, I create bins of 1000 euros and count (c_{Bt}) the number of firms that have an income equal to $B \in [0, max(B_{it}]$ in a specific year t, with $max(B_{it})$

[16] An interesting extension would be to also use earnings before tax but before loss compensation is applied, which is reported by Statistic Netherlands, as a robustness check to see whether this affects my results substantially. Also, I might use actual taxes paid, to infer taxable income by inverting the progressive tax schedule: $B_{it} = [T_{it} - (\tau^l_{it} - \tau^h_{it})A_{it}]/\tau^h_{it}$, although tax credits will cause inaccuracies in this case. I leave both issues for future research.

indicating the highest taxable income. I then fit a polynomial of order 5, following Devereux *et al.* (2013) to a range of the empirical density including the kink, but excluding a small interval around the kink. By choosing a range out of the total empirical density I hope to better fit the polynomial compared to the polynomial that would result from fitting the whole empirical density (which might include more than one bracket-end). Following Devereux *et al.* (2013), the complete regression can be represented by (dropping time indices for now as I focus on only one year for each estimated polynomial)

$$c_B = \sum_{l=0}^{5} \beta_l.(z_B)^l + \sum_{i=z_L}^{z_U} \gamma_i.1[z_B = i] + \sum_{r \in R_k} \rho_{r_k}. \left[\frac{z_B}{r} \in N\right] + \epsilon_B \tag{15}$$

where $z_B = B/A$ denotes taxable income relative to the kink. The first term represents the polynomial of order 5. The second term captures the excluded interval, I include a dummy for all values of $z_B \in \{z_L, z_U\}$, causing a perfect fit in this interval. The final term captures potential round-number bunching. As discussed in Kleven en Waseem (2012) and Devereux *et al.* (2013) the density of taxable income seems larger at round-numbers. Specifically, the set R_k includes the round-numbers for which I expect bunching.[17] The predicted values of Eq. (15), excluding the estimated values for the dummies in the excluded range, yield the first estimate of the counterfactual distribution $\hat{c}_b^0$. This can be used to define the excess mass around the kink as

$$\hat{EH}^0 = \sum_{j=z_L}^{z_U} (c_B - \hat{c}_B^0), \tag{16}$$

where EH denotes the excess in the empirical distribution ($H(.)$). Note, I take the sum over the whole excluded area, also above the kink. This takes into account that some entrepreneurs might not have perfect control over their final taxable income. Moreover, entrepreneurs have to set their tax shifting parameters before the actual realization of, for example, turnover. In that case, some firms might still overshoot the kink, whereas they intended to end up exactly

[17] I follow Devereux, Liu and Loretz (2013) here as well by considering bunching at each 5k interval for points below 20k, at 10k intervals until 100k and 50k intervals until 300k (which is the maximum value of B that I consider).

at the kink. When such imperfections exist, we would also observe an excess mass just above the kink. Furthermore, Devereux *et al.* (2013) make clear, this first estimate suffers from two inaccuracies. First, the tax increase will have affected taxable income in general. That is, all firms in the high tax bracket have an incentive to earn less due to the higher tax and, therefore, report a lower taxable income. This reduces the observed number of firms everywhere to the right of the kink relative to the true counterfactual distribution. Second, the firms that bunch at the kink come from the region just after the kink. I follow Devereux *et al.* (2013) and Chetty *et al.* (2011) by computing a second counterfactual distribution that is shifted upwards until the area under the counterfactual distribution is equal to the area under the empirical distribution:

$$c_B \left(1 + 1[B > R]\frac{\hat{EH}^0}{\sum_{j=z_U+1}^{\infty} c_j}\right) = \sum_{l=0}^{5} \beta_i.(z_B)^l + \sum_{i=z_L}^{z_U} \gamma_i.1[z_B = i] + \sum_{r \in R_k} \rho_{r_k}. \left[\frac{z_B}{r} \in N\right] + \epsilon_B, \tag{17}$$

where the "excess firms" ($\hat{EH}^0$) as a fraction of all firms above the excluded area ($\sum_{j=z_U+1}^{\infty} c_j$) are spread evenly over all bins above the excluded area. This leads to a *corrected* counterfactual distribution: $\hat{c}_b$ with a corrected excess mass of

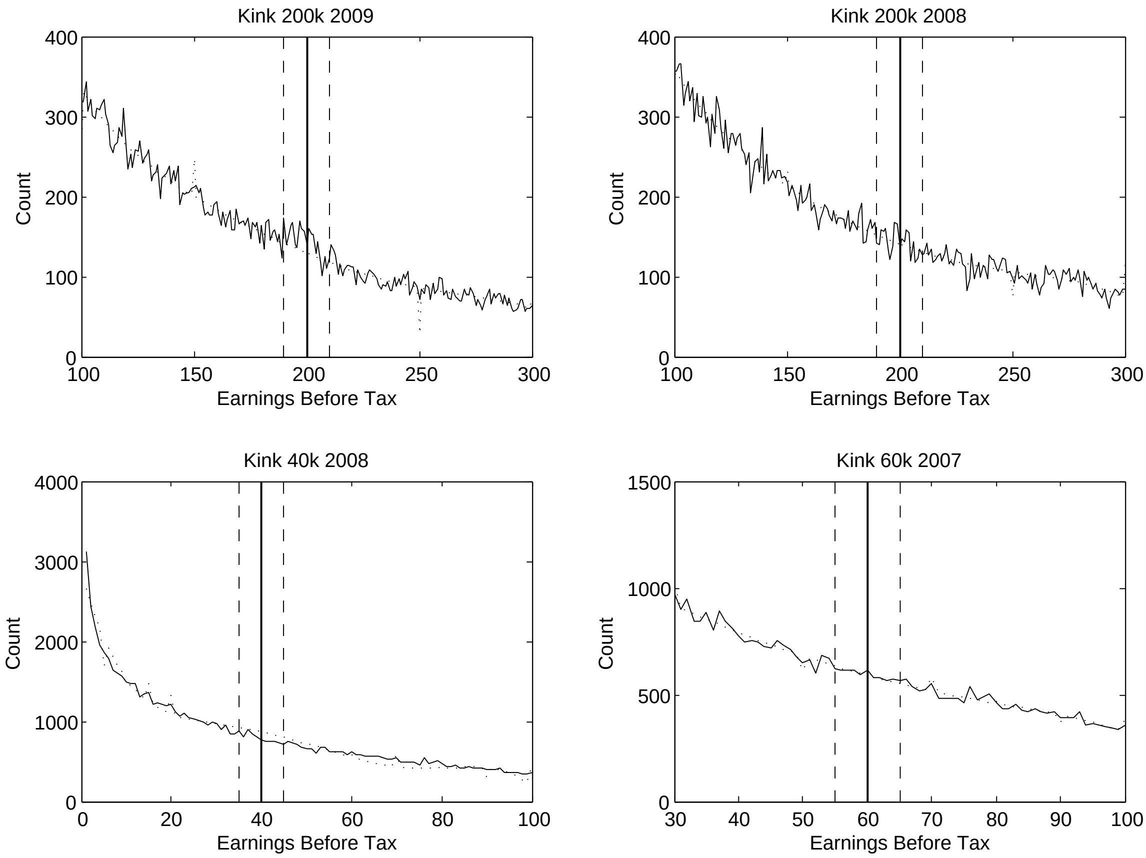
$$\hat{EH} = \sum_{j=z_L}^{z_U} (c_B - \hat{c}_B) \tag{18}$$

such that the excess bunch is given by

$$\hat{EB} = \frac{\hat{EH}}{\sum_{j=z_L}^{z_U} (\hat{c}_j / N_j)} \tag{19}$$

where N_j is a count of the number of bins that have been excluded. Standard errors for EB are obtained from a bootstrap method where I estimate the residuals from Eq. (17) and use these residuals to generate new firm counts. I generate a new residual by sampling with replacement from the old vector of residuals, and add this new residual to the fitted-values

Figure 2: Bunching between 2007 and 2009



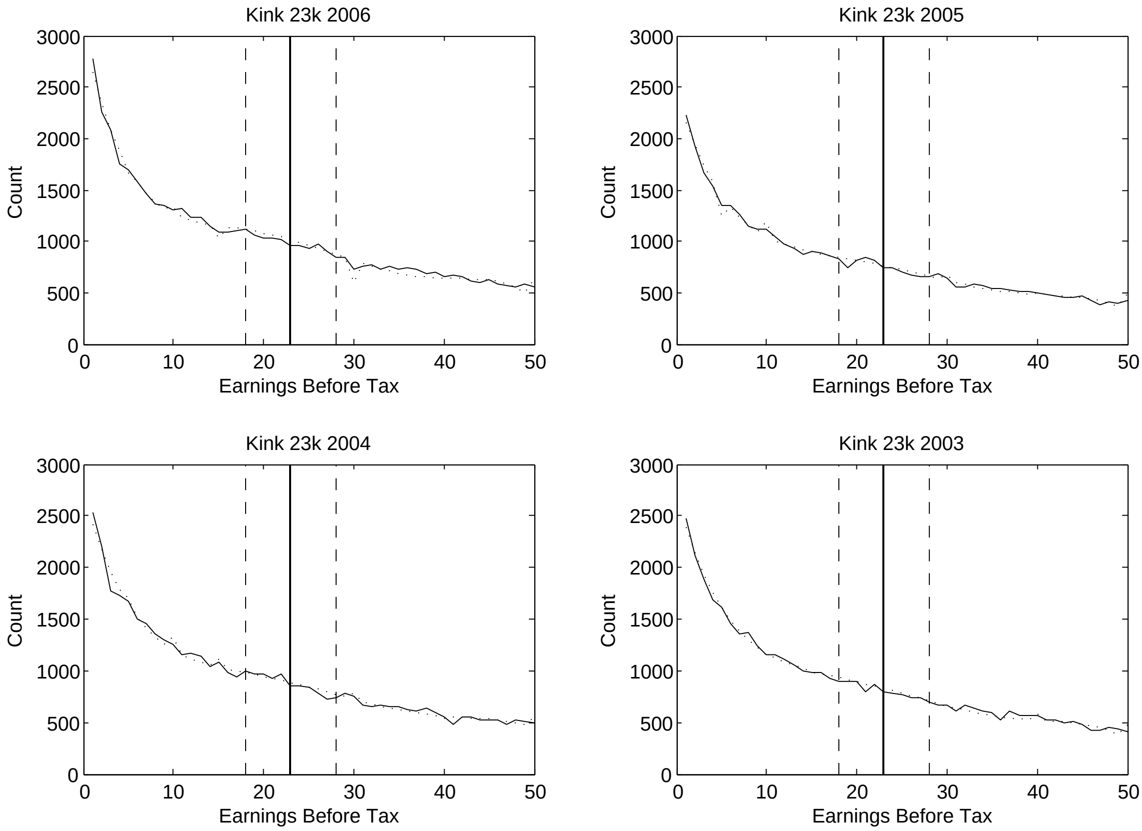
obtained from Eq. (17), a new estimate of EB is obtained by applying the methods discussed above to these bootstrapped counts.

Bunching Results

Figures 2 and 3 show bunching around the various kinks (the vertical-solid lines) that can be found in Table 2.[18] The counterfactual distribution is indicated by the dotted smooth line, while the empirical distribution is given by the solid-line. The vertical-dashed lines show excluded interval. Table 5 reports the estimated excess bunching EB and the respective (boots-trapped) standard errors.

[18]I do not report the graph for the 25k kink in 2007 to save some space as it is very similar to the graphs for the 23 kink in previous years.

Figure 3: Bunching around 23k before 2003-2006



Interestingly, I only find significant bunching at the 200k kink in 2009. For this case, Table 5 therefore also reports bunching in the (median values of the) Debt-Asset-Ratio, the Salary Costs and other Costs, this to infer whether those variables can explain the bunching observed in the frequencies. The most striking result here is that the estimates suggest that especially wages are used to manipulate taxable income. Also for other Costs I find significant excess bunching, but given the large variance in this variable (also outside the excluded interval), I am less convinced by this result. Note that the absence of bunching around the 23k kink stands in sharp contrast with the findings of Devereux *et al.* (2013) who also find significant bunching at very low levels of taxable income.

Table 5: Excess Bunching

Figure (2): 200k kink in 2009

	200k 09	mWage	mCosts	mDar
EB	2.160***	0.123**	0.167**	0.026
Std. Error	0.269	0.027	0.069	0.023
Tax Differential	5.5 %	5.5 %	5.5 %	5.5 %

Figure (2): Kinks in 2007 and 2008

	200k 08	40k 08	60k 07	25k 07
EB	0.185.	-1.513***	-0.025	-0.178
Std Error	0.291	0.291	0.160	0.171
Tax Differential	2.5 %	3.0 %	2.0 %	3.5 %

Figure (3): Kinks around 23k 2003 till 2006

	2006	2005	2004	2003
EB	-0.234.	-0.030	-0.189	-0.228
Std Error	0.142	0.258	0.139	0.160
Tax Differential	4.1 %	4.5 %	5.5 %	5.5 %

6.2 Difference-in-Difference methodology

The Difference-in-Difference method (Dif-in-Dif) focusses on specific changes in the tax law that asymmetrically affect two groups of otherwise almost similar firms in order to identify a treatment effect. The results of this analysis is most useful when compared to both the bunching-analyses discussed before and the panel data techniques that follow. Dif-in-Dif relies on the assumption that firms are more or less similar at both sides of the kink. The results of the bunching analyses are therefore in general encouraging. Especially the absence of bunching in DAR around the 200k kink is important. On the other hand, Dif-in-Dif comes closest to a true causal effect from the tax increase and a significant effect in at least some of the Dif-in-Dif analyses can therefore be regarded as a necessary condition for claiming a causal relationship based upon the panel-data techniques to be discussed later.

As discussed in Section 4, after 2004 every year there have been changes in the CIT-law leading to good identification opportunities. Tax rates have been reduced in a number of steps and, maybe even more important, the tax brackets have been adjusted several times. To stress the economic significance of the change in the corporate tax schedule, compare the marginal tax rate paid by a firm with taxable profits between 25k and 40k in 2004 with the marginal tax rate of a similar firm in 2008, the rate decreased with 14.5 percent. Furthermore,

Table 6: Difference-in-Difference Intervals

Year	Kink	Treatment	Control
2007 - 2008	25k	25k - 40k	10k - 25k
2007 - 2008	200k	140k - 200k	200k - 260k
2008 - 2009	40k	40k - 55k	25k - 40k
2008 - 2009	200k	140k - 200k	200k - 260k

Notes: Column Kink denotes the respective kink studied. Treatment shows the range within which firms are being supposed to be treated. Control gives the range for the control group.

note that before 2007 there are no clear natural experiments: the tax rates on both sides of a tax bracket changed in all cases. However, the introduction of an additional tax bracket in 2007 and 2008, provides a few interesting cases in which a Dif-in-Dif design can identify the tax effect on the financing structure and potentially on the investment decision (although adjustment costs will be more pronounced for investment).

I discuss one quasi-natural experiment in debt (the kink at 25k in 2007) and define treatment and control for the remaining experiments in Table 6. The selection variable that divides the firms in treatment and control group is taxable income *after* loss compensation is taken into account: earnings before taxes but corrected for losses (EBL). Depending on the change in the corporate tax law firms either experienced a shock, those are the "treated", or are not affected, the control group. I create a dummy variable (T_{it}) that equals one for the treated after they received treatment and zero otherwise. Firms in 2007 that earned between 25k and 40k faced a 23.5 % marginal tax rate, while in 2008 these firms (assuming their taxable income is still between 25k and 40k) face a 20 % rate, a decline of 3.5 %. The firms between 10k and 25k always have a 20 % marginal tax rate. I therefore assign a one to treated in 2007, as this is the exception, the dummy therefore measures an increase in the tax rate. Figure 4 visualizes the quasi-experiment around 25k between 2007 and 2008 and the case for 200k between 2007 and 2008, note that the selection of treatment and control is similar for 2008-2009. The specification estimated is given by the following equation

$$Y_{it} = \alpha^d T_{it} + \sum_{l=1}^{3} \beta_l^d (EBL_i)^l + \mu_i^d + \eta_t^d + \epsilon_{it}. \tag{20}$$

where Y_{it} either denotes the Short-Term-Debt-Asset-Ratio (SDAR): (D_{it}/A_{it}), or the change in Investment $((I_{it} - I_{i,t-1}))$. The polynomial of Earnings Before Taxes (EBL_i) is used to correct for the potential endogeneity of the selection variable (taxable income), μ_i^d denotes a firm fixed-effect, while η_t^d denotes a year fixed effect (the d indicates that I am dealing with difference-in-difference here).

I conduct two tests. The first test selects all firms that are between 10k and 25k in *both* 2007 and 2008 into the control group and the firms that are between 25k and 40k in the treatment group. I label this the Small sample. The second test selects all firms that are between 10k and 25k in 2007 into the control group, while the firms that are between 25k and 40k in 2007 are selected into the treatment group. Firms are left free in 2008. I label this the Broad sample. Realize that firms that respond aggressively to the tax reduction, for example by reducing their debt in response to a tax reduction, might migrate out of the treatment group in 2008 (have a taxable income above 40k).[19] Similar tests are constructed for the 40k kink in between 2007 and 2008 and the 200k kink along which changes occurred both between 2007 and 2008 and between 2008 and 2009.

Results Difference-in-Difference

Table 7 presents the results of the Dif-in-Dif methodology for SDAR. I differentiate between various sub-groups. The first six columns adhere to a full sample of firms in the respective years satisfying the conditions discussed above. The final six columns focus on a sample of Mature firms. Within each sample, the first three columns follow the small selection (S) procedure and the final three columns the broad selection criterium (B). Within each selection criterium I differentiate between all firms (A), constrained firms (C) and unconstrained firms (U). I study four kinks.

The line with $\hat{\alpha}$ reports the coefficient of the treatment dummy. The line with shock, gives the change in the marginal tax rate in respective quasi-experiment. To compute the implied

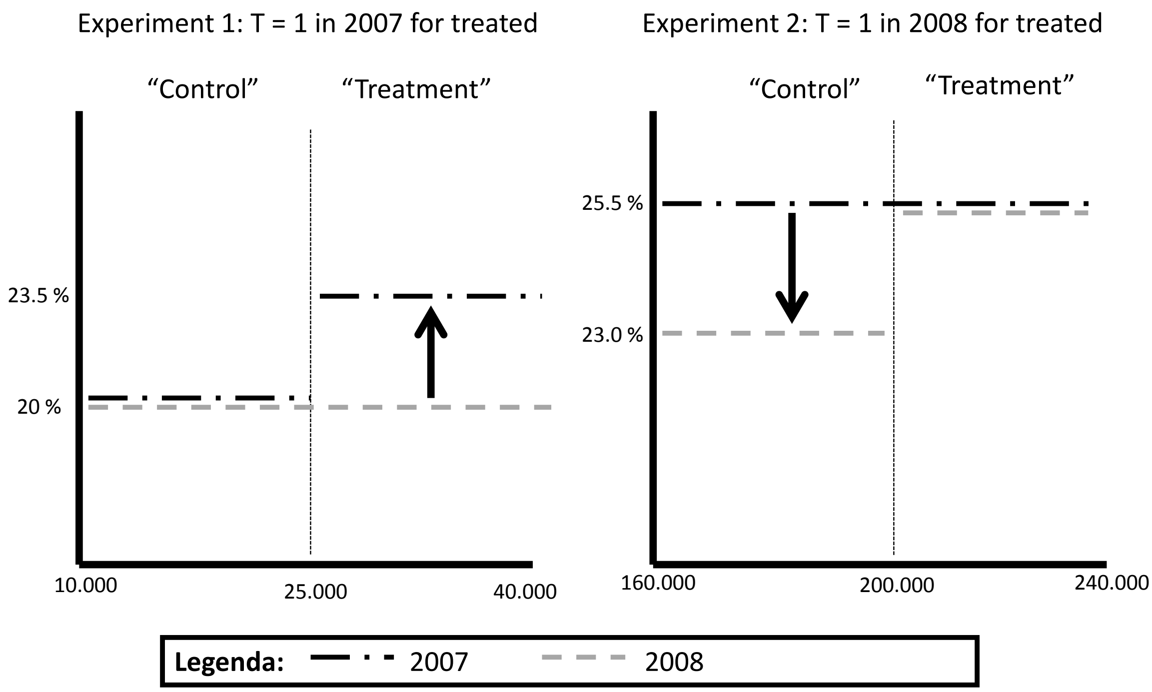
[19]Note, I might go even further and select firms that are both on average over the full sample period and in the year *before* the change within a specific range. This will select firms that exhibit most likely less sensitivity in EBL. I leave this for future research.

Table 7: Difference-in-Difference and Financing

	Full Sample						Mature Firms					
	S-A	S-C	S-U	B-A	B-C	B-U	S-A	S-C	S-U	B-A	B-C	B-U
	2007-2008 25k Full Sample						2007-2008 25k Mature Firms					
α^d	0.054	0.078	0.014*	0.008	0.007	0.011**	0.011	0.024*	-0.004	0.016**	0.027**	0.003
	(0.034)	(0.051)	(0.007)	(0.008)	(0.012)	(0.006)	(0.008)	(0.014)	(0.010)	(0.007)	(0.012)	(0.006)
Shock	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035
Number of Firms	17879	13405	3958	27711	18843	7465	1487	798	566	4429	2346	1586
R-squared	0.004	0.004	0.034	0.001	0.001	0.011	0.032	0.029	0.042	0.002	0.002	0.019
	2008-2009 40k Full Sample						2008-2009 40k Mature Firms					
α^d	-0.022	-0.032	0.003	0.011	0.016	-0.003	-0.007	-0.007	-0.003	-0.005	-0.015	-0.000
	(0.020)	(0.030)	(0.007)	(0.022)	(0.034)	(0.003)	(0.008)	(0.012)	(0.012)	(0.008)	(0.016)	(0.005)
Shock	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Number of Firms	7901	5188	2494	25333	16560	7592	780	347	373	3586	1617	1587
R-squared	0.003	0.004	0.008	0.000	0.000	0.005	0.028	0.050	0.017	0.005	0.006	0.011
	2007-2008 200k Full Sample						2007-2008 200k Mature Firms					
α^d	-0.002	-0.005	0.003	-0.005	0.002	-0.004	0.010	-0.004	0.015	-0.014	-0.020**	0.021
	(0.004)	(0.007)	(0.006)	(0.005)	(0.011)	(0.005)	(0.007)	(0.013)	(0.009)	(0.011)	(0.008)	(0.027)
Shock	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Number of Firms	9313	4477	4495	16347	6835	8456	1128	266	773	3321	894	2063
R-squared	0.089	0.097	0.087	0.000	0.001	0.001	0.070	0.039	0.090	0.001	0.025	0.002
	2008-2009 200k Full Sample						2008-2009 200k Mature Firms					
α^d	0.001	0.010	-0.005	-0.013***	-0.003	-0.015***	-0.009	-0.014	-0.004	-0.021***	-0.019	-0.018***
	(0.005)	(0.007)	(0.006)	(0.004)	(0.005)	(0.005)	(0.008)	(0.013)	(0.009)	(0.005)	(0.012)	(0.006)
Shock	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Number of Firms	6786	3014	3575	17372	7956	8462	944	234	656	3099	873	1897
R-squared	0.018	0.067	0.004	0.000	0.019	0.004	0.013	0.064	0.012	0.004	0.003	0.013

Notes: ***, **, * denote significance at the 1, 5 or 10 percent level, respectively. Conventional Generalized Least-Squares Standard Errors are reported in parentheses below the parameter estimates. Period fixed and firm fixed effects are included.

Figure 4: Difference-in-Difference



semi-elasticities, divide the coefficient by the shock times the median value of SDAR, which is equal to 0.3 for the whole sample and 0.2 for Mature firms respectively.

The first important observation is that the signs of the estimated coefficients are in general in accordance with our expectations. The treatment-dummy variable is created such that the treatment around the 25k and 40k kinks are an increase in the tax rate (the dummy is one when the tax is high and zero otherwise), so I expect this to be positively correlated with the DAR. Around the 200k kink, treatment is assigned to the group of firms that experience a reduction (the dummy is one for the group that experiences a reduction and zero otherwise).

For the 25k kink, I find a significant effect for unconstrained firms, and for mature constrained firms. Note that Section (3) predicts that both amongst the constrained and the unconstrained firms there is a group of firms that follows a trade-off theory ($M2$ and $M3$, respectively). The semi-elasticities are between 1.2 (B-U Full Sample) and 4.5 (B)C Mature

Firms). For the 40k kink, I do not find any significant results. Two insights might explain the lack of significance here. First, given the parliamentary discussion on the change in 2008 (see Section 4) one might wonder whether there might have been uncertainty concerning the long-term marginal tax rate for the firms in the control group. Also, firms between 40k and 200k received a one-time tax rebate in 2008. Third, some of the firms in the treatment group experienced a reduction in the marginal tax as well between 2007 and 2008. The cumulative reductions received by the treatment and control groups since 2004, are exactly equal for the quasi-experiment around 40k, whereas for the 25k case the cumulative treatment on the treatment group is larger compared to the control group.

For the 200k kink, I observe mainly significant effects for the change between 2008 and 2009. Again, I point to the uncertainty around the 200k bracket-end during 2008, which might have implied that most firms did not respond the (expected) kink in the tax bracket yet. Only constrained mature firms respond to the kink between 2007 and 2008. This is followed by an adjustment through the unconstrained firms between 2008 and 2009, which is again somewhat more pronounced amongst the mature firms in the data set. The semi-elasticity in 2007-2008 equals 4, whereas I find a semi-elasticity of 3 and 3.5 for All and Unconstrained firms in 2008-2009, respectively.

Table 8 studies the investment decisions, where I only focus on the two lower treatments because I need treatment to be effective above the tax bracket. Otherwise, also the average tax rates in the control group would have been affected.[20] Results are mixed, which might not come as a surprise given potential adjustment costs for changing investment strategies. To interpret the results recognize that to transform the coefficients into elasticities one must multiply with roughly 0.65.[21] The significant negative results that I find are for the 25k kink, which does not show any sign of bunching, whereas I do not find any significant results around the 40k kink where I also found negative bunching. The significant negative coefficients adhere

[20] For investments average taxes matter in case firms are constrained. Therefore, one could argue that (constrained) firms further away from the kink are affected more. I have included an interaction variable with distance to the kink, not finding any (consistent) significant results.

[21] To transform the change in investment dI into an elasticity we must multiply with $(1/dt)(t/I)$, using an average tax of $t = 0.23$ and a change in the tax of $dt = 0.03$) we find $t/(dt * I) \approx 0.65$ for a median value of investment around 12 (12.000 euros).

to the constrained firms in the panel, which I would expect to respond when their AETR changes.

6.3 Panel Data Estimator

The third methodology that I discuss is a panel data estimator employing a large number of observations to establish whether on average I find SMEs responding to the changes in the CIT-system identified above. To start with, I briefly discuss the backward-looking marginal tax rate (MTR) that I use and the Average Effective Tax Rate (AETR) that is included in the regression equations.

MTR and AETR

Below, MTR_{it} denotes the firm-specific *current* marginal tax rate after taking into account all loss-compensation provisions. It represent the marginal tax rate the firm faces in the current year over an additional euro of taxable income. Some papers in the literature use a more sophisticated method. That is, scholars have computed simulated *forward-looking* marginal tax rates as in amongst others Graham (1996) and Graham *et al.* (1998). For now, I assume that the managers of SMEs are relatively short-sighted. That is, the current marginal tax rate is the marginal tax rate they expect to pay over the relevant future years. This assumption might be valid for SMEs as compared to the management of large (listed) companies. In any case, I assume that the current marginal tax rate is a good proxy for the true forward-looking marginal tax rate. An endogeneity problem might arise with respect to this variable. The current marginal tax rate is affected by the financing choice: when in response to an increased marginal tax rate the manager decides to take on a large stock of debt, the increased interest payments might actually reduce the marginal tax rate that the firm faces when the firm ends up in a lower tax bracket, causing reversed causality. This endogeneity problem will be solved below by including two instruments for the marginal tax rate. The first is the marginal tax rate computed from the Earnings Before Interest and Taxes (EBIT), which is by definition exogenous for changes in interest payments. The second instrument is the time-lag of the current marginal tax rate, which is also used by amongst others Alworth and Arachi (2001).

Table 8: Difference-in-Difference Investment

	S-A	S-C	S-U	B-A	B-C	B-U
			2007-2008 25k Full Sample			
α^d	7.121	-2.794	27.68*	-5.924*	-6.281	-0.360
	(5.928)	(4.258)	(16.05)	(3.207)	(4.256)	(5.281)
Shock	0.035	0.035	0.035	0.035	0.035	0.035
Number of Firms	10365	7106	2862	27032	18305	7335
R-squared	0.001	0.001	0.006	0.000	0.000	0.001
			2007-2008 25k Mature Firms			
α^d	-0.809	-4.917	5.903	-16.890***	-18.580**	-7.394
	(6.650)	(11.920)	(6.250)	(5.456)	(8.726)	(6.855)
Shock	0.035	0.035	0.035	0.035	0.035	0.035
Number of Firms	1487	798	566	4429	2346	1586
R-squared	0.002	0.001	0.018	0.002	0.004	0.007
			2008-2009 40k Full Sample			
α^d	2.757	11.020*	-10.760	1.522	-0.510	4.240
	(4.588)	(6.263)	(7.091)	(3.371)	(4.531)	(5.256)
Shock	0.030	0.030	0.030	0.030	0.030	0.030
Number of Firms	6521	4193	2149	25062	16359	7527
R-squared	0.006	0.008	0.006	0.004	0.002	0.009
			2007-2008 40k Mature Firms			
α^d	2.899	5.244	-1.731	-5.378	-9.569	-0.285
	(8.403)	(13.70)	(10.37)	(6.435)	(8.770)	(10.850)
Shock	0.030	0.030	0.030	0.030	0.030	0.030
Number of Firms	780	347	373	3586	1617	1587
R-squared	0.014	0.020	0.025	0.009	0.009	0.012

Notes: ***, **, * denote significance at the 1, 5 or 10 percent level, respectively. Conventional Generalized Least-Squares Standard Errors are reported in parentheses below the parameter estimates. Period fixed and firm fixed effects are included.

Next to the marginal tax rate, I include some measures for the Average Effective Tax Rate. Specifically, $AETR_{it}$ is a row vector consisting of three measures,

$$AETR_{it} = \left[\frac{T_{i,t} - T(\hat{B}_{it})}{K_{i,t-2}}, \frac{T_{it}(\hat{B}_{it}) - \hat{T}_{it}(\bar{B}_i)}{K_{i,t-2}} \frac{\hat{T}_{it}(\bar{B}_i)}{K_{i,t-2}} \right]. \tag{21}$$

The first variable measures the difference between the observed tax payments by the firm (lagged) and the tax liability that I infer from the estimated level of taxable income *after loss compensation*. These differences might, besides in-accuracies in the process of applying loss compensation, capture unobserved tax credits received by the firm, I therefore label this variable Credit below. This predicted tax liability is then subsequently split-up into a variable that measures the tax liability due on the average taxable income after loss compensation for each firm (final term) and the difference between this average and the predicted tax liability. I label the former (third term) TPA and the latter PROGR (second term). Splitting the variable is useful as TPA now identifies purely changes in the tax system, as I keep taxable income constant. PROGR captures the effect of an increase in taxable income. Note that only constrained firms are expected to respond to changes in the AETR. However, I do include the change in the AETR for unconstrained firms as well because the AETR might also capture some inaccuracies in measuring the MTR and unobserved tax credits.

Investment

Following the model developed in Section 3, I estimate the following investment equation

$$\begin{aligned} \frac{\Delta K_{it}}{K_{i,t-1}} &= \alpha_i + \beta_1^P K_{i,t-2} + \beta_2^P (1 - D_i^C) \Delta MTR_{it} + (1 - D_i^C) \Delta AETR_{i,t-1} \gamma_1^P \\ &+ D_i^C \Delta AETR_{i,t-1} \gamma_2^P + (1 - D_i^C) Z_{i,t-1} \lambda_1^P + D_i^C \times Z_{it} \lambda_2^P + \delta_t + \epsilon_{it}, \end{aligned} \tag{22}$$

where the dependent variable is the percentage change in *fixed* assets (which follows amongst others Vergara, 2007).[22] Besides fixed assets lagged two periods ($K_{i,t-2}$), to correct for some potential regression to the mean and the effect of size on investment, I include three groups of

[22]Vergara corrects investment for depreciation, I have run a robustness check with this correction, yielding similar results.

variables. First, Hypothesis (1) suggests that Unconstrained firms should respond to changes in their marginal tax rate (ΔMTR_{it}). Second, I include the various components of $AETR_{it}$ identified above. The superscript P denotes panel data techniques. I including firm fixed (α_i) and time fixed effects (δ_t) such that the identification in this specification relies on within-firm changes. Consistent differences in the level of taxation and investment do not affect the results, relative changes in taxation and investment remain. Finally, ϵ_{it} is an error term that is assumed to be independent across firms, but potentially correlated across time.

Z_{it} is a row vector containing the remaining control variables. As Tobin's Q cannot be measured for SMEs, I include sales growth to capture changes in future investment opportunities. Furthermore, I control for the free cash-flow as a fraction of fixed assets ($CF_{i,t-1}$). This control variable is important because investments might be determined in part by this free cash-flow and the free cash-flow is positively correlated with the marginal tax rate. I include the Debt-Asset-Ratio (lagged) as this might also be correlated with the marginal tax rate and investment decisions. Finally, $Loss_{it}$ is a Dummy variables that equals one when the firm experienced a loss in the present year. This is important as this will imply a zero value for the marginal and average tax rate, which is not the effect I intend to identify with those variables. Furthermore, using $K_{i,t-2}$ implies that I use only firms with at least three years of data. As mentioned in Section 5 above, regressions are performed for the period after 2003 only.

Results Investment

Table 9 shows the regression results, where the different columns show the results for different subgroups. Following Section 3 I differentiate between Young and Mature firms. Furthermore, it is interesting to see whether size matters, because the smaller firms might for example be less well informed about changes in the tax schedule or have higher compliance costs. Now recall that I hypothesized that investments by unconstrained firms respond in general significant to changes in the marginal effective tax rate, the results confirm this hypothesis.[23] The coefficients reported are semi-elasticities, a 1 percentage point increase in the MRT leads to a

[23]I have included the interaction variable with Constrained firms as well in robustness checks, it was never significant.

1.6 % decrease in investment on average. This implies an elasticity of 0.4 (when I assume an average tax of 0.25) which is low compared to the estimates implied by the studies of Hasset and Hubbard (2002) and Chirinko (2002), who suggest an elasticity between 0.5 and 1.0 (see also de Mooij and Ederveen (2008) for a review of the literature).

Furthermore, I hypothesized that Mature firms respond fiercer compared to Young firms. To see this, note that type $Y1$ has a steeper marginal revenue curve compared to type $M2$. This is confirmed by the results. In the limit, one might think of Small Young firms ($Y1$) not responding at all. They have invested in a few necessary assets, which are essential, and they do not have any further investment opportunities.

Unfortunately, the coefficients on the AETR are either insignificant or of the wrong sign. Recall that I expect constrained firms to respond by reducing their investments upon an increase in (either one of the components of) the AETR. Unconstrained firms should not respond to the AETR as they have sufficient retained earnings to finance new investments. ΔTPA is expected to measure the pure effect of a change in the average tax rate. It reports a significant positive effect instead of a negative effect. This might be related to the variation in the averages taxable income, such that the changes in the average taxes are correlated with size and, hence, investment opportunities. This was supposed to be taken up by (CF) which is always insignificant. Also progression is sometimes significantly positive (if at all), maybe from the same argument. Interesting, only the variable Credit has the expected sign, but for the wrong group. Recall that Credit might pick up unobserved investment credits, which might indeed boost investment. They might be earmarked for specific investments explaining why unconstrained firms respond to them.

Furthermore, we see that assets generally have a significant negative effect on investments. This might either be regression to the mean, some of the larger firms shrink over time because they where over-sized, or (related) it might indicate that larger firms have relatively smaller investments. Sales growth is never significant, maybe causing TPA to pick up average differences in investment opportunities. Loss is significantly negative for Unconstrained firms, maybe now reflection a reduction in investment opportunities, instead of a pure cash-flow argument.

Debt-Asset-Ratio

The methodology for estimating the average effect of the MTR on Short-term Debt-Asset-Ratio (SDAR) incorporates the approaches observed in the literature used for explaining the debt-asset ratio (see Section 2). In it's most general form, the specification reads as follows

$$\frac{D_{it}}{A_{it}} = \alpha^P MTR_{it} + X_{it}\beta^P + \mu_i + \eta_t + \epsilon_{it} \tag{23}$$

where D_{it}/A_{it} denotes the SDAR, where assets are measured by the Balance-Sheet Total and Debt is Short-term Debt.[24] MTR_{it} denotes the marginal tax rate, X_{it} is a matrix including various control variables, μ_i stands for firm-specific fixed effects, while year fixed effects are represented by η_t. Finally, ϵ_{it} is an error term that is assumed to be independent across firms, but potentially correlated across time. I expect to find a positive coefficient for the MTR ($\alpha > 0$), which indicates that firms borrow more when they have to pay more tax on the margin. Including firm fixed effects (not used in most of the papers discussed in Section 2) and time fixed effects implies that our identification in this specification relies solely on within-firm changes in the marginal tax rate. Consistent differences in the level of the marginal tax rate and the level of the SDAR are filtered out of the data. However, relative changes in SDARs and MTRs between firms still remain. Each of the variables is briefly discussed below.

The X_{it} matrix contains the following variables. First and foremost I control for size, which is measured by the log of annual turnover, as this has proven to be an important control variable in the literature. I use turnover instead of balance total to circumvent endogeneity issues as much as possible (note that Balance-Sheet Total is used for the dependent variable as well). The size of a firm can be correlated with both the marginal tax rate, due to progressivity of the tax schedule, and the financing structure, as size might be correlated with access to financial markets and the need to rely on debt. Using the log of size is a standard approach in the literature. I did however run a robustness test in which we estimated a specification using a size, size squared and size cubed. Second, I include cash-holdings relative to Balance-Sheet Total ($Cash_{it}$) and tangible assets relative to Balance-Sheet Total ($Tang_{it}$). A high value for

[24] Using the sum of Long-term Debt and Short-term Debt yields insignificant results.

$Cash_{it}$ reflects a healthy liquidity and might be of influence for access to capital markets. A high value for $Tang_{it}$ indicates that there is substantial collateral available, which also eases borrowing (and maybe cheaper).[25] Finally, I include retained earnings as a measure of profitability ($Ret_{i,t,1}$) which equals net income minus dividends paid divided by Balance-Sheet Total. Firms with more retained earnings pay higher taxes and, in line with the model discussed in Section 3, might show a reduction in their Debt-Asset-Ratio.

Results Financing Decision

Table 10 and 11 present the results. Table 10 includes only the MTR as a tax variable, but studies various subgroups of firms. Table 11 adds the AETR measures whilst only focussing on constrained versus unconstrained firms. The results show that in general the marginal tax rate has a significant effect on the SDAR. To transform the coefficients into semi-elasticities, we need to divide by the average SDAR which is roughly equal to 0.5. This yields semi-elasticities equal to 1.5 on average, 0.6 for Mature firms and almost 2 for constrained firms. These estimates are large compared to the literature, de Mooij (2011) reports a mean semi-elasticity of 0.78. Interestingly, Bartholdy and Mateus (2006), who study SMEs as well, also find a high semi-elasticity equal to 2.33.

Note, that the trade-off theory is expected to be especially strong for Mature firms ($M2$ and $M3$). Furthermore, amongst the mature firms, the constrained firms ($M3$) could be expected to respond the strongest when we think of those as being large firms with numerous investment opportunities. The large coefficient for Young firms is somewhat unexpected, but not significantly different from the coefficient of the Mature firms. Only the insignificant result for unconstrained firms is unexpected, it suggests that this group consists mainly of types $Y1$ and $M1$ who do not (hardly) respond to changes in the marginal tax rate.

Besides the expected negative coefficient of size, especially the result obtained for Retained Earnings is intuitive. Constrained firms are expected to use the cheap funds in order to reduce their leverage. This is what we observe in the results. Note that also the group of Mature

[25] As a robustness check I have included the modified Z-Score (lagged) of the firm, to reflect bankruptcy costs, following amongst others Graham *et. al.* (1998) and Bartholdy and Mateus (2006). This does not affect the results reported.

firms, includes a category of Constrained firms ($M3$). With respect to the Young firms, type $Y1$ seems to dominate. Compared to Table 10 it is interesting to see that Table 11 shows a positive pure tax effect (ΔTPA).

7 Conclusion

This paper uses micro-data available from the Corporate Income Tax Returns in the Netherlands to study the relationship between the Corporate Income Tax system in the Netherlands and both financing and investment decisions of Small and Medium-Sized Enterprises. The tax returns concern data from all Dutch Small and Medium-Sized Enterprises between 2000 and 2009.

The contributions of the paper are threefold. First, this data set has never been used to study the effect changes in the Corporate Income Tax System, whereas also the focus on Small and Medium-Sized enterprises is not common in the literature. Second, I apply three complementary methodologies. A Difference-in-Difference methodology is used to focus on specific changes that affected a specific group of firms, whereas panel data methods are used to estimate the average effect of changes in the Corporate Income Tax Code between 2004 and 2009 on investment and financing. Furthermore, I use a bunching analyses around bracket-ends to verify whether the control and treatment groups of the Difference-in-Difference are not affected by strategic behaviour too much.

Using a simple theoretic model I split up the group of firms in Mature and Young and in Credit-Constrained and Unconstrained firms. In the panel regressions, I find a semi-elasticity of 1.5 on average for the financing choice, and an average elasticity of 0.4 for the investment choice. The result for the financing choice is large relative to the literature, whereas investment of Small and Medium-Sized firms seems somewhat less responsive to tax compared to larger firms. Average Effective Tax Rates are found to affect the financing decision but not the investment decision. The latter finding is unexpected.

For future research I hope to improve the measure for the Average Effective Tax Rate and compute an overall estimate for the excess burden of taxing Small and Medium Sized Enterprises.

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Table 9: IV estimates for Investment

	Full Sample	Mature	Young	Small
ΔMTRLC$\times D_{UC}$	-1.550***	-1.790**	-0.308	-1.603***
	(0.503)	(0.795)	(0.998)	(0.502)
Assets(t-2)$\times D_{UC}$	-0.001***	-0.001***	0.000	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Assets(t-2) $\times D_C$	-0.001*	-0.001***	-0.000	-0.002***
	(0.001)	(0.000)	(0.000)	(0.000)
ΔTPA(t-1)$\times$ D_C	0.117**	0.115**	0.0315	0.0749
	(0.046)	(0.057)	(0.093)	(0.047)
ΔTPA(t-1) $\times D_{UC}$	-0.056	-0.008	-0.011	-0.015
	(0.041)	(0.033)	(0.030)	(0.025)
ΔPROGR(t-1)$\times D_C$	0.110**	0.102*	0.048	0.066
	(0.046)	(0.058)	(0.102)	(0.047)
ΔPROGR(t-1)$\times$ D_{UC}	-0.065*	-0.022	0.008	-0.027
	(0.039)	(0.030)	(0.024)	(0.025)
ΔCredit(t-1)$\times D_{UC}$	-0.088**	-0.056*	-0.111	-0.053**
	(0.0405)	(0.0334)	(0.125)	(0.0245)
ΔCredit(t-1)$\times D_C$	0.070	-0.006	-0.068	0.099**
	(0.052)	(0.048)	(0.095)	(0.049)
ΔCF(t-1)$\times D_{UC}$	-0.007	-0.011	-0.001	-0.008
	(0.006)	(0.009)	(0.002)	(0.007)
ΔCF(t-1)$\times D_C$	-0.008	-0.026	-0.051	0.005
	(0.008)	(0.022)	(0.059)	(0.005)
SalesGrowth(t-1)$\times D_{UC}$	-0.002	-0.076	-0.020	-0.002
	(0.003)	(0.053)	(0.021)	(0.002)
SalesGrowth(t-1)$\times D_C$	-0.011	-0.069	-0.001	-0.016
	(0.011)	(0.064)	(0.016)	(0.018)
DAR(t-1)$\times D_{UC}$	-0.127**	-0.366**	0.359	-0.084
	(0.074)	(0.160)	(0.700)	(0.056)
DAR(t-1)$\times D_C$	0.027	-0.004	0.702	0.003
	(0.028)	(0.027)	(0.858)	(0.019)
Loss$\times D_{UC}$	-0.439***	-0.507**	-0.199	-0.398***
	(0.146)	(0.231)	(0.320)	(0.144)
Loss$\times D_C$	0.146*	0.118	-0.487	0.090
	(0.085)	(0.127)	(1.068)	(0.055)
Period Fixed Effects	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes
Observations	441481	178445	16666	420431
R-squared	0.002	0.004	0.003	0.002

Notes: ***, **, * denote significance at the 1, 5 or 10 percent level, respectively. Panel Robust (clustered by firm) Standard Errors are reported in parentheses below the parameter estimates. Period fixed and firm fixed effects are included.

Table 10: IV Estimates DAR

	Total	Mature	Young	Constrained	Unconstrained
MTR	0.756***	0.315***	1.142*	1.048***	-0.053
	(0.143)	(0.088)	(0.646)	(0.224)	(0.056)
log(Turnover)	-0.421***	-0.213***	-0.360***	-0.615***	-0.050***
	(0.039)	(0.026)	(0.090)	(0.060)	(0.019)
Cash (t-1)	0.229***	0.050	0.044	0.376***	-0.036
	(0.064)	(0.086)	(0.162)	(0.097)	(0.034)
Tang (t-1)	0.031	-0.099	0.003	0.028	0.013
	(0.114)	(0.087)	(0.289)	(0.161)	(0.034)
RetEar (t-1)	-0.129***	-0.192***	0.003	-0.146***	-0.029
	(0.047)	(0.064)	(0.058)	(0.056)	(0.021)
Period Fixed Effects	yes	yes	yes	yes	yes
Firm Fixed Effects	yes	yes	yes	yes	yes
Observations	855068	204181	208547	525850	261467
R-squared	0.002	0.007	0.001	0.003	0.002

Notes: ***, **, * denote significance at the 1, 5 or 10 percent level, respectively. Panel Robust (clustered by firm) Standard Errors are reported in parentheses below the parameter estimates. Period fixed and firm fixed effects are included.

Table 11: IV Estimates DAR including AETR

	Total	Constrained	Unconstrained
MTRLC	0.563***	0.852***	-0.016
	(0.096)	(0.157)	(0.052)
log(Turnover)	-0.348***	-0.554***	-0.053*
	(0.034)	(0.057)	(0.028)
Cash (t-1)	0.225***	0.395***	-0.00873
	(0.073)	(0.115)	(0.021)
Tang (t-1)	-0.115	-0.214	0.011
	(0.109)	(0.170)	(0.039)
RetEar (t-1)	-0.263**	-0.389**	-0.045
	(0.122)	(0.178)	(0.041)
TPA (t-1)	0.001**	0.003**	0.000
	(0.000)	(0.001)	(0.000)
Progr (t-1)	-0.000	0.001	-0.000
	(0.000)	(0.001)	(0.000)
Credit (t-1)	0.000	0.001	-0.000
	(0.000)	(0.001)	(0.000)
Period Fixed Effects	yes	yes	yes
Firm Fixed Effects	yes	yes	yes
Observations	583164	334272	194615
R-squared	0.008	0.013	0.002

Notes: ***, **, * denote significance at the 1, 5 or 10 percent level, respectively. MTRLC is instrumented with the marginal tax rate based on EBIT and the lagged MTRLC. Panel Robust (clustered by firm) Standard Errors are reported in parentheses below the parameter estimates. Period fixed and firm fixed effects are included.

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