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Do Thin-Capitalization Rules Affect Capital Structure Decisions?

Evidence from Norwegian Multinationals

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Abstract

This thesis studies the effects of thin-capitalization rules on the level and the tax rate sensitivity of internal and total debt in foreign affiliates of Norwegian multinationals. In response to multinationals' enhanced opportunities to explore the tax advantages of debt, several countries have implemented such rules to protect their corporate tax base. For the empirical analysis, we construct a main sample of micro-level panel data on foreign affiliates of Norwegian multinationals in European and OECD countries, years 1996 – 2004, as well as an extended sample where 25 countries are added and the period extended to 1994 – 2006. The data set provides information on total and parent debt, where the latter serves to identify the effects on internal debt.

The full samples provide weak evidence of thin-capitalization rules reducing the tax rate sensitivity of parent and total debt, and no evidence supporting a direct level effect. Two subsamples provide stronger evidence. In a subsample including only the countries that implemented a rule during the sample period, a thin-capitalization rule with a safe haven ratio of 4:1 is estimated to reduce the parent debt-to-assets ratio by 2.8 – 4.7 percentage points, and reduce the tax rate sensitivity of a 10 percentage points increase in the tax rate by 25% – 40%. A subsample including only firms with the highest parent debt ratios provides robust evidence of the same qualitative effects. Neither of the subsamples provides strong evidence for the expected effects on total debt.

Identification of the effects of thin-capitalization rules has proven harder on the Norwegian data, compared to existing studies on German and US multinationals. To the extent this thesis provides evidence, it supports that thin-capitalization rules reduce the use of internal debt in affiliates of multinationals, but it only shows limited evidence of reduced total debt ratios.

Keywords: Thin-capitalization rules, multinational corporations, debt, capital structure

Preface

The intention of this thesis is to contribute to the existing literature on thin-capitalization rules with experience from Norwegian multinational companies. The inspiration to analyze thin-capitalization rules came from taking the masters course "Taxes and Business Strategy" at NHH, lectured by one of our supervisors, Dirk Schindler. Both authors of this thesis developed an interest in taxation and the capital structure decision of multinationals, and working with this master thesis has allowed us to obtain further knowledge and insight on this topic. We appreciate the help by Dirk Schindler in arriving at the topic and the research question of this thesis.

In addition to Dirk Schindler, we have been fortunate to have Arnt Ove Hopland as a supervisor. Together their sharing of expertise and knowledge is greatly appreciated. We are grateful for all the discussions we have had with them, and the feedback they have provided have been essential to our thesis. We are also thankful to Georg Wamser for providing us with the tax rates, lending rates, and information on thin-capitalization rules used in Buettner, Overesch, Schreiber, & Wamser (2012). Finally, we would like to thank the Norwegian Tax Authority and SNF at NHH for awarding us a grant in tax economics.

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1. Introduction

It is well documented that the capital structure decision of firms, in general, is distorted towards debt financing, as most tax codes allow for interest on debt to be deducted from taxable profits. On the other hand, the opportunity cost of equity is usually not tax deductible. Multinational companies (MNCs) have enhanced opportunities to explore the tax advantages of debt, compared to domestic firms, through the use of internal leverage[1] and international debt shifting (see e.g. Desai, Foley, & Hines Jr, 2004; Huizinga, Laeven, & Nicodeme, 2008). Facing different tax rates in the countries they operate, MNCs can shift both internal and external debt such that the overall tax savings are maximized (Møen, Schindler, Schjelderup, & Tropina, 2011, p. 2). This gives MNCs a competitive advantage over domestic firms, as it allows them to lower the effective cost of capital (Schindler & Schjelderup, 2012, p. 642). It may also create a bias towards becoming an MNC rather than a domestic firm (Bucovetsky & Haufler, 2008).

In addition to hurting domestic competition, the emergence of MNCs may be worrisome for the host country, inasmuch as international tax planning can reduce the corporate tax base. Credit markets today extend across borders and MNCs may be more likely to issue external debt internationally compared to domestic firms. In addition, interest on MNCs' internal debt is paid solely to foreign entities. If tax treaties between countries reduce or abolish withholding taxes on international interest payments, the return on capital in affiliates of MNCs can be completely tax exempt in the host country[2] (Buettner et al., 2012, p. 931).

The last few decades' ongoing globalization of formerly national financial markets, and new technology such as the Internet, has substantially lowered the barriers for corporations to operate across borders. In combination with the abovementioned benefits of operating internationally, this has led to a significant growth in foreign direct investments and the emergence of an increasing number of MNCs. In line with this development, the consequences of international debt shifting have gained greater attention among policy makers, and rules curbing thin-capitalization in affiliates of MNCs have seen the light of day.

[1] Internal debt, also known as intracompany debt, is debt provided by another affiliate within the same MNC, e.g. the parent of the MNC, or other related parties to the firm such as shareholders.
[2] In fact, it has come to light that multibillion, global corporations such as Apple, Google and Starbucks have been able to obtain effective tax rates close to zero on corporate income, while generating huge revenues and benefiting from public infrastructure (see e.g. Barford & Holt, 2013).

Among such rules are so-called thin-capitalization rules, which are the focus of this thesis. Canada was a pioneering country, introducing thin-capitalization rules as early as 1971, followed by Australia, Indonesia, the UK and the U.S. in the eighties (Blouin, Huizinga, Laeven, & Nicodème, 2014, p. 7). However, widespread adoption took place between the mid-nineties and 2005. In that period, the number of OECD countries practicing thin-capitalization rules increased from about one-third to three-fifths (Ruf & Schindler, 2012, p. 4). There is no universal way of defining thin-capitalization rules, and thus there is a variety of rules around the world. By and large, thin-capitalization rules are aimed at preventing MNCs from evading their tax liabilities, by restricting tax deduction of interest on international debt.

A crucial point about thin-capitalization rules is how effective they are in accomplishing their intent of reducing debt financing and increasing the tax base and tax revenue of the host country. If thin-capitalization rules are effective in increasing equity finance, the corporate tax base should increase, all else equal. However, if external debt is not restricted, firms may respond by substituting external for internal debt (see e.g. Wamser, 2014). The consequence for the tax base and tax revenue then depends on whether the debt is issued to domestic or foreign investors, and whether the investor is a corporation or a personal taxpayer[3].

It is clear that there are many factors that determine the ultimate effect of thin-capitalization rules on a country's tax base and tax revenue. Empirical studies have provided evidence that thin-capitalization rules are effective in reducing the overall debt levels in affiliates of MNCs, suggesting that the direct effect of these rules are increased corporate tax base per se. However, it has been pointed out that thin-capitalization rules can also have adverse, indirect effects on the corporate tax base, leaving the total effect ambiguous[4].

[3] If internal debt is replaced by external debt issued to a domestic, corporate investor, the corporate tax base and tax revenue should increase, even if internal debt is replaced by external debt. If the investor is a personal investor, the corporate tax base will not increase, but the total tax base of the host country will increase since the interest income is taxed domestically. However, if personal taxes are lower than corporate taxes, the total tax revenue will not increase as much as it would if the debt holder is a corporation. If internal debt is replaced by foreign external debt, the consequence may be that neither corporate tax base nor total tax base increases, if tax treaties exempt the debt holder from local taxation.

[4] For instance, since restrictions on debt financing increase the effective cost of capital for MNCs, it may reduce investments, and thus the total capital base, in countries that impose thin-capitalization rules (Buettner, Overesch, & Wamser, 2014, p. 4; Merlo, Riedel, & Wamser, 2014, p. 23). If that is the case, the corporate tax base may not increase by imposing thin-capitalization rules, even if a larger share of the capital is taxable. Further, thin-capitalization rules may foster tax-competition in order to attract MNCs (Haufler & Runkel, 2012), and it may also increase the incentive to use transfer pricing to shift profits out of high-tax countries.

The focus of this thesis is the potential direct upside of thin-capitalization rules through reduced debt levels in affiliates of MNCs. The aim is not to determine whether or not the tax base or tax revenue increases, but to search for evidence of thin-capitalization rules' effectiveness in reducing the use of internal and total debt. In the end, it might be the impact on the tax base and tax revenues that are the most important, but an essential first step is to reduce debt financing. This thesis is inspired by similar, existing studies on thin-capitalization rules. Despite the relatively rich literature on the use of debt in MNCs, surprisingly few papers have studied the effects of thin-capitalization rules. Earlier studies have mainly focused on German or US MNCs, and to the best of our knowledge, this thesis is the first to study foreign affiliates of Norwegian MNCs in relation to thin-capitalization rules. The research question of this thesis is

Do thin-capitalization rules reduce leverage in foreign affiliates of Norwegian MNCs?

This thesis is mainly inspired by a similar study on German MNCs, by Buettner et al. (2012). Our study closely follows that paper, and we partially adopt the same investigation approach. Buettner et al. (2012) focus on how thin-capitalization rules impact the use of debt through the tax rate sensitivity of debt. This thesis will also study the direct level effect of thin-capitalization rules, partly inspired by Blouin et al. (2014). Note, however, that the level effect is also studied in working paper versions of Buettner et al. (2012)[5].

The thin-capitalization rules analyzed in this thesis are so-called safe haven rules. These rules define a "safe haven" debt-to-equity ratio and deny tax deductions of interest on debt that exceeds the defined ratio. Safe haven ratios are usually defined in terms of total debt-to-equity or internal debt-to-equity, but in both cases it is usually only tax deduction of interest on internal debt that is restricted (Buettner et al. 2012, pp. 931-932).

For our empirical analysis, we use information on tax rates and thin-capitalization rules for a broad range of countries, including information on safe haven ratios. We address the research question by utilizing the variation in the presence and the tightness[6] of thin-capitalization rules over time within each country. We have two full samples, where the

[5] See Buettner, Overesch, Schreiber, & Wamser (2006, 2008).
[6] The tightness refers to the defined safe haven debt-to-equity ratio: for instance, a ratio of 2:1 is tighter than a ratio of 3:1.

main sample includes observations for the same years, 1996 – 2004, and 36 OECD and European countries as Buettner et al. (2012). The extended sample is expanded to include all years available in the data set, 1994 – 2006, and observations from 25 more countries. In addition, we study several subsamples. For instance, a subsample of only the countries that implemented a rule and a subsample of the affiliates with the highest debt levels allow us to study the effects in the countries and affiliates of most interest. Optimally, we would split debt into external, parent and non-parent internal debt. However, our data set only provides us with data on parent and total debt, and parent debt thus serves to identify the effects of thin-capitalization rules on internal debt.

The empirical analysis of the main sample provides evidence that the tax rate sensitivity of both internal and total debt is reduced by thin-capitalization rules, but the results are not robust to the extended sample, and we find no evidence of a direct reduction in the level of debt. In the subsample of countries that implemented a rule, the parent debt-to-assets ratio is estimated to be reduced by 2.8 – 4.7 percentage points, while the tax rate sensitivity, to a 10 percentage points increase in the tax rate, is estimated to be reduced by 25% – 40%. Studying only affiliates with debt levels in the highest quintile, we find further evidence for a reduced tax rate sensitivity of parent debt, and the level effect is estimated to be a reduction of 3.2 – 4.4 percentage points. In general, we only obtain weak evidence supporting that thin-capitalization rules affect the total debt ratio.

This thesis is structured as follows: Section 2 presents related literature on the capital structure of MNCs and how it is affected by thin-capitalization rules. Section 3 gives an introduction to the main characteristics of thin-capitalization and provides descriptive information on how they affect affiliates of MNCs. In Section 4 we present the theoretical model which is based on existing theoretical concepts, allowing us to make predictions of the effects of thin-capitalization rules on internal debt - including parent debt - and total debt. Section 5 provides an outline of our investigation approach and the general regression equation of the analysis. Section 6 explains sample restrictions, data calibration, relevant variables and descriptive statistics. In Section 7 the results from the main and extended sample are first presented, together with a discussion of the results. Next, various subsamples are tested to search for further evidence of the effects of thin-capitalization rules. Section 8 provides our conclusions.

2. Literature Review

This section presents existing literature related to the capital structure decisions of MNCs and thin-capitalization rules. The objective is to provide an overview of findings and predictions from existing research. First, literature on the general use of debt financing is reviewed. Then, we present literature on the tax rate sensitivity of MNCs' capital structure and international debt shifting mechanisms. These topics are important for the understanding of the capital structure choice of MNCs in the absence of thin-capitalization rules. Lastly, literature directly related to the effects of thin-capitalization rules is presented. As noted by Blouin et al. (2014), most studies on the capital structure of MNCs consider the tax advantage of debt only regarding variation in tax rates[7]. Consequently, there are relatively few papers studying the effects of thin-capitalization rules.

2.1 Capital Structure and Costs/Benefits of Debt

Modigliani and Miller are by many seen as the founders of modern thinking on capital structure. With their simplest version of the irrelevance theorem, they showed that in a world without friction, e.g. taxation and bankruptcy costs, the value of a firm is determined solely by its underlying assets, and not by how the assets are financed (Modigliani & Miller, 1958). However, they also considered that interest payments on debt were tax deductible at the corporate level - known as the debt tax shield - but this issue was addressed more specifically in a later paper (Modigliani & Miller, 1963).

In addition to the debt tax shield, firms have to consider other costs and benefits of debt. Kraus and Liztenberger (1973) introduced a theory showing that the optimal debt level is determined by a trade-off between costs and benefits of debt. The costs and benefits of internal and external debt are commonly assumed to differ, but the trade-off theory applies to both.

Jensen (1986) argues that external debt can be beneficial, as it helps reducing asymmetric information problems and discipline managers. Shareholders and managers may not have

[7] See Blouin et al. (2014, p. 3).

coinciding interests, and managers can have incentives leading to decisions and spending of the firm's free cash flows in a way not beneficial to shareholders. External debt is thought to reduce these problems because debtors will monitor the firms, and interest payments and debt repayments will restrict free cash flows.

Myers (1977) argues that typical costs of external debt include debt overhang problems[8], and Robichek & Myers (1966) point to financial distress and reorganization costs as other costs of external debt. Several studies have found empirical evidence of bankruptcy and financial distress causing direct and indirect costs[9] (see e.g. Altman (1984) and Betker (1997)). Direct costs have been reported to average about 1.5% – 4% of the pre-bankruptcy market value of a firm's assets (Berk & DeMarzo, 2014, p. 544; LoPucki & Doherty, 2004). A study of highly leveraged firms by Andrade and Kaplan (1998) estimated a potential impact of indirect costs of 10% – 20% of a company's value.

Unlike external debt, internal debt does not affect the risk of bankruptcy, nor does it necessarily restrict the free cash flows of the firm (Schindler & Schjelderup, 2012, p. 638). However, the literature points to other costs and benefits. According to Desai et al. (2004, pp. 2468-2483) internal debt can be used to mitigate and overcome imperfections in the local capital markets. Gertner, Scharfstein and Stein (1994) argue that the ownership aspect of internal debt makes it easier to redeploy assets of underperforming projects. On the downside, facilitating internal debt is assumed to carry a cost, such as setting up an internal bank, and it may, in addition, carry concealment costs if rules restricting internal debt usage must be circumvented.

2.2 The Capital Structure of MNCs and International Debt Shifting

Although there is a common belief that taxation has implications for the capital structure, early studies of firms' capital structure found it difficult to prove this. As pointed out by Graham (2003) and Auerbach (2002), this may partly be due to measurement problems or

[8] A firm is said to have a debt overhang problem when equity-holders are not willing to invest in projects with positive net present value, because the face value of the existing debt is higher than the expected payoff from the project.
[9] Direct costs are associated with e.g. hiring outside help such as accounting and legal advisors and consultants. Indirect costs are related to loss of customers, suppliers, reputation, etc.

lack of variation in tax rates. However, the recent globalization of capital markets have led to countries reforming their tax systems - reduced tax rates being the most prominent change - and the emergence of many MNCs. As pointed out by Desai et al. (2004, p. 2484), analyzing affiliates of MNCs across national boarders has its advantages compared to analysis of domestic firms; it attenuate the difficulties in comparing heterogeneous firms measured by different accounting standards, and it exploits affiliate-specific variation in local tax incentives and capital market conditions.

Compared to domestic firms, affiliates of MNCs have two additional sources of debt; parent debt, and internal debt from non-parent entities. Several papers have shown that this enables affiliates of MNCs to resort to debt financing to a higher degree than comparable domestic firms. One such paper is the beforementioned paper by Desai et al. (2004), studying the relationship between the local tax rate and the sources of debt available to affiliates of MNCs. Analyzing data from about 3,700 US MNCs for the years 1982, 1989, and 1994, they find that the use of both parent and external debt increase with tax rates. In particular, they estimate that a 10% increase in the tax rate is associated with a 2.8% increase in an affiliate's total debt-to-assets ratio[10]. Similar results are obtained in a recent working paper by Blouin et al. (2014) running an analogous regression on the same data set extended by adding the years 1999 and 2004. Being one of the early papers on MNCs capital structure, a weakness of Desai et al. (2004) is that it does not include the debt shifting mechanisms that have later been pointed out by other papers. Coincidently though, it turns out that a shortcoming of the data they use actually might reduce the bias of omitting external debt shifting[11].

In the rest of this section, we will review literature on two international aspects of the capital structure of MNCs; external and internal debt shifting. The standard debt tax shield has already been discussed in Section 2.1; it benefits both MNCs and domestic firms, and it is driven solely by the local tax rate.

Mintz and Smart (2004) show that internal debt shifting is driven by the maximum tax difference between the lowest taxed affiliate and all other affiliates. They study how firms

[10] Desai et al. (2004, p. 2452). Examining their results reveals that they probably mean *percentage points*, even though they write %.

[11] The US data set used by Desai et al. (2004) has its drawbacks: back-to-back loans between parent and affiliates, and intercompany loans between affiliates other than the parent, is recorded as external debt (Desai et al. 2004, p. 2458). It is thus likely that the reported tax rate sensitivity of parent debt is underestimated, all else equal. On the other hand, it will reduce the bias of omitting external debt shifting (Møen et al., 2011, p. 4).

present in several jurisdictions can use tax-planning strategies to shift income. Since interest income from internal debt is taxable at the lending affiliate, their model predicts that the internal bank should be located in the lowest taxed jurisdiction. They test their model on Canadian firms present in several Canadian Provinces and are able to confirm their predictions. They also find that the use of internal debt in an affiliate increases with the spread between that affiliate's tax rate and the lowest taxed affiliate, i.e. the internal bank. Buettner and Wamser (2013) confirm a significant effect of the tax rate differentials, but they find that the effect is rather small[12]. Based on their findings, they argue that the use of internal debt is not necessarily motivated by profit shifting, but rather reflect the conventional debt tax shield.

Huizinga et al. (2008) develop a model of external debt shifting, based on a hypothesis that the capital structure of an affiliate of an MNC is not only dependent on the local tax rate, but also on the tax rate faced by all other affiliates of the MNC, including the parent. For a given level of external debt, and thus cost of bankruptcy, it is optimal for the MNC to allocate external debt in those affiliates that produce the highest tax savings. An increase in the tax rate for one affiliate will incentivize the MNC to take on more external debt in that affiliate. At the same time, to keep the overall bankruptcy costs in check, the debt levels in all other affiliates should be reduced. External debt shifting thus lets MNCs exploit the external debt tax shield more aggressively than domestic firms, without affecting the overall risk of bankruptcy. Using firm data from MNCs present in 32 European countries, Huizinga et al. (2008) are able to confirm their predictions; if an MNC with two equally sized affiliates, located in different countries, experience a 10 percentage points increase in the tax rate in one of the countries, the debt-to-assets ratio in that country increases by 2.4 percentage points and the ratio is reduced by 0.6 percentage points in the other country[13]. A drawback of the empirical work by Huizinga et al. (2008) is that the data they use (Amadeus) does not distinguish between internal and external debt. As commented by Møen et al. (2011, p. 5), the empirical results may, therefore, be influenced by the use of internal debt, which is not controlled for.

[12] Buettner and Wamser (2013) find that the low tax sensitivity may partly be explained by the German CFC-rules, which appear to curb profit shifting from high-tax to low-tax countries.
[13] See Huizinga et al. (2008, p. 81). The results can also be seen in Huizinga et al. (2008, p. 101), Table 8, regression (3).

Egger, Eggert, Keuschnigg and Winner (2010) find, in accordance to Desai et al. (2004), that MNCs resort more to debt financing in general than comparable domestic firms. Based on a model that accounts for internal and external debt, including debt shifting, they find the average difference in debt-to-assets ratios to be about 1.7 percentage points between domestically and foreign owned firms[14]. The difference is found to increase with the statutory tax rate, implying that the debt-to-assets ratios of MNCs' affiliates are more sensitive to tax rate changes than comparable domestic firms. In comparison to the other abovementioned papers, Egger et al. (2010) apply a different identification strategy by explicitly using domestic firms as a reference group. They argue that other papers may suffer from their data being a non-random sample of only MNCs[15].

As is clear from the existing literature, the capital structure of MNCs is sensitive to tax rates, and MNCs employ both internal and external debt shifting. However, the papers examined so far has omitted either internal or external debt in their models, or been limited by the data set at hand. Thus, they have been unable to identify empirically the isolated effect of the mechanisms in play and their relative importance.

Møen et al. (2011) develop a model taking all the three mechanisms driving debt into account, including the costs and benefits of debt discussed earlier. The model gives several important predictions. It shows that firm value is maximized when MNCs shift both external and internal debt. The finding is important, as it shows that studies omitting one of them will not truly reflect profit-maximization behavior. In addition, they point out that both internal and external debt shifting is driven by differences in local tax rates and are thus correlated. Empirical testing of models omitting one or the other may, therefore, suffer from an omitted variable bias. In accordance to Mintz and Smart (2004), the model by Møen et al. (2011) predicts that the internal bank should be located in the lowest taxed jurisdiction to maximize firm value[16].

Møen et al. (2011) test their predictions on a micro-level data set explicitly dividing debt into external debt, parent debt, and internal debt from non-parent affiliates. They are able to prove their theoretical predictions, and to identify the relative importance of the standard

[14] Egger et al. (2010, p. 106), Table 8.
[15] Egger et al. (2010, p. 97).
[16] Møen et al. (2011, p. 9).

debt tax shield and international debt shifting. In a hypothetical case of an MNC with equally sized affiliates in two countries, they find that a 10 percentage points increase in the tax rate for the highest taxed affiliate will give a 4.6 percentage points increase in the debt-to-assets ratio of that affiliate, and a decrease of 1.4 percentage points in the other affiliate's debt-to-assets ratio[17]. This is a larger effect than reported by Huizinga et al. (2008). Møen et al. (2011, p. 23) show that about 40% of the increased debt ratio is due to the standard debt tax shield, and about 60% is due to international debt shifting, where internal and external debt shifting are of equal importance. Further, they find that the omitted variable bias of omitting international debt shifting mechanisms leads to an overestimation of the effect of the standard debt tax shield of 140% compared to their preferred estimate[18].

2.3 Effects of Thin-Capitalization Rules

Weichenrieder and Windischbauer (2008) study the impact of a tightening of the German thin-capitalization rules on internal leverage, in affiliates of MNCs present in Germany. They find that the introduction of thin-capitalization rules in 1994 and the tightening in 2001 seemingly reduced the use of internal debt for the affiliates affected. However, the effects found are modest, and it is pointed out that the internal debt-to-assets ratio had a declining trend for non-affected affiliates in the same period as well. Further, they find that the limited impact of the thin-capitalization rules can partly be explained by a loophole in the German legislation, allowing holding companies to have a higher internal debt-to-equity ratio. Lastly, the paper finds no evidence for thin-capitalization rules causing reduced investments, suggesting that the reduced internal leverage is replaced by either equity or external debt.

Buettner et al. (2012) was the first paper to analyze how thin-capitalization rules affect the capital structure in affiliates of MNCs across countries and over time[19]. They use the MiDi database, studying foreign affiliates of German MNCs in all OECD countries and some additional European countries. The data set allows them to study the effect on non-parent internal debt, parent debt and external debt. Buettner et al. (2012, p. 936) find that imposing a relatively tight thin-capitalization rule about halves the tax rate sensitivity of internal debt,

[17] See Møen et al. (2011, p. 21), Table 3, Column (2) and Møen et al. (2011, p. 23).
[18] Leaving out external debt shifting overestimates the standard debt tax shield effect by 100% and the contribution by internal debt shifting by 40%, whilst leaving out internal debt shifting gives a more modest bias of about 9% for the standard debt tax shield and 4% for external debt shifting. Møen et al. (2011, pp. 22-23).
[19] Note that the first working paper version of the paper is dated 2006 (Buettner et al., 2006).

but increases the tax rate sensitivity of external debt. They thereby qualitatively confirm the results of Weichenrieder and Windischbauer (2008). Further, they find evidence suggesting that the reduced tax rate sensitivity of internal leverage is mainly driven by a reduced tax rate sensitivity of parent debt. The reduction in the tax rate sensitivity is found to be larger for rules where the safe haven ratio is defined in terms of total debt instead of related party debt. In terms of levels, they estimate that implementing a thin-capitalization rule denying interest deductions for debt exceeding a debt-to-equity ratio of 2:1, in a host country with a sample average tax rate of 34%, decrease the parent debt ratio by 5.5 percentage points if the rules are defined in terms of total debt[20]. If the rules are defined by a related party debt-to-equity ratio, the decrease can equivalently be estimated to 1.8 percentage points. An important implication is thus that rules defining a safe haven debt-to-equity ratio in terms of total debt are more effective in reducing the tax incentive for using internal debt. Further, their results suggest that the substitution of external debt for internal debt is not complete[21], resulting in a decrease in total leverage, but this is not tested explicitly. Our thesis picks up on this, by including total debt as a dependent variable. The effect on total leverage is important, as it will determine how effective thin-capitalization rules are in actually increasing a country's tax base.

Blouin et al. (2014, pp. 6-7) criticize Buettner et al. (2012) for not controlling for the direct effect of thin-capitalization rules, and thereby potentially confounding the direct level effect and the indirect effect through a changed tax rate sensitivity. However, the working paper Buettner et al. (2006)[22] includes the direct effect, and it is found to be insignificant. If the direct effect is insignificant, the exclusion of the direct effect in the published paper (Buettner et al., 2012) does not necessarily confound their results, and their estimated level effect for a given tax rate should be valid.

One of the co-authors of the paper by Buettner et al. (2012) study the substitution effect suggested in both Buettner et al. (2012) and Weichenrieder and Windischbauer (2008). Based on the reform of the German thin-capitalization rules, Wamser (2014) analyzes the extent to which external debt is substituted for internal debt when firms face binding thin-

[20] Buettner et al. (2012, p. 936)
[21] According to their results, imposing a safe haven debt-to-equity ratio of 2:1, in a country with the sample average tax rate, increases the external debt ratio by 1.4 or 2.8 percentage points, depending on if the safe haven ratio is defined in terms of related party debt or total debt, respectively (Buettner et al. (2012, p. 936), Table 5, column 8).
[22] Buettner et al. (2006, p. 21), Table 3, Column (4).

capitalization rules. Wamser (2014) confirms that thin-capitalization rules reduce internal leverage and that companies seemingly are substituting external for internal debt. More importantly, he finds that firms for which the thin-capitalization rules became binding as a result of the reform, increase their external debt-to-capital ratio by 5.1 percentage points compared to firms for which the rules were not binding[23]. He also confirms that the substitution is not complete as the total debt level decreases. These findings are important, as they suggest that the substitution effect may limit the effectiveness of thin-capitalization rules in increasing the corporate tax base.

A recent working paper by Blouin et al. (2014) studies the effect of thin-capitalization rules on affiliates of US MNCs. Blouin et al. (2014) collect a broader and more detailed data set on thin-capitalization rules, compared to for instance Buettner et al. (2012), totaling 54 countries worldwide. Another difference is that they directly study the level effect on debt by thin-capitalization rules, as well as the effect on the tax rate sensitivity. They find that thin-capitalization rules, with a safe haven ratio defined in terms of total debt, on average reduces the total debt-to-assets ratio by 1.9 percentage points[24]. A thin-capitalization rule restricting loans from the parent reduces the total debt-to-assets ratio by 0.8 percentage points[25], while the parent debt-to-assets ratio is reduced by 6.3 percentage points[26]. Further, they find automatically enforced rules to exert stronger impact than discretionary enforced rules[27].

[23] Wamser (2014, p. 775), Table 4, Column 2 (*Radius (r= 0.1)*).
[24] Blouin et al. (2014, p. 29), Table 4, Column (4). Note that in the paper they write 1.9% (not percentage points), but looking at their tables it is apparent that the correct interpretation is percentage points.
[25] Blouin et al. (2014, p. 32), Table 7, Column (1).
[26] Blouin et al. (2014, p. 30), Table 5, Column (4).
[27] Application with discretion may, for instance, be by an arm's length principle.

3. Introduction to Thin-Capitalization Rules

The aim of this section is to give a brief overview of the characteristics of thin-capitalization rules, and how they are designed to curb international tax planning. There are almost as many ways of specifying thin-capitalization rules as there are countries applying them. Our aim is thus not to describe every possible specification, but rather give a brief overview of the most common features and areas of variation. We will also define the type of thin-capitalization rules analyzed in this thesis, and what assumptions we make about their properties.

3.1 Characteristics of Thin-Capitalization Rules

A common feature of all thin-capitalization rules is their purpose; to limit excessive use of leverage and tax revenue loss from international debt shifting. Dourado and de la Feria (2008, p. 2) categorize rules limiting interest deductibility into specific and non-specific rules. The main difference is that specific rules directly restrict deduction of interest from internal debt, based on a safe haven debt-to-equity ratio, while non-specific rules usually restrict tax deduction of interest from all kinds of debt. It is easy to see that specific thin-capitalization rules are only relevant to MNCs, as internal debt in terms of tax planning is beneficial for MNCs only. Non-specific rules, on the other hand, might affect domestic firms as well, as the rules consider total debt levels, but countries often offers domestic firms leeway such that the rules in practice mainly are relevant for MNCs (Ruf & Schindler, 2012, p. 6). The most apparent example of non-specific rules are so called "earnings-stripping rules", denying tax deductibility of interest payments in excess of a defined percentage of (usually) EBITDA.

Because of the many different specifications of thin-capitalization rules, and the fact that they are not defined by a specific theoretical concept, there is no universal definition of what falls under the term "thin-capitalization rules". For example, Dourado and de la Feria (2008, p. 2) claim that earnings-stripping rules are not really thin-capitalization rules, but rather just rules having similar effects as "real" thin-capitalization rules. On the other hand, Ruf and Schindler (2012, p. 5) find this differentiation "too semantic". For this thesis, the distinction between earnings-stripping rules and thin-capitalization rules is not of concern, as earnings-

stripping rules were not adopted by any of the countries included in our analysis until 2008[28,29]. What is described as thin-capitalization rules in this thesis is most similar to what has been described as specific thin-capitalization rules.

Common for specific thin-capitalization rules are that they define a maximum amount of debt allowable relative to a measure of capital, often called a "safe haven" or "safe harbor" ratio. What is not common is precisely how this safe haven ratio is defined. The numerator is usually defined as either total debt or total internal debt, but the two measures can also be specified in more narrow terms[30]. The denominator in the safe haven ratio is usually a measure of the equity of the company[31], but there is also more than one way to specify equity.

Further on, thin-capitalization rules differ among countries in which firms they apply to, how the rules are applied, and how excess interest payments are treated[32]. Some countries only apply thin-capitalization rules to affiliates where a foreign parent has a substantial direct or indirect ownership share, while other countries apply the rules to all affiliates of foreign MNCs[33]. Some countries apply the rules automatically, meaning that once the safe haven ratio is exceeded the affiliate will be subject to restrictions, while others use discretion in the application of the rules, usually by an arm's length principle. Finally, once an affiliate is subject to restrictions, there are mainly two ways to treat excess interest. The first is to simply deny tax deduction of interest to all or exceeding debt, and the second is to reclassify interest payments as dividends.

[28] In 2008, Germany replaced it's specific thin-capitalization rules with earnings-stripping rules, denying deductibility of interest expenses exceeding 30% of EBITDA regardless of to what kind of debt (internal or external) the interest is paid (Ruf & Schindler, 2012, p. 5).
[29] The U.S thin-capitalization rules, adopted in 1989, leans somewhat towards being earnings-stripping rules. The U.S. rules deny tax deduction of interest payments exceeding 50% of EBITDA. However, this only applies if the debt-to-assets ratio exceeds a safe haven ratio of 1.5 and if the interest is paid to related parties exempted from U.S. taxation. Thus, these rules are not pure earnings-stripping rules, and the preconditions are analogous to specific thin-capitalization rules. We therefore treat the U.S. rules as specific TC-rules in our analysis. Buettner et al. (2012, p. 932) refer to the U.S. rules as "interest-stripping rules".
[30] See Blouin et al. (2014, pp. 23-24) Table 1: *Characteristics of thin capitalization rules at year-end 2004* for full details on the different specifications of safe haven ratios for both internal debt and total debt.
[31] New Zealand defines the safe haven ratio in terms of debt to assets (Smith & Dunmore, 2005, p. 8).
[32] Even more sources of variation exist. Readers are referred to the papers by Bloiun et al. (2014) and Dourado and de la Feria (2008) for more detailed reviews of thin-capitalization rules on a per country basis.
[33] For instance, the US and Denmark applies thin-capitalization rules only to affiliates where the parent has an ownership share of at least 50%, while the rules in Belgium and Switzerland applies to all affiliates.

Due to the great variety of specifications of thin-capitalization rules, we have to make simplifying assumptions to be able to produce a well-defined theoretical framework and predictions for the empirical analysis. We do that by summarizing the most important, common characteristics of the rules; they define a maximum allowable debt-to-equity ratio, and put restrictions on the tax deductibility of interest on internal debt if that ratio is exceeded[34]. This will be applied as the definition of thin-capitalization rules for the remainder of this thesis.

3.2 Effects on the Capital Structure

We now turn to the impacts of thin-capitalization rules on MNCs' capital structure. This section aims at providing a basic intuition, while the effects are formalized in a theoretical model in the following theory section. By restricting the tax deductibility of interest on internal debt, thin-capitalization rules should affect the optimal level and the tax rate sensitivity of internal debt in restricted firms, i.e. affiliates with debt ratios above the safe haven ratio. However, an important determinant of the effectiveness of the rules is whether or not there exist loopholes to partly circumvent the rules (Ruf & Schindler, 2012, p. 3).

For the case where there are no loopholes, often called strictly binding thin-capitalization rules, interest expenses become nondeductible as soon as the safe haven debt-to-equity ratio is exceeded. In other words, the debt tax shield from internal debt drops to zero and the marginal concealment costs increase to infinity for every unit of debt above the allowable amount. Efforts to employ more internal debt are then not profitable. Firms facing binding thin-capitalization rules are thus incentivized to reduce their debt-to-equity ratio until it equals the safe haven ratio. A tightening of the rules by reducing the safe haven debt-to-assets ratio should further reduce the internal debt level in affiliates affected by the rules. Since the debt tax shield is capped at the safe haven ratio, firms will not find it profitable to increase the amount of internal debt in response to an increase in the tax rate. The tax rate sensitivity of internal debt should thus be zero for firms restricted by strictly binding rules. Firms that have debt-to-equity ratios below the defined safe haven ratio should not be affected by the rules.

[34] Our definition is in line with how thin-capitalization rules are usually defined and treated in existing papers on thin-capitalization rules (see e.g. Buettner et al., 2012; Overesch & Wamser, 2010; Ruf & Schindler, 2012; Wamser, 2014; Weichenrieder & Windischbauer, 2008).

When there are loopholes available to partly circumvent the thin-capitalization rules, the effects of the rules may be weaker. Loopholes allow for interest expenses on internal debt to remain tax deductible, even when the safe haven debt-to-equity ratio is exceeded. However, exploration of loopholes is assumed to be costly, as it requires extra concealment efforts, and consequently the cost of internal debt increases. Compared to the case with strictly binding thin-capitalization rules, firms facing restrictions may in the case with loopholes not find it optimal to reduce their internal debt levels all the way down to the safe haven debt-to-equity ratio. However, because of the increased costs of debt, restricted firms should find it optimal to reduce their use of internal debt to some extent. The optimal debt level will be somewhere between the case with strictly binding rules and no rules. Since the debt tax shield remains positive in the case with loopholes, the tax rate sensitivity of internal debt will also stay positive. However, because of the increased concealment costs, firms should not find it profitable to increase the amount of internal debt as much as they would in the absence of a thin-capitalization rule. The tax rate sensitivity is thus reduced even when there are loopholes, but it should not drop to zero, as was the case with strictly binding rules.

4. Theoretical Framework

This section aims at presenting the underlying theoretical model of our empirical analysis. This thesis is concentrated on a small part of the capital structure literature, and will in accordance be focused on the theoretical impacts of thin-capitalization rules on optimal leverage. We build our model by combining theory and models presented in existing work. The result is a theoretical model that, by and large, is similar to the theoretical model underlying the empirical analysis by Buettner et al. (2012)[35]. However, we choose a slightly different approach and make some other assumptions, but the fundamental concepts and theoretical predictions are coinciding.

The thin-capitalization rules in focus of this thesis are assumed only to have an impact on the optimal level of internal debt[36]. However, as has been stressed earlier, thin-capitalization rules may have an indirect effect on the use of external debt as firms may substitute internal for external debt when internal debt is restricted. This is discussed at the end of this section.

4.1 Theoretical Model

The model of international debt shifting by Møen et al. (2011, Section 2) serves as our base model to determine the optimal capital structure of MNCs[37]. We adapt their main assumptions, but in contrast to Møen et al. (2011), we exclude external debt shifting from our model. This is done to achieve a simpler and tidier model. The exclusion of external debt shifting has no implication for the theoretical predictions, as we assume thin-capitalization rules only to affect internal leverage. Compared to the full model by Møen et al. (2011), excluding external debt shifting is the equivalent to assuming that the parent does not guarantee for external debt, i.e. the overall bankruptcy cost, C^f, is zero.

The model is formed by defining an MNC as a company resident in country p with fully owned affiliates in $i = 1, .., n$ countries. It is assumed that the parent company is a holding

[35] The theoretical framework is elaborated in more detail in a working paper version (Buettner et al., 2008) of the published paper.
[36] Note that there exist rules that also restrict the use of external debt. The effect on external debt by such rules should be analogous to the effect on internal debt by rules only restricting internal debt (Ruf & Schindler, 2012, p. 7).
[37] Note that the model by Møen et al. (2011) is in turn inspired by other work.

company and has direct ownership in its affiliates. We relax the assumption of direct ownership to also include indirectly owned affiliates. Our claim is that the ultimate decision lies at the parent of the MNC, regardless of whether the affiliate is directly owned or controlled via an ownership chain[38].

Each affiliate produces a homogenous good by the production function $y_i = F(K_i)$ where K_i denotes total capital and the sales price is normalized to unity, i.e. $p = 1$. Capital can be provided from three sources; equity, external debt, and internal debt. External debt is assumed to be debt provided by non-related parties. Internal debt is debt coming from the parent company or other affiliates within the same MNC. The parent provides affiliate i with the needed equity to obtain the optimal, tax-efficient capital structure. The capital structure of affiliate i can be written as

$$K_i = E_i + D_i^I + D_i^E \qquad \textit{where} \qquad E_i = Equity$$
$$D_i^I = Internal\ debt$$
$$D_i^E = External\ debt$$

The rental cost of capital is taken as exogenous and equal to $r > 0$ (i.e. small country assumption) and we assume an arm's length principle to apply such that the interest rate on internal and external debt is equal[39]. In line with most real world tax regimes, the rental cost of debt is assumed to be tax deductible, while the opportunity cost of equity is not[40]. Debt is thus tax-favored compared to equity. MNCs benefit from the debt tax shield of both external and internal debt. The debt tax shield is determined by the rental cost of debt, r, and the tax rate, t_i, and is from an affiliate's point of view defined as

$$t_i \cdot r \cdot D_i \qquad \textit{where} \qquad D_i = D_i^I, D_i^E$$

[38] In the empirical analysis, we test if this assumption impacts the results.

[39] By the small country assumption, we assume $i^E = r^{Equity}$. Further, firms may have incentives to set the interest rate on internal debt above the interest reate on external debt (market value) to shift profits out of high taxed countries. The arm's length principal is a restriction to prevent firms from setting the interest rate on internal debt above the market value. We thus assume the maximum value of interest on internal debt to be equal to the interest on external debt, $i^I = i^E$. We therefore assume $i^I = i^E = r^{Eq} = r$.

[40] Note that in countries with corporate tax systems such as "allowance for corporate equity" (ACE) or Comprehensive business income tax (CBIT), the differential treatment of debt and equity will to a large extent be eliminated (De Mooij & Devereux, 2011).

The optimal levels of debt are determined by a trade-off between the tax shield benefit of debt, and other costs and benefits of debt[41]. Thus, the cost functions of internal[42] and external debt, $C^I(b_i^I)$ and $C^E(b_i^E)$ respectively, are included in the model. The functions are defined as[43]

$$C^I(b_i^I) = \frac{\eta}{2} \cdot (b_i^I)^2 \cdot K_i \,, \; if \;\; b_i^I > 0 \,, \qquad \text{and} \qquad C^I(b_i^I) = 0, \;\; if \;\; b_i^I \leq 0 \qquad (1)$$

$$C^E(b_i^E) = \frac{\mu}{2} \cdot (b_i^E - b^*)^2 \cdot K_i - \frac{\mu}{2} \cdot (b^*)^2 \cdot K_i \qquad (> 0) \qquad (2)$$

$$C(b_i^I, b_i^E) = C^I(b_i^I) + C^E(b_i^E) \qquad (3)$$

where $b_i^I = \frac{D_i^I}{K_i}$ and $b_i^E = \frac{D_i^E}{K_i}$ are the internal and external debt-to-assets ratios respectively, b^* is the optimal external debt-to-assets ratio in absence of taxation, and η and μ are positive constants. Except for the debt tax shield and the costs of debt, the model assumes perfect capital markets.

Equation (3) illustrates that the cost functions of external and internal debt are assumed to be additively separable. This assumption is commonly adopted in models on capital structure, based on some fundamental differences between the cost of internal and external debt (see e.g. Schindler & Schjelderup, 2012, p. 638), but hinges to some degree on assuming perfect capital markets[44]. Further, the assumption is in line with the workings of thin-capitalization rules restricting only internal leverage, and it allows for clear theoretical predictions based on thin-capitalization rules' effect on the cost of internal debt.

[41] Costs and benefits of debt were reviewed in Section 2.1.
[42] We assume costs of internal debt to be positive, though low, even in the absence of thin-capitalization rules. The alternative case, $C^I = 0 \; if \; b_i^I > 0$, would imply 100% internal debt financing as internal debt always would be cheaper than external debt and equity, and have no offsetting cost.
[43] Note that these cost functions are net cost functions.
[44] Desai et al. (2004) argue that separability only holds in perfect capital markets; if internal debt is a substitute for external debt in imperfect capital markets, the two kinds of debt will depend on each other.

The cost functions of both internal and external debt are assumed to be convex in the debt-to-assets ratios. The properties of the cost functions can be summed as follows

$$C^I(b_i^I) > 0, \quad with \quad C^{I\prime}(b_i^I) > 0, \;\; C^{I\prime\prime}(b_i^I) > 0, \qquad if \qquad b_i^I > 0 \tag{4}$$

$$C^I(b_i^I) = 0, \quad with \quad C^{I\prime}(b_i^I) = 0, \qquad if \qquad b_i^I \leq 0 \tag{5}$$

$$C^E(b_i^E) > 0, \quad with \quad C^{E\prime}(b_i^E) > 0, \;\; C^{E\prime\prime}(b_i^E) > 0, \qquad if \qquad b_i^E \geq b^* \tag{6}$$

$$C^{E\prime}(b_i^E) < 0, \;\; C^{E\prime\prime}(b_i^E) > 0, \qquad if \qquad b_i^E < b^* \tag{7}$$

On the affiliate level, the true economic profit, π_i^e, taxable profit, π_i^t, and after-tax profit, π_i, of affiliate i is defined as

$$\pi_i^e = F(K_i) - [r + C^I(b_i^I) + C^E(b_i^E)] \cdot K_i \tag{8}$$

$$\pi_i^t = F(K_i) - r \cdot [D_i^I + D_i^E] - [C^I(b_i^I) + C^E(b_i^E)] \cdot K_i \tag{9}$$

$$\begin{aligned} \pi_i = V_i^L &= \pi_i^e - t_i \pi_i^t \\ &= (1 - t_i) \cdot F(K_i) - r \cdot K_i + t_i \cdot r \cdot [D_i^I + D_i^E] - (1 - t_i) \cdot [C^I(b_i^I) + C^E(b_i^E)] \cdot K_i \end{aligned} \tag{10}$$

Note that we assume the costs of internal and external debt to be tax deductible, implying that the costs are tangible costs showing up on the income statement for corporate taxation[45]. The assumption does not change the qualitative results, compared to e.g. Møen et al. (2011), but it will theoretically lead to higher levels of debt as it implies a tax subsidy on the costs of debt.

Given the cost functions of debt, and the profit functions on the affiliate level, the MNC employ equity and debt such that the overall value of the MNC is maximized. In a static, one-period model, total profits and the value of the MNC are identical, and can be written as[46]

$$\Pi_{MNC} = V^L = \sum_i V_i^L = \sum_i (\pi_i^e - t_i \cdot \pi_i^t) \tag{11}$$

[45] Assumption in accordance with Schindler and Schjelderup (2012, p. 639). The assumption deviates from Møen et al. (2011) and Huizinga et al. (2008), who assume the costs not to be tax deductible. Huizinga et al. (2008, p. 94) argue that bankruptcy costs are induced by loss making firms, and cannot be credited against profits earned elsewhere in the MNC. Møen et al. (2011, p. 7) argue that the assumption is necessary for deriving well-defined structural equations for their empirical model of international debt shifting, though admitting the assumption may be strong. We would argue that some costs do show up in the income statement, such as concealment costs, and the stronger assumption of non-deductibility is not needed for our model to yield well-defined equations and predictions. From the first order conditions it can be seen that the choice of either assumption does not affect the results qualitatively.

[46] As has been mentioned earlier, we have omitted external debt shifting from our model. Equation (11) and (12) thus deviates from the corresponding equation by Møen et al. (2011, p. 8) by omitting the overall bankruptcy cost on the parent level, C^f.

Maximizing the value of the MNC yields the following optimization problem

$$\max_{D_i^I, D_i^E} \Pi_{MNC}$$

$$= \sum_i \{(1 - t_i) \cdot F(K_i) - r \cdot K_i + t_i \cdot r \cdot [D_i^I + D_i^E] - (1 - t_i) \cdot [C^I(b_i^I) + C^E(b_i^E)] \cdot K_i\} \quad (12)$$

$$s.t. \sum_i r \cdot D_i^I = 0$$

Note the constraint that the sum of all interest on internal debt must equal zero. This is intuitive, as interest paid to internal debt in affiliate i is earned as interest income in another affiliate $j \neq i$. The total must thus sum up to zero. Solving the maximization problem yields the following first-order conditions (FOC) for the optimal levels of internal and external debt[47]:

FOC Internal debt: $$(t_i - \lambda) \cdot r = (1 - t_i) \cdot \frac{\partial C^I(b_i^I)}{\partial b_i^I} \geq 0 \qquad \forall\, i \qquad (13)$$

FOC External debt: $$t_i \cdot r = (1 - t_i) \cdot \frac{\partial C^E(b_i^E)}{\partial b_i^E} > 0 \qquad \forall\, i \qquad (14)$$

As shown by equation (13) and (14), the optimal debt structure of the MNC is found by balancing the debt tax shields (Left Hand Side, LHS) against the marginal costs of debt (Right Hand Side, RHS). The resulting first-order conditions have several important implications. One is that it is optimal for affiliates of MNCs to employ both internal and external debt, given that $r > 0$ and $t_i > 0$. Since we have excluded external debt shifting, the first-order condition for external debt is exactly the same for an affiliate of an MNC as for a comparable domestic firm, but the affiliate of the MNC will still have more total debt due to internal borrowing.

Before moving on, an examination of the first-order condition of internal debt is needed. First, notice the Lagrange parameter λ. It represents the shadow price of shifted interest expenses, caused by the fact that the lending affiliate pays tax on the interest income from internal debt. It can be shown that λ should be chosen such that $\lambda = \min_i t_i$ to maximize the overall value of the MNC[48]. In other words, the tax efficient set-up is to choose the lowest taxed affiliate as the internal bank, and that affiliate should be the only one lending money.

[47] See appendix A for complete derivation of the first-order conditions.
[48] See Schindler and Schjelderup (2012, p. 645), Appendix A for proof.

Since our internal debt related dependent variable is parent debt – a special case of internal debt – we need to address an issue regarding parent debt. Following the abovementioned logic behind $\lambda = \min_i t_i$, there should be no internal lending between the parent and other affiliates, if the parent is not the lowest taxed entity in the MNC. The Norwegian parents in our data set are not likely to be the lowest taxed affiliate in the MNCs, since many countries have lower tax rates than Norway. Despite this, the data set shows extensive use of parent debt. Several other studies also show that parent debt is indeed employed, even if the parent is located in a high-tax country[49]. Imperfect external capital markets and institutional environments have been pointed out as possible reasons for why parent debt is employed (Aggarwal & Kyaw, 2008, p. 409)[50]. Another reason might be presence of CFC-rules in the home country of the MNC[51]. The focus of this thesis is internal debt in general, and it is not within the scope of this thesis to solve what some authors call the ”parent debt puzzle” (see e.g. Møen, Schindler, Schjelderup, & Bakke, 2012; Niesten-Dietrich, 2014). However, we find it important to have a brief discussion of parent debt before moving on with the theoretical predictions.

Existing literature have pointed out that parent debt, when financed by external debt, may be a substitute for external debt at the affiliate level, simply rerouting external debt from external creditors to affiliates via the parent company (see e.g. Dewaelheyns & Van Hulle, 2010). The argument is that this is a more credible way for the parent to commit to the debt, which in turn lowers the credit spread on external debt[52]. Further, Buettner et al. (2008, p. 6) argue that parent debt is more likely to be financed by external debt if the parent is not located in a low-tax country, because the potential tax burden on the interest income could otherwise be substantial. Since Norway is not a low-taxed country, it may be more realistic to assume parent debt to be financed by external debt.

[49] See e.g. the descriptive statistics in Buettner et al. (2012, p. 935) and Blouin et al. (2014, p. 25).
[50] For a comprehensive review of literature on parent debt, see Niesten-Dietrich (2014), section 3.
[51] The Norwegian CFC rules limit the use of internal banks by taxing profits from affiliates at the tax rate faced by the parent, if the affiliate faces an effective tax rate lower than 2/3 of the Norwegian tax rate (Schjelderup et al., 2006, p. 106). Norway has had CFC-rules since 1992 (Schjelderup et al., 2006, p. 103).
[52] An alternative approach presented in existing literature is that the affiliate directly takes on external debt and parent guarantees for the debt (see e.g. Huizinga et al. 2008, p. 94). However, some argue that taking on the external debt at the parent level serves as a more credible commitment, reducing the credit spread.

By looking at equation (13), it can be seen that lending from the parent to a lower taxed affiliate actually carries a negative debt tax shield, because $\lambda > t_i$. However, if parent debt is financed by external debt, the interest income at the parent will be offset by the corresponding interest cost. This means that the shadow price of shifted interest on debt, λ, will be reduced to zero, as the tax burden at the parent is not increased. Further, if parent debt is financed by external debt, Møen et al. (2012, p. 4) argue that the agency costs and benefits of parent debt should qualitatively be the same as for external debt, if the parent monitors the affiliate closely. By the arguments stated above, a more realistic first-order condition for parent debt may then be[53]

$$t_i \cdot r = (1 - t_i) \cdot \frac{\partial C^P(b_i^P)}{\partial b_i^P} > 0 \qquad \forall\, i \qquad (15)$$

where b_i^P is the share of parent debt over total assets. The first-order condition for parent debt (equation 15) differs from the previously stated first-order condition for internal debt (equation 13). However, qualitatively, the debt tax shields in the two equations are the same; they both increase in the host country's tax rate. In addition, even though the agency costs may differ, the concealment costs of internal debt, which will increase with thin-capitalization rules[54], should be the same for parent debt and non-parent internal debt. This means that the tax rate sensitivity and the effects of thin-capitalization rules should qualitatively be analogous for non-parent internal debt and parent debt, even if we were to assume parent debt to be financed by external debt. For the continuation of the theoretical predictions, we therefore employ the first-order condition for internal debt stated by equation (13) as the first-order condition for internal debt in general. The important take-away is that the predictions we yield in the following subsections are not dependent on this choice, and that our analysis should be valid in identifying the effects of thin-capitalization rules on internal debt in general, even though our dependent variable is parent debt[55].

Having defined the first-order conditions for the optimal levels of internal and external debt, it can be determined how the debt ratios are affected by changes in the tax rate, i.e. the tax

[53] The presented first-order condition for parent debt is simplified for the sake of the argument. For a more advanced model, see Møen et al. (2012, section 2).
[54] The effects of thin-capitalization rules on internal debt are examined in section 4.3.
[55] It is also important to be able to predict the effect on total internal debt, i.e. internal debt in general, to be able to predict the effect on total leverage.

rate sensitivity of internal and external debt. Implicitly differentiating the first-order conditions yields the following tax rate sensitivities[56]

$$\frac{db_i^I}{dt_i} = \frac{r + \partial C^I / \partial b_i^I}{(1-t_i) \cdot (\partial^2 C^I / \partial b_i^{I2})} > 0 \tag{16}$$

$$\frac{db_i^E}{dt_i} = \frac{r + \partial C^E / \partial b_i^E}{(1-t_i) \cdot (\partial^2 C^E / \partial b_i^{E2})} > 0 \tag{17}$$

Based on the maximization problem hitherto presented, and its resulting first-order conditions, we can draw some conclusions of how the tax rate is related to internal and external debt in affiliates of MNCs in the absence of thin-capitalization rules. It is clear that the tax rate sensitivity of both is positive. Higher taxed affiliates will have higher levels of both internal and external debt than comparable, lower taxed affiliates, due to the higher value of the debt tax shield. An increase in the tax rate will increase the value of the debt tax shield of both internal and external debt. Looking at equations (13) and (14), this implies an increase of the LHS. This in turn means that the levels of debt should increase to restore the balance between the marginal costs of debt and the debt tax shield. This is confirmed by equations (16) and (17), showing a positive tax rate sensitivity of both internal and external debt. In addition, since we assume costs of debt to be tax deductible, an increase in the tax rate also affects the RHS of the first-order conditions (equation 13 and 14) as it increases the tax subsidy on the costs of debt, reinforcing the positive tax rate sensitivity of debt.

4.2 The Impact of Thin-Capitalization Rules

This section now turns to how thin-capitalization rules impact the capital structure decision. Again, we stress that we assume thin-capitalization rules to only have an effect on internal debt. Thus, the results for the optimal level of external debt and its tax rate sensitivity stated above holds under thin-capitalization rules.

Recall from Section 3.2 that thin-capitalization rules are either strictly binding or possible to circumvent to some degree due to loopholes. In Buettner et al. (2012, Section 4) thin-capitalization rules are modeled as strictly binding. In contrast, we chose to model thin-

[56] See Appendix A for complete derivation of the tax rate sensitivity.

capitalization rules as non-strictly binding, i.e. we allow for loopholes. We find it more likely that rules offer some leeway rather than being 100% strictly binding. As explained in Section 3.2., and shown below, this assumption does not change the qualitative predictions; the level of internal debt and the tax rate sensitivity should still be reduced. However, quantitatively the effects will be smaller, as the tax rate sensitivity will remain positive, and affiliates will not have the same incentive to reduce the debt level all the way down to the threshold.

As stated in Section 3.2, exploring loopholes allows for the debt tax shield to stay positive even when the debt ratio exceeds the safe haven ratio, but it is assumed to be costly. To incorporate the additional costs, we add an argument, α_i, to the cost function of internal debt. The α_i represents how strictly the thin-capitalization rules are applied, i.e. how difficult it is to circumvent the rules, and it can be seen as a positive shock on the marginal cost of internal debt. α_i takes the value of zero if there is nothing enforcing the thin-capitalization rules, i.e. in practice no rule apply, and increase towards infinity with how strict the rules are enforced. We redefine the cost of internal debt and its first-order condition as

Cost function of internal debt:

$$C^I = C^I(b_i^I, \alpha_i) \tag{18}$$

$$\textit{with } \frac{\partial C^I(b_i^I,\alpha_i)}{\partial \alpha_i} > 0, \quad \frac{\partial^2 C^I(b_i^I,\alpha_i)}{(\partial \alpha_i)^2} > 0, \; \frac{\partial^2 C^I(b_i^I,\alpha_i)}{\partial b_i^I \partial \alpha_i} > 0 \;\; \textit{if } b_i^I > \bar{b}_i^I \tag{19}$$

$$\textit{with } \frac{\partial C^I(b_i^I,\alpha_i)}{\partial \alpha_i} = 0, \quad \frac{\partial^2 C^I(b_i^I,\alpha_i)}{(\partial \alpha_i)^2} = 0, \; \frac{\partial^2 C^I(b_i^I,\alpha_i)}{\partial b_i^I \partial \alpha_i} > 0 \quad \textit{if } b_i^I = \bar{b}_i^I \tag{20}$$

$$\textit{with } \frac{\partial C^I(b_i^I,\alpha_i)}{\partial \alpha_i} = 0, \quad \frac{\partial^2 C^I(b_i^I,\alpha_i)}{(\partial \alpha_i)^2} = 0, \; \frac{\partial^2 C^I(b_i^I,\alpha_i)}{\partial b_i^I \partial \alpha_i} = 0 \quad \textit{if } b_i^I < \bar{b}_i^I \tag{21}$$

First-order condition for optimal internal debt:

$$(t_i - \lambda) \cdot r = (1 - t_i) \cdot \frac{\partial C^I(b_i^I,\alpha_i)}{\partial b_i^I} \qquad \forall\, i \tag{22}$$

$$\textit{with } \frac{\partial C^I(b_i^I,\alpha_i)}{\partial b_i^I} > \frac{\partial C^I(b_i^I)}{\partial b_i^I} \quad \textit{if} \qquad \alpha_i > 0, \; b_i^I \geq \bar{b}_i^I \tag{23}$$

where $\bar{b}_i^I$ is the safe haven debt-to-assets ratio. Examining the equation above, it can be seen that the case of $\alpha_i = 0$ is the equivalent of not having thin-capitalization rules, as equation (18) then is the same as equation (1). Further, equation (21) shows that the strictness of the rules does not increase the cost of internal debt as long as the debt ratio of an affiliate is

below the safe haven ratio. The theoretical outcome is that the level of internal debt is unaffected by thin-capitalization rules, and it responds to changes in the tax rate as if no rule is in place.

The more interesting case to examine is affiliates with debt ratios above the defined safe haven ratio. These are the affiliates that we, and governments imposing thin-capitalization rules, are the most interested in. From equation (23) it is clear that the thin-capitalization rules cause the marginal costs of internal debt to increase for these affiliates, and the second derivative in equation (19) shows that the costs increase progressively with the strictness of the rules. This means that the marginal costs of internal debt will equal the internal debt tax shield at a lower level of debt when the firm is restricted. Said slightly different, the level of internal debt is expected to decrease by the imposition of a thin-capitalization rule. Using comparative statistics, this can formally be shown by

$$\frac{db_i^I}{d\alpha_i} = -\frac{\partial^2 C^I(b_i^I,\alpha_i)/(\partial b_i^I \partial \alpha_i)}{\partial^2 C^I(b_i^I,\alpha_i)/(\partial b_i^I)^2} < 0 \text{ [57]} \quad if \quad b_i^I > \overline{b_i^I} \tag{24}$$

Equation (24) confirms that thin-capitalization rules should reduce the level of internal debt in affiliates where the debt ratio exceeds the safe haven ratio. The equation also states that the stricter the rules are enforced, the more it will reduce the internal debt ratio.

The thin-capitalization rules will also impact the tax rate sensitivity of internal debt. Because of the loopholes, the value of the internal debt tax shield increases with the tax rate as if no rules were in place, but, as shown in equation (23), the corresponding marginal costs increase more when there is a rule. Thus, the resulting increase in internal debt from a rise in the tax rate will be lower with a thin-capitalization rule in place, i.e. the tax rate sensitivity is reduced. Note, however, that even though the tax rate sensitivity is lowered, it is still positive. Formally, this can be seen below by comparing the tax rate sensitivity of internal debt when there is a thin-capitalization rule in place, to the case without a rule

$$\frac{db_i^I}{dt_i} = \frac{r+\partial C^I(b_i^I)/\partial b_i^I}{(1-t_i)\cdot[\partial^2 C^I(b_i^I)/(\partial b_i^I)^2]} > \frac{r+\partial C^I(b_i^I,\alpha_i)/\partial b_i^I}{(1-t_i)\cdot[\partial^2 C^I(b_i^I,\alpha_i)/(\partial b_i^I)^2]} > 0 \tag{25}$$

[57] The expression is negative since both the numerator (equation 19) and denominator (compare equation 26 and 4) is positive.

$$since \quad \frac{\partial C^I(b_i^I,\alpha_i)}{\partial b_i^I} > \frac{\partial C^I(b_i^I)}{\partial b_i^I}, \qquad \frac{\partial^2 C^I(b_i^I,\alpha_i)}{(\partial b_i^I)^2} \gg \frac{\partial^2 C^I(b_i^I)}{(\partial b_i^I)^2} \tag{26}$$

The tax rate sensitivity is further reduced the stricter the rules are applied. In other words, the tax rate sensitivity is declining in α_i. As a final remark, note that strictly binding thin-capitalization rules are the equivalent of assuming that the application of thin-capitalization rules is infinitely strict, in other words that $\alpha_i \to \infty$.

4.3 Thin-Capitalization Rules in Relation to Total Debt

Our model assumes that thin-capitalization rules have no direct effect on external debt. Given that thin-capitalization rules reduce internal leverage, it is thus implied that total debt also will be reduced. However, as was mentioned in the literature review, thin-capitalization rules may have an indirect effect on external debt if firms substitute external for internal debt when internal debt is restricted. In Section 3, it was assumed that interest on external debt remains fully tax deductible under thin-capitalization rules, while the incentive to use internal debt is reduced. Facing the changed tax incentives of debt, MNCs must consider the overall costs and benefits of debt. If external and internal debt has some identical costs and benefits, MNCs may find it profitable to replace internal with external debt when facing thin-capitalization rules (Wamser, 2014, pp. 768-769). The degree of substitution thus depends on to what extent internal and external debt serve the same purpose and carry the same costs[58]. For instance, Wamser (2014, p. 769) argues that the benefit of debt restricting free cash flows is common for internal and external debt.

The costs and benefits of internal and external debt do have some fundamental differences, meaning that complete substitution is unlikely. This has also been confirmed in empirical studies (Buettner et al., 2012; Wamser, 2014). The takeaway for our empirical analysis is thus that we should expect total debt ratios to decrease when thin-capitalization rules are introduced, but the decrease in total debt may be less pronounced than the decrease in parent debt because of the possible substitution effect.

[58] We assume costs of internal and external debt to be additively separable, and that there are some fundamental differences in the cost and benefits of internal and external debt. However, that does not mean that the costs and benefits are entirely different.

4.4 Theoretical Predictions

The theoretical discussion of how thin-capitalization rules impact the capital structure of MNCs gives us the following predictions to bring into our empirical analysis:

Affiliates with internal debt ratios below the safe haven ratio should not be affected by thin-capitalization rules. Their debt levels should react to changes in the tax rate as if no rule were in place, i.e. the debt levels are expected to increase with the tax rate.

Affiliates with internal debt ratios above the safe haven ratio should reduce their levels of internal debt if a thin-capitalization rule is introduced. The internal debt level is expected to react weaker to changes in the tax rate, i.e. their tax rate sensitivity should be reduced. The decrease in internal debt, and the tax rate sensitivity, should be larger the stricter the rules are enforced.

External debt should not be directly impacted by thin-capitalization rules, but may be indirectly affected by a substitution effect. If that is the case, external debt may increase. The substitution is not likely to be complete, and thus total leverage of restricted affiliates is expected to decrease, but the decrease might be modest.

5. Investigation Approach

Equipped with the theoretical predictions from Section 4, we now turn to testing these predictions empirically. At hand, we have a panel data set containing affiliate-level financials for a selection of Norwegian MNCs[59]. In addition, we have collected information about each country's corporate tax rates, and safe haven ratios for countries with thin-capitalization rules. Together, the collected data gives us three main sources of variation. First, there is variation in corporate taxation. The tax rates differ both within and across countries over time. The other two sources of variation are the presence and the safe haven ratios of thin-capitalization rules. During the period of our study, some countries implemented a rule, one abolished its rule[60], while others had a rule the whole period. In addition, some countries changed the safe haven ratio. We thus have variation in thin-capitalization rules within countries. These sources of variation should enable us to test the theoretically predicted implications of thin-capitalization rules on the levels and the tax rate sensitivity of debt in affiliates of MNCs.

We miss information on two important factors to be able to set up a complete and true regression model, based on our theoretical predictions. The first is accurate information on whether or not an affiliate is subject to being restricted, i.e. if its debt ratio exceeds the safe haven debt ratio. In principle, this should be as easy as just comparing the observed debt ratio to the defined safe haven ratio. With our data set, this can be done for total debt when the safe haven ratio is defined in terms of total debt-to-equity. However, for internal debt we have information on parent debt, but not total internal debt. The latter is often the numerator in safe haven ratios, and thus it is not possible to determine if affiliates in countries with such a safe haven ratio are in fact restricted[61]. The second piece of missing information is how strict the rules are enforced. Exhaustive information on loopholes in each country's thin-capitalization rules is next to impossible to collect. It would require legal expertise and full insight in each country's legislation. Further, companies exploiting loopholes are not very likely to say so publically, making it even harder to identify the loopholes they exploit.

[59] See Section 6: Data and descriptive statistics.
[60] Slovakia abolished their rules in 2004.
[61] In addition, even with the total debt ratio available, and if we had information on total internal debt, it would still be hard to be absolutely sure about the status of the affiliate. The reason is that the application of thin-capitalization rules differ across countries (see Section 3.1), and specific firm characteristics are often needed to determine the correct tax status of an affiliate (Buettner et al., 2012, p. 934). We are therefore not able to accurately determine the status of each affiliate.

In order to identify the effects of thin-capitalization rules, Buettner et al. (2012) use an approach that exploits the relationship between the likelihood of rules being binding – i.e. the likelihood that firms are restricted by the rules – and a measure of the tightness of safe haven ratios. The probability of a rule being binding is increasing with the tightness of the rule, and the use of a quantitative tight variable allows the effects of thin-capitalization rules to depend on the tightness. We choose to adopt the same approach in our analysis. Note that Buettner et al. (2012) assume rules to be strictly binding if a firm is restricted, while we allow for loopholes. However, that does not change the probability of a rule being restricting[62]; it merely affects the theoretically expected quantitative outcome, but not the qualitative result.

5.1 Econometric Techniques

The cross-sectional units in our panel data are individual affiliates. It is reasonable to assume that every affiliate is associated with unobservable, affiliate-specific effects, which may affect the dependent variable and be correlated with one or more of the independent variables. In that case, we risk suffering from an omitted variable bias, and we use fixed effects estimation to minimize that risk[63]. In addition, fixed effects estimation will control for average differences across affiliates. We are then left with the variation within each affiliate. A potential problem with the analysis is two-way causality, as rules are not randomly assigned to countries. It is only natural that countries experiencing substantial debt shifting are more likely to implement a thin-capitalization rule. In that case, we have that thin-capitalization rules affect the debt levels, but at the same time the debt levels affect thin-capitalization rules. Using fixed effects may in this case reduce the problem of two-way causality, since fixed effects consider variation around the mean values; it should be the absolute level of debt shifting in a country that drives the potential two-way causality and not the variation from the mean.

[62] The safe haven ratio determines if a rule is binding, i.e. if a firm is restricted, or not. The ratio is the same regardless of loopholes. Thus, the probability of a rule being binding does not change with loopholes. This is explained further in Appendix B.

[63] Omitting a variable that affects the dependent variable, and is correlated with at least one explanatory variable, causes the error to be correlated with the explanatory variable(s) (Wooldridge, 2014, pp. 76-80). Assuming the unobservable affiliate-specific effects are time-invariant, fixed effects estimation will remove the part of the error term which is potentially correlated with the independent variable(s), and the omitted variable bias will be eliminated.

Industry and country should be fixed for every affiliate, and the affiliate-specific effects, therefore, nest industry-specific and country-specific fixed effects. The latter will, for instance, capture time-invariant characteristics of each host country. The parent of an affiliate is not necessarily fixed, as the majority owner of an affiliate may change due to mergers and acquisitions. Parents may have different debt policies, and we control for this by including parent dummies in the regressions. In addition, we include time dummies to capture time-specific effects. These are effects associated with a particular year, which affect all affiliates independent of location and parent. Since all MNCs in our analysis share the same home country, the time-specific effects will capture characteristics of the home country such as lending conditions and tax rates.

A potential problem with our analysis is serial correlation and heteroskedasticity in the error terms within clusters[64]. Failing to adjust for this will not bias the estimated coefficients of the explanatory variables, but can lead to (usually) underestimated standard errors, which will produce too high t-statistics. The cluster-specific fixed effects will control for part of the within-cluster serial correlation, but not for heteroskedasticity (Cameron & Miller, 2013, p. 16). To control for both, we compute cluster-robust standard errors on the country-year cells, adopted from Buettner et al. (2008, 2012).

5.2 Regressions

We have two dependent variables of interest. The first is the *parent* debt-to-assets ratio of affiliate *i*, located in country *j*, observed in period *t*, $PDR_{i,j,t}$. The second is the *total* debt-to-assets ratio of the same affiliate, $TDR_{i,j,t}$. All regressions will be run two times – one for each dependent variable. In addition to the main explanatory variables, we include the firm- and country-specific control variables ($X_{i,j,t}$), as well as affiliate-, parent-, and time-fixed effects ($\alpha_{i,j}$, μ_{MNC} and γ_t, respectively).

[64] Serial correlation in the error term is present if the error terms of two observations, either from different points in time or cross-sectional observations, are correlated. Formally, it violates the assumption that $cov(u_{i,t}, u_{j,\tau}|\mathrm{X}) = 0$ for all $(i,t) \neq (j,\tau)$ (Wooldridge (2014), Chapter 12). Heteroskedasticity is present if the variance of the error term is dependent on one or more of the explanatory variables. Formally, it violates the assumption that $var(u_{i,t}|\mathrm{X}) = var(u_{i,t}) = \sigma^2$ (Wooldridge, 2014, pp. 212-213).

Our theoretical framework focuses on two effects of thin-capitalization rules on the capital structure of MNCs; the direct impact the rules have on the level of debt (level effect), and the indirect effect through a changed tax rate sensitivity of debt. We begin our empirical analysis with two simple tests to obtain some descriptive evidence of the normal tax rate sensitivity of debt and the level effect of thin-capitalization rules. We do that by running two regressions; one with the tax rate, $\mathcal{T}_{j,t}$, as the explanatory variable, and one with a dummy-variable, $TCR_{j,t}$, indicating whether or not a thin-capitalization rule is in place. However, a weakness with these tests is that both the tax rate and the presence of thin-capitalization rules are determinants for the capital structure, and running two separate regressions fails to take this into account. We therefore run a third regression where both variables are included.

Next, we want to test the impact of thin-capitalization rules on the tax rate sensitivity of debt. We do that by running a regression where we include the tax rate and an interaction term between the tax rate and the dummy variable for rule. However, the regression may suffer from not including the level effect as well. If the main effect is not included, the regression may confound the main effect and the interaction effect (Jaccard & Turrisi, 2003). To control for this, we run a fifth regression including both main effects and the interaction term, which gives the general regression equation[65]

$$DR_{i,j,t} = \beta_1 \mathcal{T}_{j,t} + \beta_2 TCR_{j,t} + \beta_3 \cdot \mathcal{T}_{j,t} \cdot TCR_{j,t} + \beta_4 X_{i,j,t} + \gamma_t + \mu_{MNC} + \alpha_{i,j} + u_{i,j,t} \qquad (27)$$

The first term captures the relationship between debt ratios and the tax rate in the absence of thin-capitalization rules, which is expected to be positive for both parent and total debt. Finding a significantly positive β_1 will provide evidence supporting this prediction.

The second term represents the level effect of thin-capitalization rules on the debt ratios. In equation (27), $TCR_{j,t}$ is a dummy variable, taking the value of 1 if a rule is in place in country j in period t. The theoretically predicted effect on parent debt is that the parent debt ratio is reduced, which will be supported by finding a significantly negative β_2[66]. For total

[65] The dependent variable in the regression equation is displayed as debt ratio, $DR_{i,j,t}$, which can be either total debt or parent debt.

[66] Note that β_2 is actually interpreted as the effect of a thin-capitalization rule if the tax rate is zero. This is not very interesting as a zero tax rate would imply no internal debt (no debt tax shield), and thus the theoretical expected level effect would be zero. In addition, none of the included countries have a zero tax rate. We therefore re-run the regression where we replace the tax variable with a variable measuring the difference in the tax rate from the sample average, i.e. $(t_{i,t} - \bar{t})$. The coefficient is then interpreted as the level effect on an affiliate facing the sample average tax rate.

debt the effect may not be as pronounced if external debt is substituted for internal debt when a rule is imposed, but existing literature have found evidence of the substitution not being complete. Finding a significant negative β_2 when testing total debt will provide further evidence for an incomplete substitution, and suggest that thin-capitalization rules are effective in reducing total debt levels.

The third term captures the effect thin-capitalization rules may have on the tax rate sensitivity of debt. While the tax rate sensitivity in the absence of thin-capitalization rules is measured by β_1, the tax rate sensitivity is $(\beta_1 + \beta_3)$[67] when a rule is in place. The theoretical model predicts that the tax rate sensitivity of internal debt is reduced by thin-capitalization rules, and thus β_3 is expected to be negative when testing parent debt ratios. The effect on the tax rate sensitivity of total debt is again dependent on the substitution effect, but given that the substitution is not complete we expect β_3 to be negative.

Next, we also run regressions based on the relationship between the probability of rules being binding and the tightness of the safe have ratios, adopted from Buettner et al. (2012). We do that by replacing the rule dummy in the regressions above with a variable that reflects the tightness of the safe haven ratios[68]. The variable utilizes the quantitative information in the rules' safe haven ratio, and allows for the effects of thin-capitalization rules to vary with the tightness. Buettner et al. (2012) define the variable as

$$TIGHT_{j,t} = \frac{1}{1+\sigma_{i,t}}$$

where $\sigma_{j,t}$ is the safe haven ratio. $TIGHT_{j,t}$ captures the whole spectrum of safe haven ratios, in the range 0 to 1. The variable is decreasing in the safe haven ratio, meaning that it takes the value of 1 if no debt is allowed (i.e. safe haven ratio =0), and the value of 0 if an unlimited amount of debt is allowed. The expected signs of the coefficients in the regressions are the same when using the tight variable as they are when using the dummy.

[67] $\frac{\partial DR_{i,j,t}}{\partial \mathcal{T}_{j,t}} = \beta_1 + \beta_3 \cdot TCR_{j,t}$, where $TCR_{j,t}$=1 if a country has a rule.

[68] Appendix B formally shows how Buettner et al. (2012) incorporate the tightness of thin-capitalization rules in their regressions.

Theoretically, the regressions using TIGHT separate the effects of thin-capitalization rules on restricted firms from unrestricted firms (see Appendix B). In practice though, TIGHT will measure the average effects of thin-capitalization rules within a country[69], and we are dependent on a sufficient number of firms being restricted to identify the effects[70]. In further efforts to study the effects on the firms that are actually restricted, we will therefore test subsamples where affiliates are assigned to a quintile based on their debt levels. Affiliates in the fifth quintile are the most likely to be restricted by the rules, and may thus allow us to separately test the effects on the affiliates that the thin-capitalization rules are aimed at.

Before moving on, it should be noted that the regression in column (8) of our regression tables (see Section 7) is exactly the same as one of the regressions run by Buettner et al. (2012). As an extension to this regression, Buettner et al. (2012) split the tight variable to see if safe haven ratios defined in terms of total debt versus related party debt have different effects[71]. In addition to our ten base regressions, we have also run this extended regression. Generally, the interaction term between the tax rate and the tight variable do not prove significant, neither in column (8) nor in the extended regression. We therefore do not report the extended regressions where the tight variable is split, except for one instance where they turn out to be significant (see Section 7.2.3).

[69] The reason is that the probability of being restricted will be equal for all firms within the same country, as tightness is measured on the country-level, and the approach do not account for the actual debt levels.
[70] This is also the case for the dummy variable approach.
[71] Recall from Section 2 that Buettner et al. (2012) find that thin-capitalization rules with safe haven ratios defined in terms of total debt are more effective in reducing the tax rate sensitivity of parent debt.

6. Data Set and Descriptive Statistics

6.1 Data Origin and Sample Restrictions

The data set used in this thesis is derived from the survey "Utenlandsoppgave", by Statistics Norway[72]. The data set is an annual panel for the period 1990 – 2006 and holds information on Norwegian MNCs and their foreign affiliates. During this period, Norwegian MNCs had the choice to submit the survey electronically or by paper. Our data set only contains electronic submissions of the "Utenlandsoppgave". It includes information about ownership shares and financial transactions between the Norwegian parent and their affiliates, basic information about the balance sheet and the income statement of the affiliates, and which country the affiliates operate in. We merge the "Utenlandsoppgave" with data from the SIFON-registry. The SIFON-registry provides information on all Norwegian limited companies with at least one foreign investor. The registry shows the total foreign ownership share in the affiliates, and the ownership share of the largest foreign investor.

We combine the "Utenlandsoppgave" and the SIFON-information with country-level data on thin-capitalization rules. Georg Wamser has provided us with data on thin-capitalization rules for the OECD and European countries used in Buettner et al. (2012), for the period 1996 – 2005[73]. This allows us to create a main sample including the same years, 1996 – 2004, and 36 countries as used in the study by Buettner et al. (2012). In addition, we have collected data on thin-capitalization rules for the years 1994 – 1995 and 2006, and data for 25 additional countries[74], to construct an extended sample[75]. The additional countries were selected based on the criteria that at least five observations from the country were available in our data set, and that values for the control variables were possible to find.

While the data set provides data on *parent* debt from 1994 and onwards[76], it only provides information on *total* debt for the years after 1998. We, therefore, have quite different numbers of observations for the two dependent variables, and hence we have two versions of

[72] Form printed in Appendix C, p. 80.
[73] Note that their analysis includes the time period 1996-2004.
[74] See Table C2 for a list of the countries in the main and extended sample.
[75] Years 1994-2006 for parent debt, and years 1999-2006 for total debt.
[76] Out of the 9266 observations before 1994 only 4 contains data on parent debt, see Table C1.

both the main and the extended samples. The main samples for parent debt and total debt consist of 9,863 and 6,424 affiliate-year observations, respectively. The two extended samples consist of 15,440 and 9,610 affiliate-year observations for parent debt and total debt, respectively.

6.2 Data Set Calibration

This subsection presents the data set calibration in chronologic order, as presented in Table 1. We limit our analysis to foreign affiliates where the Norwegian parent has an ownership share above 50%. This ensures that the Norwegian parent is in control of the financial decisions of the affiliate. In addition, several countries define a foreign ownership requirement for the thin-capitalization rules to apply. Another issue is that some affiliates enter the data set several times the same year, because some have several Norwegian owners who all report to Statistics Norway. Removing affiliate-observations where the Norwegian ownership share is not above 50% solves this problem as well. We are then left with the information provided by the parent with the largest ownership share in the subsidiary.

We remove the few affiliates where the reported country of the affiliate changes from one year to another to avoid complications, as we are computing cluster-robust standard errors at the country-year level. Observations with nonsensical values in relevant variables, such as negative assets, revenue or debt, are also dropped[77].

Total debt ratios and parent debt ratios are calculated by dividing total debt and parent debt by total assets. We eliminate observations with missing values in one of these three variables. As have been mentioned before, we only have total debt figures from the years after 1998, and thus many observations disappear from that sample at this stage. We only have four observations of parent debt before 1994[78], and these are dropped.

It is technically possible to have negative equity and still be in business. However, if the equity is negative over several years, it may be that the affiliate is being kept alive for special reasons. In addition, special taxation conditions may apply if the equity is negative. To make

[77] For example, the data set includes an account for loans from the parent to the subsidiary, and another account for loans from the subsidiary to the parent, and hence the parent debt variable should not have a negative value.
[78] See Table C1.

sure the included affiliates are productive and that no special taxing conditions apply, we remove all observations with negative equity.

Financial service providers and holding companies are eliminated as special conditions often apply to such firms[79]. The Norwegian standard industrial classification (SIC) for these types of firms is a code between 65000 – 67200[80]. For the year 2006, the "Utenlandsoppgave" does not include a variable for the SIC code. We, therefore, use the median SIC-code for an affiliate when dropping financial service providers. By using the data from the SIFON-registry, we can see if parents are more than 50 % foreign owned. Affiliates where the parent has a foreign majority owner are excluded, as we want to analyze affiliates with Norwegian parents.

Revenue is supposed to be reported in 1000 NOK in Statistics Norway's survey, but examining the data reveals that some MNCs most likely have failed to divide by 1000[81]. To handle this, we delete affiliate-year observations where current year's revenue is 900 times larger or smaller than the revenue in the previous and following year. Due to the same reasons as why negative equity is dropped, we also delete observations with zero revenue. This also eliminates observations where the affiliate is being discontinued.

As total debt includes all kinds of debt, parent debt can by definition not exceed total debt. Despite this, the data set has observations where parent debt exceeds total debt. We remove these observations as there is most likely a reporting error in either of the debt variables. We also remove observations where the parent debt ratio or the total debt ratio exceeds 1[82]. We use the variable total assets, instead of total capital, when calculating parent and total debt ratios. We have data on total assets for all years in the data set, while values for total capital are missing before 1999, due to the lack of values for total debt.

[79] For instance, the German thin-capitalization rules before 2001 allowed holding companies to have substantially higher debt levels (Ruf & Schindler, 2012, p. 11).
[80] By looking at the codes in the data set it seems like the 2002 version of the SIC-codes have been used, and not the 2007 SIC-codes that are currently effective ("Standard for næringsgruppering (SN2002)," 2009).
[81] For example, we have observations where revenue is approximately 1000 times the revenue the year before and after, which we find likely to be an error.
[82] This is per definition not possible when we do not allow for negative equity. However, firms may have reported rounded numbers, so we use a cut of value of 1.01. We take this into account by setting debt ratios in the range $1 < x < 1.01$ equal to 1.

Table 1: Data calibration

		Number of obs. Parent debt ratio	**Number of obs.** Total debt ratio
(1)	All observations of foreign affiliates from 1990 to 2006	66,425	66,425
(2)	Remove pure duplicates	66,382	66,382
(3)	Remove minority owned affiliates and observations	52,618	52,618
(4)	Remove duplicates on affiliate level and affiliates changing country	52,412	52,412
(5)	Remove observations with nonsensical values in relevant variables	51,787	51,787
(6)	Remove observations with missing values in the dependent variable	32,798	22,326
(7)	Remove observations before 1994	32,794	22,326
(8)	Remove observations with equity less than zero	28,472	19,591
(9)	Remove financial service providers	27,793	19,066
(10)	Remove observations if parent has a foreign majority owner	24,129	16,291
(11)	Remove observations with extreme values of revenue	24,117	16,287
(12)	Remove observations with revenue equal to zero	16,298	10,012
(13)	Remove observations where parent debt exceeds total debt	16,042	10,012
(14)	Remove observations where the dependent variable exceeds 1	15,950	9,943
(15)	Remove observations with missing TCR-info or control variables	15,440	9,610
	Extended sample	15,440	9,610
(16)	Remove countries not in Buettner et al. 2012	13,686	8,335
(17)	Remove years not in the period 1996-2004	9,863	6,424
	Main sample	9,863	6,424

6.3 Relevant Variables

6.3.1 Dependent Variables

The first dependent variable to be tested is *parent debt ratio*, which is the fraction of parent debt to total assets. This ratio should be directly affected by thin-capitalization rules. Buettner et al. (2012) explicitly test the effects on parent debt, and thus our results will be directly comparable. As mentioned before, we would prefer to analyze the effect on total internal debt, but this information is not available in our data set. However, an advantage of using parent debt is that it is indisputably defined as internal debt[83], and Buettner et al. (2012) find parent debt to be the main driver of thin-capitalization rules' effects on total internal debt[84].

The second dependent variable to be tested is *total debt ratio*. Total debt consists of non-parent internal debt, parent debt and external debt, and *total debt ratio* is the fraction of total debt to total assets. This dependent variable should be directly affected by thin-capitalization rules through internal debt, but may also be indirectly affected by the substitution effect between internal and external debt. Buettner et al. (2012) do not explicitly test the effects on total debt ratios, but imply that it is reduced.

[83] Buettner et al. (2012, p. 936) argue that it can be hard to determine what categorizes as total related party debt for tax purposes. Parent debt on the other hand is definitely a type of related party debt.
[84] The results were reviewed in section 2.3.

6.3.2 Variables for Thin-Capitalization Rules

We generate the same two variables as Buettner et al. (2012) to control for the presence and the tightness of the thin-capitalization rules[85]. $TCR_{j,t}$ is a binary variable equal to 1 if there is a thin-capitalization rule in place in country j in period t, and 0 otherwise. $\text{TIGHT}_{j,t}$ is a transformation of the safe haven debt-to-equity ratio. This variable was outlined in Section 5.2.

6.3.3 Tax Variable

The variable *Statutory tax rate* is created from augmenting data on tax rates from Georg Wamser[86], with tax rates from the OECD Tax Database, and tax surveys done by KPMG, EY, and PWC[87]. The tax rates are adjusted as best possible to reflect the tax incentive for using debt[88]. For example, while the corporation tax in Italy was 37 % in 1997, the tax burden on corporate income was 53.2%, due to the local corporate income tax rate of 16.2% (Bordignon, Giannini, & Panteghini, 2001, p. 193).

6.3.4 Control Variables

To control for other determinants of the capital structure, we include control variables in addition to the abovementioned explanatory variables. The control variables are inspired by other studies, and they are thus commonly used in the literature. To obtain directly comparable results to Buettner et al. (2012), we use the same affiliate-level and country-level control variables when running regressions on our main sample. Three affiliate-level variables are used:

Loss carryforward may reduce the tax-induced incentives to use debt financing, as the effective tax reduction from using debt might be zero when there is loss carryforward

[85] The sources for the collected information on thin-capitalization rules are listed in Appendix G.
[86] We have slightly changed a few of the tax rates, based on other tax rate sources. For instance, Estonia was registered with a zero tax rate. That is true on the affiliate level, but as soon as the profits are transferred to the parent the profits are taxed. The tax incentive from the parents point of view is thus not reflected by a zero tax rate (Lehis, Klauson, Pahapill, & Uustalu, 2008). We also did robust tests using the exact same tax rates provided by Wamser, but it did not affect the qualitative results.
[87] In addition, other tax rate sources have been used. These sources are listed in Appendix G.
[88] An alternative tax rate measure could be the median effective tax rate in each country, as used by e.g. Blouin et al. (2014). However, this hinges on a sufficient number of observations per year in order to reflect the true changes in the tax incentive of debt financing; in a large sample the median is likely to change in line with the statutory tax rate. For small samples on the other hand, changes in the observed median effective tax rate may be due to random changes. We thus favor using statutory tax rates.

(Mackie-Mason, 1990). In that case, the expected relationship between loss carryforward and the debt ratios is negative. Running a loss may also make it difficult to obtain external loans. This would lead to lower external debt ratios, and higher internal debt ratios if there is a substitution effect. In that case, the effect on the total debt ratio will depend on the rate of substitution, but in any case it is not expected to increase. Loss carryforward is not reported in our data set, so we create a binary variable indicating if the affiliate ran a loss in the previous years. The dummy is set equal to 1 if the accumulated profit in the previous years is negative, otherwise 0[89]. The loss carryforward variable is created before the cleaning of the data set, but even so around 10 % of our final samples have missing values for loss carryforward the first year. In order not to lose these observations, we give the first-year observation of an affiliate the value 0[90].

Revenue is an indicator of the cash flows and the size of the affiliate, which is thought to capture variation between companies in borrowing conditions and corporate debt policies. Larger firms may face better lending conditions, which can increase the use of external debt. In addition, MNCs with larger affiliates in the form of cash flows might use internal debt shifting in a greater degree than smaller MNCs. Revenue may thus be expected to be positively related with debt.

Fixed assets ratio is the ratio of fixed to total assets, which may also capture differences in borrowing conditions. Fixed assets may serve as collateral to external creditors, making it easier to obtain external debt (Rajan & Zingales, 1995, p. 1451). The effect on internal and total debt would then again depend on the rate of substitution between external and internal debt. Since depreciable assets carry tax deductible allowances, it might reduce the incentive to utilize the debt tax shield (DeAngelo & Masulis, 1980, p. 4). In that case, the expected effect would be a reduction in both debt ratios.

In addition to the affiliate-level controls, we employ the external *lending rate* as a country-level control variable, to control for external lending conditions. Optimally, we would use actual, subsidiary-specific interest expenses. However, our data only shows interest paid to

[89] We allow the loss carryforward to accumulate profits for up to the five previous years, as the OECD countries could carry forward trading losses 5 years or more during the period (Messere, de Kam, & Heady, 2003, p. 115; OECD, 2002, p. 47), and most of the other countries could also carry forward losses for at least 5 years (Ernst & Young, 2004, 2015).

[90] However, if profits are negative the first, second and third year, we find it likely that the profit was negative in the previous (unobserved) year as well, and give the first observation a value of 1 instead of 0.

parent debt, but no information on interest paid to external debt. We thus choose to use the host country's nominal lending rates for the private sector as our control variable. We augment the lending rates provided by Georg Wamser with lending rates from the World Development Indicators database of the World Bank. Higher external lending rates are expected to have a negative effect on external debt. Higher external lending rates also allow for higher interest rates on internal debt, which together with the substitution effect may lead to higher internal debt levels. On the other hand, if internal debt is restricted and parent debt is a substitute for external debt[91], higher lending rates might have a negative effect on *parent* debt[92]. It may then be profitable to reduce parent debt by taking on external debt directly and increase the use of non-parent internal debt as this is usually the cheaper kind of internal debt. The substitution effect makes the effect on total debt undetermined.

Other factors that typically affect financial decisions are corruption and the conditions of financial markets. We find these factors to be of less concern in the main sample, as it consists of European and OECD countries. However, in our extended sample, countries with less developed economies are included, and we add two additional country-level variables:

Corruption is the annual level of corruption in each country measured by the Corruption Perceptions Index (CPI), taken from Transparency International. The CPI ranks countries based on how corrupt their public sector is perceived to be, and it is used as a proxy for a country's legal system and political risk. The index is a combination of different corruption-related data collected from a variety of reputable institutions and experts. It is expressed as a number between 0 and 10, where 10 indicate that a country is very clean. Møen et al. (2011, p. 15) point out that it may be harder and less safe to obtain credit in corrupt countries, suggesting that the corruption index may have a positive relationship to external debt. At the same time, this suggests that more internal debt is used in more corrupt countries, and, thus, that there is a negative relationship between internal debt and the corruption index. On the other hand, the risk of expropriation may induce firms to use external debt rather than internal debt in order not to lose their own money if things go south (Aggarwal & Kyaw, 2008, p. 416). This would suggest opposite relationships to the ones described above. The expected effect of corruption on the debt levels is thus ambiguous.

[91] See section 4.1.
[92] As stressed before, our internal debt related dependent variable is in fact parent debt.

Inflation is the annual percentage change in the consumer price index from the World Economic Outlook (WEO) database of the International Monetary Fund[93]. Mintz & Weichenrieder (2010, p. 119) suggest that higher inflation will increase leverage, since higher inflation, at a given lending rate, reduce the real interest rate. Another view is that higher inflation might reduce internal debt, but increase external debt, since it could be an indication of future currency depreciations (Aggarwal & Kyaw, 2008, p. 418). High inflation also often means that higher inflation risk premiums must be paid on external credit. This should, however, be picked up by the variable (nominal) lending rate.

Lastly, in a robustness test, we test if another commonly used control variable, c*reditor rights*, should be included. Creditor Rights is the annual index of creditor rights in a country, from Djankov, McLiesh and Shleifer (2007). Well-protected creditor rights generally facilitate borrowing, and may thus be associated with higher external debt. This could in turn reduce the need for internal debt. However, countries such as Cyprus, Iceland, Estonia, Luxembourg, and Malta are not included in the creditor rights index, and observations in these countries will thus be lost if creditor rights is used as a control variable. In addition, the index does not include the years after 2004, meaning that the 2004-values must be assumed not to change for the consecutive years in order to use the index. For these reasons, we have chosen not to employ creditor rights as a control variable as the default, but rather test its importance as a robustness test.

6.4 Descriptive Statistics

Table C3 and Table C4 (Appendix C) show the correlation matrixes of the tax rate-, thin-capitalization rules-, and control variables for the main and extended samples. TCR is positively correlated with the tax rate in both samples, which indicates that high-tax countries are more likely to have a thin-capitalization rule. Parent debt ratio does not show a significant correlation with tax rate, nor thin-capitalization rules (variables TCR and TIGHT) in neither of the samples. Total debt, on the other hand, is positively correlated with the tax rate in the extended sample, and it is negatively correlated with TCR in both samples. In the main sample, total debt also shows a significantly negative correlation with TIGHT. In the

[93] An alternative would be to use the World Development Indicators (WDI) database of the World Bank. However, WEO generally has less missing data for the countries we are using. In the few cases where data is missing from WEO, inflation data from the WDI is used.

extended sample (Table C4), the control variable creditor rights is not significantly correlated with the two dependent variables[94].

Descriptive statistics for the variables in the main and extended samples are presented in Table 2 and Table 3 and includes 10,171 and 16,217 affiliate-year observations, respectively[95]. In the extended sample there are 3,735 affiliates that belong to 875 parents, observed over 13 years. On average there are 4.3 observations per affiliate and 4.3 affiliates per parent. The largest parent has 188 affiliates, while 83% of the parents have less than 10 affiliates. The data set consists of electronically submitted responses in the period 1990-2006, and thus the number of observations per year may be expected to increase in line with the digitalization. Table C1 show that the number of observations increases from 1998 to 2001, while being stable from 1994 – 1998 and 2001 – 2006[96]. However, for the final samples, Table 9 and Table 10 in Section 7.2.2 show that the number of observations per year is quite evenly distributed.

Table 2 and Table 3 show very similar statistics. The mean tax rate in the main sample is 33%. The mean parent debt ratio of 11.6% is slightly lower than the average in Buettner et al. (2012)[97]. Fixed assets account for about 30% of total assets in the average firm. About 60% of the observations in the main sample are from countries having a thin-capitalization rule, while this number is about 55 % in the extended sample. The mean value for corruption is about 8 in both samples, which mean that the sample average observation is in a country not perceived as being corrupt. The maximum inflation rate is found in Bulgaria in 1997[98].

Table 4 shows that there is a declining trend in both the mean tax rate and the mean debt ratios. The mean tax rate in the extended sample decreased from 34.7% in 1994 to 29.5% in 2006. In the same period, the mean parent debt ratio declined by 3.3 percentage points (23 %), while total debt ratio declined by 5 percentage points (8%) from 1999 to 2006. Note that in the year 2000, both debt ratios seem to experience a negative shock.

[94] Recall from section 6.3.4 that our default is to not include creditor rights as a control variable. Since the variable creditor rights is not correlated with the dependent variables, omitting it should not cause an omitted variable bias in our regressions.
[95] Note that the number of observations for both parent debt and total debt is lower than the total number of observations. This is due to some observations missing values for either of the ratios. For instance, the total number of affiliate-year observations for parent debt ratio is lower than the sample total, because we have 777 observations for total debt ratio where the value for parent debt ratio is missing.
[96] In Table C1 52,412 observations are included, as minority owned affiliates and duplicates are removed (see step 4 in the data calibration). However, the trend in the amount of yearly observations is the same when these observations are included.
[97] Average parent debt ratio in Buettner et al. (2012) is 13.2%.
[98] The second highest was an inflation rate of 1.97 in Russia in 1995.

Table 2: Descriptive statistics for the main sample

Variable	N	Mean	Std. Dev.	Min	Max
Affiliate-level variables					
Parent debt(rel. to total assets)	9,863	0.116	0.212	0	1
Total debt (rel. to total assets)	6,424	0.583	0.286	0	1
Loss carryforward (binary)	10,171	0.389	0.488	0	1
Revenue (in mill. NOK)	10,171	282	1,552	1	51,409
Asset tangibility	10,171	0.303	0.294	0	1
Country-level variables					
STR (Statutory tax rate)	10,171	0.330	0.066	0.125	0.532
RULE (Thin-capitalization rule exists)	10,171	0.595	0.491	0	1
TIGHT[99]	10,171	0.203	0.188	0	0.5
TIGHT (related party debt)	10,171	0.067	0.134	0	0.4
TIGHT (total debt)	10,171	0.136	0.190	0	0.5
Lending rate	10,171	0.069	0.041	0.018	1.23
Corruption	10,171	8.017	1.634	2.66	10
Inflation	10,171	0.023	0.152	-0.011	10.61
Creditor rights	9,949	1.959	1.211	0	4

Table 3: Descriptive statistics for the extended sample

Variable	N	Mean	Std. Dev.	Min	Max
Affiliate-level variables					
Parent debt(rel. to total assets)	15,440	0.118	0.213	0	1
Total debt (rel. to total assets)	9,610	0.569	0.284	0	1
Loss carryforward (binary)	16,217	0.391	0.488	0	1
Revenue (in mill. NOK)	16,217	260	1,387	1	51,409
Asset tangibility	16,217	0.306	0.298	0	1
Country-level variables					
STR (Statutory tax rate)	16,217	0.324	0.070	0.10	0.532
RULE (Thin-capitalization rule exists)	16,217	0.546	0.498	0	1
TIGHT	16,217	0.186	0.188	0	0.5
TIGHT (related party debt)	16,217	0.061	0.128	0	0.4
TIGHT (total debt)	16,217	0.125	0.184	0	0.5
Lending rate	16,217	0.083	0.096	0.017	3.20
Corruption	16,217	7.730	1.922	1.5	10
Inflation	16,217	0.028	0.131	-0.039	10.61
Creditor rights	15,874	2.044	1.191	0	4

Table 4: Mean parent debt ratio, total debt ratio and statutory tax rates (extended sample)

Year	Mean Parent debt ratio	Mean Total debt ratio	Mean STR
1994	.1430	-	.3472
1995	.1356	-	.3489
1996	.1345	-	.3478
1997	.1335	-	.3422
1998	.1224	-	.3427
1999	.1137	.6014	.3311
2000	.0987	.5471	.3301
2001	.1134	.5967	.3135
2002	.1052	.5826	.3087
2003	.1067	.5613	.3060
2004	.1024	.5519	.2997
2005	.1117	.5569	.2923
2006	.1107	.5524	.2949

[99] Tightness of the safe haven debt-to-equity ratio.

7. Empirical Results

This section aims at testing the theoretical predictions outlined in Section 4. In Section 7.1.1, we run the base regressions on the main sample for both dependent variables of interest – parent debt ratio and total debt ratio. In 7.1.2, we run the regressions on the extended sample. A robustness test of the findings is thus conducted. Next, further robustness tests are done for both the main and the extended sample. In sum, the base regressions provide weak evidence for the theoretical predictions. In Section 7.2 we run the regressions on subsamples based on whether a country never had a rule, implemented a rule, or always had a rule during the period of the samples[100]. To further explore the data set, regressions are run on subsamples based on quintiles of debt ratios, and various other tests are presented, in Section 7.3. The subsamples of countries implementing a rule and the fifth quintile of debt ratios provide evidence for the theoretical predictions. Lastly, the results are discussed in Section 7.4.

7.1 Base Regressions

7.1.1 Main Sample

Parent Debt

Starting with column (1) and (2) of Table 5, the results provide no descriptive evidence of neither the tax rate nor the presence of a thin-capitalization rule affecting the parent debt ratio. Including the tax rate and the rule dummy in one regression (column 3) does not alter these results. The coefficients of both the tax rate variable and the rule dummy are positive. The latter suggests that imposing a thin-capitalization rule increases the level of parent debt, which clearly goes against the theoretical prediction. However, the coefficients are insignificant. The regression in column (4) tests the impact of a thin-capitalization rule on the tax rate sensitivity. A rule is expected to reduce the tax rate sensitivity, but we obtain no evidence supporting this.

A thin-capitalization rule may have both a level effect and an impact on the tax rate sensitivity of debt, and the results hitherto may be confounded by the exclusion of either. In

[100] Years 1996 – 2004 for the main sample, and years 1994 – 2006 for the extended sample.

column (5), both effects are included. The coefficient of the tax rate is positive and significant, which is consistent with the theoretical prediction that higher tax rates lead to higher debt levels. In particular, it is estimated that a 10 percentage points increase in the tax rate gives a 1.8 percentage points increase in the parent debt ratio ($\approx 0.10 \times 0.1807$). This corresponds to a semi-elasticity of 15.5%, which is larger than the semi-elasticity found by Desai et al. (2004) and Buettner et al. (2012) [101]. The significantly negative coefficient of the interaction term between the tax rate and the rule dummy provides qualitative proof of the prediction that rules reduce the tax rate sensitivity of parent debt. However, the magnitude is quite large relative to the main effect of the tax rate, implying that the tax rate sensitivity turns negative if a rule is imposed. The level effect of the rule by itself is significantly positive, but note that the dummy in column (5) measures the effect of imposing a thin-capitalization rule when the tax rate is zero. This is not very interesting, and we, therefore, re-run the regression with a tax variable that measures the difference between the observation-specific tax rate and the sample average tax rate. The new coefficient of the rule dummy is reported in column (6). The coefficient is insignificant, providing no evidence that affiliates facing a tax rate at the sample average reduce the level of parent debt when a rule is imposed.

Columns (7) through (10) are equivalent to the regressions in columns (3) through (6), where we replace the rule dummy with the tightness measure of thin-capitalization rules. Column (7) and (8) tests the level effect and the tax rate sensitivity separately. The coefficients are positive, suggesting that the level, and tax rate sensitivity, of parent debt increase with the tightness of a rule. However, none of these effects are significant. The regression in column (8) is directly comparable to the equivalent regression in Buettner et al. (2012), which finds significant coefficients in line with the theory[102].

Equivalent to regression (5) and (6), column (9) includes both the level effect and the tax rate sensitivity effect, and column (10) re-tests the level effect when the tax rate is measured as the difference from the sample average. The regressions provide no proof of a significant relationship between the tightness of thin-capitalization rules and the effect on parent debt;

[101] The coefficient of tax rate in Desai et al. (2014, p. 2470), Table III, Column (10) is 0.0822, and the mean parent debt ratio is reported to be 0.08 (p. 2460, Table I), giving a semi-elasticity of about 10%. Buettner et al. (2012, p. 936) report a semi-elasticity of 9.5%.
[102] Buettner et al. (2012, p. 936), Table 5, column (3).

the coefficient of the level effect (column 10) and the coefficient of the interaction term is insignificant. Note though that the coefficient of the interaction term has the expected sign and is very close to being significant[103].

Loss carryforward displays a significantly positive effect on parent debt, suggesting that losses in previous years increase the use of parent debt in subsequent years. This positive relationship may be due to loss-making firms having more trouble getting loans from external sources. As discussed in Section 6.3.4, external lending rates might have a negative effect on parent debt if internal debt is restricted, but since not all countries have thin-capitalization rules, the significant negative effect of interest rate on parent debt is unexpected. The significant positive effect of revenue indicates that higher revenue make it more important to engage in internal debt shifting as a profit shifting mechanism[104]. Fixed assets are found to have a negative impact on parent debt ratio. This might suggest that other types of tax deductible allowances reduce the incentive to utilize the debt tax shield.

Table 5: Main sample with parent debt ratio as dependent variable

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0133		0.0214	0.0031	0.1807*	0.1807*	0.0595	0.0164	0.1735*	0.1735*
	(0.046)		(0.047)	(0.049)	(0.104)	(0.104)	(0.059)	(0.047)	(0.103)	(0.103)
TCR		0.0126	0.0130		0.0858**	0.0127				
		(0.009)	(0.010)		(0.039)	(0.010)				
TIGHT							0.0754		0.2870**	0.0658
							(0.046)		(0.145)	(0.047)
STR x TCR				0.0201	-0.2256**	-0.2256**				
				(0.028)	(0.113)	(0.113)				
STR x TIGHT								0.1339	-0.6826	-0.6826
								(0.136)	(0.422)	(0.422)
Loss Carryforward	0.0191***	0.0192***	0.0191***	0.0191***	0.0193***	0.0193***	0.0192***	0.0191***	0.0192***	0.0192***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	-0.0293***	-0.0290***	-0.0288***	-0.0287***	-0.0325***	-0.0325***	-0.0293***	-0.0287***	-0.0326***	-0.0326***
	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
Ln(Revenue)	0.0043**	0.0044**	0.0044**	0.0044**	0.0044**	0.0044**	0.0044**	0.0044**	0.0044**	0.0044**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0081	-0.0081	-0.0081	-0.0081	-0.0082	-0.0082	-0.0084	-0.0082	-0.0084	-0.0084
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Observations	9,863	9,863	9,863	9,863	9,863	9,863	9,863	9,863	9,863	9,863
R^2	0.065	0.065	0.065	0.065	0.066	0.066	0.066	0.065	0.066	0.066
Nr. of affiliates	2,729	2,729	2,729	2,729	2,729	2,729	2,729	2,729	2,729	2,729
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

[103] t-statistic: $-0.6826/0.422 = -1.6175$.

[104] Other studies have found varying effects of revenue on parent debt: Buettner et al. (2012, p. 936) find a significant negative effect, while Blouin et al. (2014, p. 30) find a significant positive effect.

Total Debt

Table 6 shows the same regressions as Table 5, but the dependent variable is replaced with total debt ratio. The results are generally the same as they were for parent debt; most coefficients are insignificant except for in column (5) and (9), where the level effect and the effect on tax rate sensitivity are included simultaneously. Starting with the dummy variable approach, columns (1) through (4) provides no evidence of the total debt ratio responding to changes in the tax rate. According to these regressions, the introduction of a thin-capitalization rule has no significant effect on the total debt ratio. In column (4), the tax rate sensitivity obtains some magnitude, and the sign of the interaction term indicates a negative effect on the tax rate sensitivity by the introduction of a rule, but it is nevertheless insignificant. The story is similar when the tight variable is used instead of the rule dummy in columns (7) and (8).

When both the level effect and the effect on the tax rate sensitivity are included in column (5) and (9), we obtain similar results for total debt as we did for parent debt. An increase in the tax rate in the absence of thin-capitalization rules exerts a significantly positive effect on the total debt ratio. In column (9), the effect of a 10 percentage points increase in the tax rate is estimated to increase the total debt ratio by 4.6 percentage points ($\approx 0.10 \times 0.4597$). This is just short of 3 times the equivalently estimated increase in the parent debt ratio. The estimate may thus be reasonable, as total debt includes parent debt, non-parent internal debt and external debt, which should all react positively to an increase in the tax rate[105]. The interaction term in column (9) obtains a quite large, significantly negative coefficient, suggesting that the tax rate sensitivity of total debt is reduced when a thin-capitalization rule is introduced, and that the reduction is greater for tighter rules. The equivalent coefficient was not significant for parent debt. Quantitatively, the effect of introducing a rule with an approximately average safe haven debt-to-equity ratio of 4:1 – giving a tightness of 0.20 – is estimated to reduce the tax rate sensitivity of a 10 percentage points increase in the tax rate to about zero ($[0.10 \times (0.4597 - 2.3426 \times 0.20)] \approx -0.0008$).

The sign of the control variables loss carryforward, revenue and asset tangibility are the same as in the regressions on parent debt. The latter can be interpreted similarly as for parent debt, and the effect of revenue is as expected. Loss carryforward was expected to have a

[105] Buttner et al (2006, p. 21) Table 3, find a coefficient of about the same size.

negative or no effect on total debt ratios. Thus, the positive effect is unexpected. The insignificant effect of lending rate might be explained by the substitution between internal and external debt.

Table 6: Main sample with total debt ratio as dependent variable

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0025		-0.0009	0.0814	0.5257**	0.5257**	0.0828	-0.0036	0.4597**	0.4597**
	(0.095)		(0.091)	(0.151)	(0.250)	(0.250)	(0.134)	(0.095)	(0.217)	(0.217)
TCR		-0.0064	-0.0064		0.1757***	-0.0323				
		(0.039)	(0.038)		(0.065)	(0.048)				
TIGHT							0.1037		0.7273**	-0.0318
							(0.123)		(0.286)	(0.161)
STR x TCR				-0.1182	-0.6421**	-0.6421**				
				(0.148)	(0.269)	(0.269)				
STR x TIGHT								-0.1357	-2.3426**	-2.3426**
								(0.489)	(1.111)	(1.111)
Loss Carryforward	0.0511***	0.0511***	0.0511***	0.0512***	0.0521***	0.0521***	0.0513***	0.0511***	0.0519***	0.0519***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	0.0097	0.0095	0.0095	0.0087	0.0112	0.0112	0.0108	0.0093	0.0094	0.0094
	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)	(0.016)	(0.017)	(0.017)	(0.017)	(0.017)
Ln(Revenue)	0.0251***	0.0251***	0.0251***	0.0251***	0.0249***	0.0249***	0.0252***	0.0251***	0.0250***	0.0250***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0531*	-0.0534**	-0.0534**	-0.0544**	-0.0539**	-0.0539**	-0.0527*	-0.0533*	-0.0532*	-0.0532*
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Observations	6,424	6,424	6,424	6,424	6,424	6,424	6,424	6,424	6,424	6,424
R^2	0.084	0.084	0.084	0.084	0.086	0.086	0.084	0.084	0.085	0.085
Nr. of affiliates	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

7.1.2 Extended Sample

We run the same regressions on the extended sample, which expands the period to include the years 1994-2006 and an additional 25 countries around the world[106], to test the robustness of the results. The extended sample also includes two additional country-level control variables; inflation and corruption. These factors are natural to include since we extend the analysis to economies outside Europe and the OECD. The significant effects found in the main sample turns out not to be very robust to the extended sample (see Table 7 and Table 8). For parent debt (Table 7), none of the regressions on the extended sample show significant effects for any of the explanatory variables of interest[107].

[106] Table C2 lists the countries in the main and the extended samples.

[107] The significant effects of the tax rate found in the main sample disappear even if the sample is extended by years only (i.e. running regressions on the same countries included in the main sample, but extending the time horizon to the years 1994-2006). See Table D3 in Appendix D.

Table 8 shows the results of the regressions on the total debt ratio. We note that the relationship between the tax rate and the total debt ratio never proves significant, and otherwise only two coefficients of interest are significant. In column (5) the interaction between the rule dummy and the tax rate is significantly negative, implying that a rule reduces the tax rate sensitivity of total debt. This is the same qualitative result as we obtained in the regression on the main sample, although the tax rate itself also was significant for the main sample. Compared to the main sample, the magnitudes of the coefficients of the main explanatory variables in column (5) are about halved.

Column (7) shows a significant positive level effect of thin-capitalization rules' tightness on total debt ratio. This suggests that imposing or tightening a rule is associated with increased total debt ratios, and that the increase is larger the tighter the rule. This is not in accordance with the theoretical predictions. In relation to the substitution effect between internal and external debt, this would imply that firms take on more external debt than they reduce internal debt when facing a thin-capitalization rule. A more plausible explanation may be that the results in column (7) are confounded by the exclusion of the interaction term. Column (10) shows that the level effect is indeed insignificant for an affiliate facing the sample average tax rate, when both the level effect and the interaction term are included.

The common control variables enter with the same signs as they did in the main samples. The two additional control variables, corruption, and inflation, enters with a negative and positive sign, respectively. The coefficients are significant in relation to parent debt, but not in relation to total debt. The negative effect of corruption on parent debt may suggest that firms in more corrupt countries resort more to parent lending. The coefficients of inflation for both parent and total debt may be said to be a precisely estimated zero[108], and thus not of much importance[109].

[108] A coefficient is said to be precisely estimated zero if the boundaries of the 95% confidence interval are not economically significant.
[109] Note that Møen et al. (2011) include inflation as a control variable when testing total and external debt, but not when testing internal debt.

Table 7: Extended sample with parent debt ratio as dependent variable

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0249		-0.0221	-0.0270	0.0122	0.0122	-0.0275	-0.0251	-0.0325	-0.0325
	(0.045)		(0.045)	(0.047)	(0.079)	(0.079)	(0.051)	(0.045)	(0.079)	(0.079)
TCR		0.0041	0.0036		0.0210	0.0034				
		(0.008)	(0.008)		(0.028)	(0.008)				
TIGHT							-0.0046		-0.0151	-0.0041
							(0.041)		(0.107)	(0.041)
STR x TCR				0.0055	-0.0543	-0.0543				
				(0.025)	(0.082)	(0.082)				
STR x TIGHT								-0.0092	0.0337	0.0337
								(0.123)	(0.322)	(0.322)
Loss Carryforward	0.0237***	0.0236***	0.0237***	0.0237***	0.0237***	0.0237***	0.0237***	0.0237***	0.0237***	0.0237***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Ln(Lending rate)	-0.0128*	-0.0125	-0.0125	-0.0127	-0.0126	-0.0126	-0.0129*	-0.0129*	-0.0128*	-0.0128*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Revenue)	0.0060***	0.0060***	0.0060***	0.0060***	0.0060***	0.0060***	0.0060***	0.0060***	0.0060***	0.0060***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0185**	-0.0186**	-0.0185**	-0.0185**	-0.0185**	-0.0185**	-0.0185**	-0.0185**	-0.0185**	-0.0185**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Ln(Inflation)	0.0029**	0.0029**	0.0029**	0.0029**	0.0029**	0.0029**	0.0029**	0.0029**	0.0029**	0.0029**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Corruption	-0.0107***	-0.0108***	-0.0106***	-0.0107***	-0.0102**	-0.0102**	-0.0107***	-0.0107***	-0.0107***	-0.0107***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	15,440	15,440	15,440	15,440	15,440	15,440	15,440	15,440	15,440	15,440
R^2	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066
Nr. of affiliates	3,483	3,483	3,483	3,483	3,483	3,483	3,483	3,483	3,483	3,483
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Table 8: Extended sample with total debt ratio as dependent variable

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0325		-0.0195	-0.0395	0.2443	0.2443	0.0621	-0.0270	0.2230	0.2230
	(0.082)		(0.081)	(0.101)	(0.155)	(0.155)	(0.096)	(0.081)	(0.147)	(0.147)
TCR		0.0224	0.0220		0.1242***	0.0068				
		(0.021)	(0.021)		(0.043)	(0.024)				
TIGHT							0.1542**		0.4521**	0.0850
							(0.077)		(0.189)	(0.095)
STR x TCR				0.0126	-0.3624**	-0.3624**				
				(0.073)	(0.152)	(0.152)				
STR x TIGHT								0.2838	-1.1331	-1.1331
								(0.287)	(0.690)	(0.690)
Loss Carryforward	0.0556***	0.0556***	0.0556***	0.0556***	0.0559***	0.0559***	0.0556***	0.0556***	0.0558***	0.0558***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	0.0157	0.0166	0.0166	0.0157	0.0193	0.0193	0.0166	0.0158	0.0178	0.0178
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln(Revenue)	0.0254***	0.0254***	0.0254***	0.0254***	0.0252***	0.0252***	0.0254***	0.0254***	0.0253***	0.0253***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Asset tangibility	-0.0413**	-0.0408**	-0.0408**	-0.0412**	-0.0410**	-0.0410**	-0.0408**	-0.0410**	-0.0411**	-0.0411**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Ln(Inflation)	0.0031	0.0031	0.0031	0.0031	0.0029	0.0029	0.0031	0.0031	0.0029	0.0029
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0104	-0.0102	-0.0102	-0.0105	-0.0076	-0.0076	-0.0090	-0.0100	-0.0077	-0.0077
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Observations	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610
R^2	0.078	0.078	0.078	0.078	0.079	0.079	0.079	0.078	0.079	0.079
Nr. of affiliates	2,721	2,721	2,721	2,721	2,721	2,721	2,721	2,721	2,721	2,721
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

7.1.3 Robustness Tests

Since two samples are used in the empirical analysis, where one is an extended version of the other, a robustness test of the results is automatically incorporated in the analysis. The regressions above showed that the results from the main sample are not very robust when the sample is extended. The differences between the two samples are the number of countries, years, and control variables. In the regressions reported in Table D1 – Table D6 in Appendix D, it can be seen that most of the significant effects on parent debt ratio disappear when the sample is extended by years. The effects on total debt ratio disappear when the extra countries are added.

Apart from the number of countries and years included, there may be other factors influencing the empirical results. This subsection will test and shortly comment the robustness of the results to such factors. All tests are done for both samples and dependent variables, thus producing numerous tables of regressions. We limit the following discussion to comments only, and selected tables of interest are reported in Appendix D.

As discussed in Section 6.3.4, creditor rights may belong in the regressions as a control variable, especially when testing the extended sample. Including creditor rights produces some significantly *positive* effects of thin-capitalization rules for both parent debt (Table D7) and total debt in the main sample, and for total debt in the extended sample (Table D9). Further testing shows that the results are due to observations being dropped when including creditor rights[110], and not due to the variable creditor rights itself. This can be seen by comparing Table D7 to Table D8, and Table D9 to Table D10. Thus, leaving out creditor rights as a control variable seems not to be an issue. However, this test is another indication of the results being sensitive to the sample selection.

About ¼ of the observations belong to affiliates switching parent, i.e. majority owner, during the period. Instead of including parent fixed effects, we test the robustness of our results by removing all of these observations. When an affiliate is acquired, there may be other factors than characteristics of the new owner that determines financial decisions, which is not picked up by the parent fixed effects. However, deleting affiliates changing parents does not affect

[110] Five countries are not included in the creditor rights index. See section 6.3.4.

the results remarkably. For the main sample with parent debt ratio as the dependent variable (Table D11), the tax rate sensitivity becomes insignificant in columns (5) and (9), while the interaction term between the tight variable and the tax rate in column (9) barely turns significant on the 10%-level. The same happens with the interaction term in column (9) for the extended sample with total debt ratio as dependent variable (Table D12). However, the small changes are most likely due to the fact that ¼ of the observations are dropped. There is thus seemingly no real difference in the results by excluding affiliates with changing parents versus including parent fixed effects.

Two parent companies stick out by having 188 and 136 affiliates each, accounting for almost 1500 observations[111]. Large MNCs are more likely to engage in internal lending through an internal bank, and the use of parent debt may thus not follow expected patterns. Testing affiliates of these two parents separately reveal that they do not exert behavior as expected. Parent and total debt ratios show a significantly negative relationship to the tax rate in both samples (Table D13 and Table D14), and parent debt reacts positively to thin-capitalization rules. These observations are thus pulling the coefficients in the wrong direction compared to the theoretical predictions. The most expressed effect of removing these observations are found for total debt in the extended sample, which now show a significantly positive relationship to tax rates in column (5) and (9) (Table D15). The normal tax rate effect found for total debt in the main sample thus becomes robust to the extended sample by removing these observations. Otherwise, it does not improve the significance or robustness of the results, though some coefficients gain magnitude in the theoretically expected direction. An important takeaway is thus that there are affiliates in our data set driving the coefficients in the wrong direction for unknown reasons, but excluding affiliates of the two largest parents is not sufficient to completely remove this effect.

7.1.4 Discussion of Preliminary Findings

The empirical results hitherto are weak. We have obtained some proof of the theoretical predicted effects of thin-capitalization rules on the tax rate sensitivity of debt, but no evidence of a level effect. The results are dependent on the specific samples, and the significant effects found in the main samples do not carry over to the extended samples. In

[111] Numbers for the calibrated data sets. The two MNCs are the largest in terms of number of affiliates, and account for 917 and 574 affiliate-year observations, respectively.

addition, the data set contains observations pulling the results in the wrong direction. It may be that such observations are driven by special incentives and should be excluded, but even if that is the case it is difficult to identify these observations.

With regards to the effects of thin-capitalization rules on parent debt, the main peers to this thesis have generally found robust, significant effects of thin-capitalization rules, on similar selections of years and countries (see Blouin et al., 2014; Buettner et al., 2008, 2012). We only find effects in our least restrictive regression. On the contrary, Blouin et al. (2014) do not find significant effects in their equivalent regression[112], but both Blouin et. al (2014) and Buettner et al. (2012) find effects in the more restrictive regressions. It is especially remarkable that neither parent debt nor total debt exerts a robust, positive relationship to tax rates, as existing literature, in general, have found significantly positive relationships between the tax rate and debt ratios, even without controlling for thin-capitalization rules.

The possible substitution effect between parent and external debt may make it difficult to find significant effects of thin-capitalization rules on total debt. On the other hand, Wamser (2014) obtains evidence for the substitution not being complete and thus indirectly suggesting that the total debt ratio will decrease, and Blouin et al. (2014) find a significant negative effect of the rule dummy when running a regression equivalent to column (3) in the tables hitherto presented[113].

By all standards, it is unlikely that Norwegian MNCs react differently to thin-capitalization rules and changes in tax rates, compared to the German and US MNCs studied in the abovementioned peer papers. Knowing that the results are very sensitive to sample selections, we therefore devote the continuation of the analysis to dig deeper into our data by testing different subsamples, in an attempt to obtain further evidence supporting the theoretically expected predictions.

[112] Blouin et al. (2014, pp. 29-30), Table 4 and Table 5, Column (3).
[113] Blouin et al. (2014, p. 29), Table 4, Column (2).

7.2 Subsamples Based on Implementation of Thin-Capitalization Rules

7.2.1 Motivation

To identify the level effect and the tax rate sensitivity effect of thin-capitalization rules, the analysis is dependent on variation in the tax rates, and the presence and tightness of thin-capitalization rules, within countries. Although 35 countries in our data set had thin-capitalization rules by 2006, whereof 23 countries implemented the rule after 1994, our results depend on how the observations are distributed among, and within, countries. For instance, Sweden, the UK, and the USA account for about two-fifths of all observations in the extended sample – countries for which there is no change in the thin-capitalization rules[114] and barely changes in the tax rates[115]. Our main explanatory variables are not useful in identifying the capital structure decision of firms in such countries. Observations in these countries might even indirectly affect the estimated coefficients of the main explanatory variables through the other control variables. The countries we are interested in are those that implemented a rule or experienced a change in their rules. It may therefore be more valuable to split the full samples into three subsamples, based on (1) countries that implemented a rule during the period of the sample, (2) countries that always had a rule, and (3) countries that never had a rule[116].

Each subsample may serve as a designated sample to test one or more of the particular effects we are interested in. For instance, the subsample of countries that never had a rule may serve as a designated sample to test the normal relationship between debt ratios and the tax rate in the absence of thin-capitalization rules, while the subsample of countries that implemented a rule is of particular interest in relation to the effects of thin-capitalization rules. Table 9 and Table 10 show the development in tax rates and debt ratios, as well as the number of observations, for each of the three subsamples[117].

[114] Sweden did not have a rule during the period, while the UK and US had a rule, but it did not change.
[115] The US only had incremental decreases in the tax rate, and the UK reduced its tax rate two times, totaling a 3 percentage points decrease in total. Sweden had no change in the tax rate.
[116] We have excluded the subsample of countries abolishing their rules, as this sample only consists of Slovakia, which has 31 affiliate-year observations for parent debt ratio and 24 for total debt ratio.
[117] The tables show statistics for the extended subsamples.

7.2.2 Descriptive Evidence

Table 9 and Table 10 show that countries without rules ("Never rule") had a declining trend in the mean debt ratios, which seemingly was not driven by the tax rate[118]. This indicates that there are other factors than the tax rate that affect the use of debt in countries without thin-capitalization rules. In the extended sample, these countries account for about 1/3 of all observations, and may be an explanation for why the base regressions do not show robust evidence of the normal tax rate sensitivity.

Table 9 and Table 10 show that only 19% and 7% of the observations in the main and extended samples, respectively, belong to countries that implemented a rule during the sample period. As can be seen in Table E1 (Appendix E), the numbers of observations within these countries are unevenly distributed between before and after the rule was implemented. Further, from Table E2 it can be seen that only a limited number of affiliates are observed both before and after. Thus, in the full samples tested this far, substantially less than 19% and 7% of the observations belong to firms that experience an introduction of thin-capitalization rules. The subsample of only the countries that implemented a rule may then be a better sample for studying the effects of thin-capitalization rules. The average parent debt ratios in countries that implemented a rule seemingly fluctuate around a lower level after 1999 (Table 9), and Table 10 shows that the average total debt ratio for this subsample declined with the tax rate[119].

The subsample of countries that always had a rule may also offer some degree of variation in thin-capitalization rules. Five countries tightened or loosened their rules during the period, and these are listed in Table E3 and Table E4. However, the t-tests presented in the same tables show few signs of the debt ratios being significantly lowered by the tightening of a thin-capitalization rule. The subsample should also be useful in analyzing how firms react to tax rate changes when a thin-capitalization rule is in place.

[118] Since the mean tax rate was relatively constant.
[119] Note, though, that the t-tests for differences in average debt ratios before and after the implementations of rules (Table E2) do not show promising results, but these tests do not take the tax rate into account.

Table 9: Mean parent debt ratio (PDR) and tax rate for the three subsamples; Never rule, Implemented rule and Always rule (extended sample)

	Never rule			Implemented rule			Always rule			Total
Year	N	Mean PDR	Mean STR	N	Mean PDR	Mean STR	N	Mean PDR	Mean STR	N
1994	396	.1464	.2859	178	.1452	.3640	605	.1404	.3822	1,179
1995	431	.1339	.2846	197	.1492	.3620	603	.1325	.3904	1,231
1996	477	.1337	.2902	220	.1283	.3619	581	.1382	.3895	1,278
1997	483	.1332	.2870	247	.1238	.3561	581	.1375	.3819	1,311
1998	481	.1186	.2869	224	.1210	.3375	584	.1259	.3906	1,289
1999	526	.0996	.2881	233	.1438	.3247	594	.1137	.3725	1,353
2000	437	.0990	.2927	238	.0979	.3177	519	.0974	.3695	1,194
2001	502	.1020	.2886	259	.1290	.3042	530	.1146	.3418	1,291
2002	431	.0907	.2878	218	.1216	.2902	460	.1092	.3376	1,109
2003	460	.0896	.2823	252	.1141	.2832	521	.1181	.3379	1,233
2004	419	.0933	.2844	223	.1137	.2609	427	.1061	.3346	1,069
2005	374	.0995	.2731	212	.1207	.2559	397	.1190	.3274	983
2006	332	.1140	.2729	190	.1189	.2616	367	.1039	.3288	889
Total	5,749			2,891			6,769			15,409

Table 10: Mean total debt ratio (TDR) and tax rate for the three subsamples; Never rule, Implemented rule and Always rule (extended sample)[120]

	Never rule			Implemented rule			Always rule			Total
Year	N	Mean TDR	Mean STR	N	Mean TDR	Mean STR	N	Mean TDR	Mean STR	N
1999	454	.6176	.2874	63	.6550	.3104	675	.5853	.3637	1,192
2000	454	.5487	.2916	79	.5665	.3112	696	.5433	.3575	1,229
2001	510	.6049	.2881	94	.6217	.3065	711	.5870	.3327	1,315
2002	482	.5937	.2885	89	.6030	.2720	650	.5727	.3292	1,221
2003	448	.5730	.2820	85	.6078	.2616	672	.5496	.3285	1,205
2004	445	.5557	.2839	84	.5991	.2357	631	.5437	.3200	1,160
2005	432	.5525	.2723	95	.5724	.2414	644	.5593	.3137	1,171
2006	387	.5261	.2725	89	.5745	.2442	617	.5658	.3162	1,093
Total	3,612			678			5,296			9,586

7.2.3 Regressions

We have tested subsamples of both the main and extended sample with both the dependent variables. This produces twelve regression tables. To keep this section tidy, we stick to commenting on the results and we only report the most interesting regression tables, while other tables of interest are reported in Appendix E.

For countries in the main sample that never had a rule, we find signs of a positive relationship between the debt ratios and the tax rate (Table E5, column (1) and (3)), but only the positive relationship between the total debt ratio and the tax rate is significant. The

[120] As we only have observations of total debt for the years 1999 and onwards, only countries implementing a rule in 2000 or later are included in the subsample Implemented rule.

results are not robust to the extended sample, where the coefficients turn negative, though insignificant[121] (Table E5, column (2) and (4)). We, thus, only obtain weak evidence of Norwegian MNCs reacting to tax rate changes as expected in the absence of thin-capitalization rules.

Testing only countries that had a rule the entire period returns a significant, negative relationship between the parent debt ratio and the tax rate in both the main and the extended sample (Table E7). Regressions on the total debt ratio show the same significant relationship in the main sample, but improve slightly in the extended sample where the relationship is no longer significant (Table E8). The observations in these countries, thus, show a relationship to tax rates that contradicts theory on capital structure. If we were to assume that all affiliates in these countries were restricted by thin-capitalization rules, we might have expected to find no relationship between debt and the tax rate. However, that assumption is unlikely to hold, and it would in any case not explain the significantly negative relationship found in Table E7 and Table E8.

The subsample of countries that implemented a rule gives the hitherto most pronounced results for parent debt. Table 11 and Table 12 show the expected relationship between the parent debt ratio and the tax rate, for both the main and the extended subsample. In the main sample, the dummy variable, the tight variable, and their respective interaction terms with the tax rate generally show the expected negative significant coefficient (see Table 11). These qualitative results carry over to the extended sample when the affiliates of the two largest parents are dropped (Table 12)[122].

Column (2), (3) and (6) provides evidence supporting the prediction that implementing a thin-capitalization rule reduces the parent debt ratio. Quantitatively, column (6) of Table 11 estimates that implementing a rule reduces the parent debt ratio of affiliates facing the sample average tax rate by about 5 percentage points. The coefficient is about halved in the extended subsample (Table 12).

[121] Removing affiliates of the two largest parents (which were seen to slightly improve the results in the robust analysis) does not help in this case. See Table E6.

[122] See Table E9 for the results when these two MNCs are included.

Column (7) and (10) of Table 11 and Table 12 further indicates that the reduction in parent debt ratio depends on the tightness of the rule. Quantitatively, a rule with tightness of 0.2 (safe haven ratio of 4:1) is in column (7) estimated to reduce the parent debt ratio by 4.7 percentage points ($\approx -0.236 \times 0.20$) in the main sample, and 2.8 percentage points in the extended sample. Column (10) indicates that the level effect of tight is significantly negative for affiliates facing the sample average tax rate.

In both Table 11 and Table 12, column (4) provides evidence of thin-capitalization rules reducing the tax rate sensitivity of parent debt, and column (8) further suggests the reduction depends on the tightness of the rule. In column (8) it is estimated that a rule of sample average tightness reduces the tax rate sensitivity of a 10 percentage points increase in the tax rate by about 40% in the main sample and 25% in the extended sample[123], compared to when there is no rule in place. Thus far, Table 11 and Table 12 provide the most complete evidence supporting the theoretical predictions. It is notable that the coefficients halves in magnitude in the extended sample compared to the main sample.

For total debt, the subsample of countries that implemented a rule provides some significant results. The results in both the main and extended subsamples suggest that implementing a thin-capitalization rule reduce total debt ratios (see Table E10 and Table E11). Both subsamples show large positive coefficients for the tax rate, but the coefficients are insignificant. All coefficients of interest for TIGHT and TCR, in addition to their interaction terms, are significant in the main subsample (see Table E10). However, the subsamples of countries that implemented a rule are relatively small as we only have observations for total debt from 1999 and onwards, and, thus, the subsamples only include countries implementing a rule after 1999. We are therefore reticent to draw conclusions about total debt based on these subsamples.

[123] How to calculate the change (for the extended sample): Tax rate sensitivity of a 10 percentage points increase in tax rate in the case of no thin-capitalization rule is estimated to 0.03152. In the case with rules, the equivalent tax rate sensitivity is estimated to $0.10 \times (0.3152 - 0.4026 \times 0.20) \approx 0.023486$.

Table 11: Subsample of the main sample, including observations for 1996 – 2004 from countries that implemented a rule during 1997 – 2004[124]

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.3195**		0.3395***	0.3828***	0.3537**	0.3537**	0.3481***	0.4004***	0.3698**	0.3698**
	(0.142)		(0.116)	(0.126)	(0.146)	(0.146)	(0.118)	(0.129)	(0.152)	(0.152)
TCR		-0.0470**	-0.0486***		-0.0340	-0.0505**				
		(0.018)	(0.018)		(0.054)	(0.021)				
TIGHT							-0.2360***		-0.1464	-0.2484**
							(0.083)		(0.231)	(0.097)
STR x TCR				-0.1597**	-0.0509	-0.0509				
				(0.065)	(0.195)	(0.195)				
STR x TIGHT								-0.7808**	-0.3147	-0.3147
								(0.299)	(0.837)	(0.837)
Loss Carryforward	0.0436***	0.0427***	0.0429***	0.0433***	0.0430***	0.0430***	0.0428***	0.0431***	0.0429***	0.0429***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Ln(Lending rate)	0.0037	0.0530**	0.0238	0.0239	0.0242	0.0242	0.0156	0.0155	0.0158	0.0158
	(0.032)	(0.025)	(0.029)	(0.028)	(0.028)	(0.028)	(0.030)	(0.029)	(0.030)	(0.030)
Ln(Revenue)	0.0077*	0.0071	0.0074	0.0073	0.0074	0.0074	0.0075	0.0073	0.0074	0.0074
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Asset tangibility	-0.0222	-0.0203	-0.0228	-0.0223	-0.0226	-0.0226	-0.0223	-0.0219	-0.0221	-0.0221
	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)	(0.032)	(0.033)	(0.033)	(0.033)	(0.033)
Observations	1,598	1,598	1,598	1,598	1,598	1,598	1,598	1,598	1,598	1,598
R^2	0.114	0.117	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120
Nr. of affiliates	442	442	442	442	442	442	442	442	442	442
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Table 12: Subsample of the extended sample, including observations for 1994 – 2006 from countries that implemented a rule during 1995 – 2006 (Excluding affiliates of the two largest parents)

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.2864**		0.2849**	0.3062***	0.2880**	0.2880**	0.2911**	0.3152***	0.2784**	0.2784**
	(0.117)		(0.113)	(0.116)	(0.125)	(0.125)	(0.114)	(0.117)	(0.124)	(0.124)
TCR		-0.0262**	-0.0260**		-0.0225	-0.0263*				
		(0.012)	(0.012)		(0.040)	(0.014)				
TIGHT							-0.1391***		-0.2034	-0.1357**
							(0.053)		(0.172)	(0.056)
STR x TCR				-0.0807*	-0.0117	-0.0117				
				(0.042)	(0.138)	(0.138)				
STR x TIGHT								-0.4026**	0.2089	0.2089
								(0.178)	(0.577)	(0.577)
Loss Carryforward	0.0307***	0.0302***	0.0304***	0.0306***	0.0304***	0.0304***	0.0302***	0.0303***	0.0301***	0.0301***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Lending rate)	0.0214	0.0362*	0.0257	0.0274	0.0260	0.0260	0.0231	0.0253	0.0218	0.0218
	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)
Ln(Revenue)	0.0070*	0.0069*	0.0072*	0.0071*	0.0072*	0.0072*	0.0073*	0.0072*	0.0073*	0.0073*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0131	-0.0104	-0.0108	-0.0100	-0.0106	-0.0106	-0.0107	-0.0098	-0.0114	-0.0114
	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Ln(Inflation)	0.0002	-0.0001	0.0004	0.0003	0.0004	0.0004	0.0004	0.0002	0.0005	0.0005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Corruption	0.0036	0.0000	0.0030	0.0034	0.0031	0.0031	0.0032	0.0039	0.0029	0.0029
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	2,662	2,662	2,662	2,662	2,662	2,662	2,662	2,662	2,662	2,662
R^2	0.121	0.120	0.123	0.123	0.123	0.123	0.124	0.123	0.124	0.124
Nr. of affiliates	616	616	616	616	616	616	616	616	616	616
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

[124] Only countries implementing a rule after 1996, or before 2005, are included, so that we can observe a change in the TCR variable.

Recall from Section 5.2 that we throughout this analysis also run an extended version (unreported) of the regression in column (8), where tight is split based on how the safe haven ratio is defined[125]. For the first time in our analysis we find a significant effect on the tax rate sensitivity in column (8) (Table 11, Table 12 and Table E10), and the extended regression also show some significant effects. The results are reported in Table E12. We obtain the same qualitative results for parent debt as Buettner et al. (2012); the coefficients suggest that the reduction in the tax rate sensitivity is larger if safe haven ratios are defined in terms of total debt. For total debt, rules defined by related party debt are found to exert stronger effects in the main sample, while rules defined by total debt is the stronger in the extended sample. The significant coefficients are large. However, as mentioned above, the subsamples for total debt do not have many observations, and thus we do not read too much into these results.

In sum, the subsamples based on thin-capitalization rules status show some results supporting the theoretical predictions. By analyzing only affiliates in countries that implemented a rule, we find proof supporting the theoretical expected relationships for parent debt. The results are qualitatively in accordance with Blouin et al. (2014) and Buettner et al. (2012). Total debt of affiliates in countries without rules display a significantly positive relationship to the tax rate in the main sample, but otherwise these subsamples do not provide evidence of the standard tax rate sensitivity. Affiliates in countries that had a rule the entire sample period show a quite robust, negative relationship between debt ratios and the tax rate, contradicting theory on capital structure and existing empirical results. These observations may partially explain why the analysis of the full samples does not show the expected outcomes.

[125] Tight is split into two separate tight variables based on if the safe haven ratio is defined in terms of total debt or related party debt.

7.3 Further Investigation

In addition to the subsamples tested in Section 7.2, several more tests have been conducted in the search for more evidence of Norwegian MNCs' behaving in line with the theoretical predictions. These tests include other subsamples, and altering assumptions that affect the data calibration. Of particular interest are subsamples of only the affiliates with debt ratios in the fifth quintile, which are created in an effort to isolate the affiliates that are in fact restricted by thin-capitalization rules. The results from these subsamples are reported in Section 7.3.1, and provide evidence that thin-capitalization rules affect parent debt ratios. In Section 7.3.2, a selection of the numerous other tests conducted is reported, but these tests generally provide no new insight.

7.3.1 Subsamples Based on Quintiles of Debt

Among the observed affiliates, only those with debt ratios exceeding the safe haven ratio will be affected by thin-capitalization rules, but with our data set it is not possible to precisely determine if an affiliate is indeed restricted or not. We, therefore, divide the samples into quintiles based on debt ratios, in an effort to separately test the effects of thin-capitalization rules on the highest leveraged firms. Observations in the upper quintiles are naturally more likely to be restricted.

The regressions on the fifth quintile of debt ratios in the main samples are printed in Table 13 and Table 14. The fifth quintile exerts behavior coinciding with the theoretical expectations, showing the same tendencies as the regressions on the subsample of countries that implemented a rule. In Table 13, the dummy variable approach suggests that thin-capitalization rules are effective in reducing the level and tax rate sensitivity of parent debt in affiliates with parent debt ratios in the fifth quintile. In Column (4) of Table 13, it is estimated that a thin-capitalization rule on average reduces the tax rate sensitivity of parent debt by approximately 1/3. Column (5), where also the level effect is included, estimates the same effect to be a reduction of about 2/3. In columns (7) through (10), the tight variable does not prove significant, but the signs of the coefficients are as expected. The results are robust to, and even improve in, the extended sample (Table F1, Appendix F). In total, the results indicate that thin-capitalization rules have the intended effect on parent debt ratios in the highest leveraged affiliates.

In regressions run on the fifth quintile of total debt ratios (Table 14), the effects of thin-capitalization rules are not as pronounced, though some effects are significant, and the signs of the coefficients are as expected. However, the significant negative effect of thin-capitalization rules in column (2) and (4) become insignificant when the sample is extended (Table F2). We, thus, do not obtain strong evidence of thin-capitalization rules affecting the total debt ratios in the highest leveraged affiliates.

The lower quintiles do not show any signs of being affected by thin-capitalization rules. Regressions run on the lower quintiles of parent debt ratios show some significant effects of the tax rate on parent debt ratios, but show no significant relationships between parent debt ratios and thin-capitalization rules. For total debt, regressions on the fourth and fifth quintile combined makes all the tax rate coefficients significant at the 1% level in the extended sample (Table F3), while all thin-capitalization variables are insignificant. The lack of significant effects of thin-capitalization rules in the lower quintiles may suggest that affiliates in these quintiles are not restricted, and that the fifth quintile to a great extent includes the affiliates that are restricted by the rules.

Table 13: Main sample for quintile 5 of parent debt ratios

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.3852**		0.3451**	0.4427***	0.6354***	0.6354***	0.3235*	0.3782**	0.5136**	0.5136**
	(0.170)		(0.170)	(0.159)	(0.192)	(0.192)	(0.182)	(0.170)	(0.205)	(0.205)
TCR		-0.0482**	-0.0388*		0.0900	-0.0444*				
		(0.022)	(0.021)		(0.072)	(0.024)				
TIGHT							-0.1028		0.2444	-0.1204
							(0.099)		(0.294)	(0.101)
STR x TCR				-0.1519**	-0.4148*	-0.4148*				
				(0.072)	(0.224)	(0.224)				
STR x TIGHT								-0.4322	-1.1257	-1.1257
								(0.298)	(0.885)	(0.885)
Loss Carryforward	0.0686***	0.0693***	0.0681***	0.0685***	0.0693***	0.0693***	0.0682***	0.0683***	0.0688***	0.0688***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Ln(Lending rate)	0.0145	0.0111	0.0094	0.0077	0.0077	0.0077	0.0127	0.0112	0.0101	0.0101
	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)
Ln(Revenue)	-0.0096	-0.0098	-0.0092	-0.0092	-0.0094	-0.0094	-0.0095	-0.0095	-0.0096	-0.0096
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Asset tangibility	-0.1207***	-0.1207***	-0.1207***	-0.1211***	-0.1218***	-0.1218***	-0.1206***	-0.1209***	-0.1216***	-0.1216***
	(0.041)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.040)	(0.041)	(0.041)
Observations	1,933	1,933	1,933	1,933	1,933	1,933	1,933	1,933	1,933	1,933
R^2	0.103	0.101	0.105	0.106	0.106	0.106	0.103	0.104	0.104	0.104
Nr. of affiliates	789	789	789	789	789	789	789	789	789	789
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Table 14: Main sample for quintile 5 of total debt ratios

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0875*		0.0792*	0.1158**	0.1367	0.1367	0.0759	0.0779	0.1697	0.1697
	(0.047)		(0.045)	(0.048)	(0.108)	(0.108)	(0.061)	(0.048)	(0.106)	(0.106)
TCR		-0.0159*	-0.0137		0.0088	-0.0136				
		(0.009)	(0.009)		(0.042)	(0.009)				
TIGHT							-0.0132		0.1422	-0.0308
							(0.044)		(0.143)	(0.038)
STR x TCR				-0.0446*	-0.0690	-0.0690				
				(0.023)	(0.116)	(0.116)				
STR x TIGHT								-0.1200	-0.5338	-0.5338
								(0.112)	(0.407)	(0.407)
Loss Carryforward	0.0107***	0.0109***	0.0110***	0.0111***	0.0111***	0.0111***	0.0107***	0.0108***	0.0110***	0.0110***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Ln(Lending rate)	0.0080	0.0064	0.0073	0.0071	0.0070	0.0070	0.0078	0.0072	0.0065	0.0065
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Ln(Revenue)	-0.0037**	-0.0040***	-0.0038**	-0.0038**	-0.0037**	-0.0037**	-0.0037**	-0.0038***	-0.0037**	-0.0037**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Asset tangibility	-0.0102	-0.0113	-0.0105	-0.0106	-0.0106	-0.0106	-0.0102	-0.0103	-0.0104	-0.0104
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Observations	1,394	1,394	1,394	1,394	1,394	1,394	1,394	1,394	1,394	1,394
R^2	0.089	0.088	0.091	0.091	0.092	0.092	0.089	0.090	0.091	0.091
Nr. of affiliates	748	748	748	748	748	748	748	748	748	748
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

7.3.2 Other Tests

As a closure to this analysis, we report a few chosen tests to highlight further issues with the samples.

Observations with Invariant Key Explanatory Variables

Countries with constant tax rates do not contribute in estimating the tax rate sensitivity. Nine countries have constant tax rates, and dropping these in the full samples may give better evidence of the tax rate sensitivity of debt. For total debt, dropping these countries makes the effects found in the main sample robust to the extended sample (Table F4, column 5 and 9). For the other base regressions, the results are unchanged.

The three countries with the most observations in our samples – Sweden, the UK and the US[126] – had no variation in thin-capitalization rules and almost no change in tax rates. Dropping these countries from the full samples may serve as an alternative to the subsample of countries that implemented a rule. However, we are not able to reproduce similar results by dropping these three countries. Compared to the base regressions, the effects on parent

[126] Combined, they account for about two-fifths of the full samples.

debt in the main sample slightly improve (see Table F5), but otherwise we obtain the same qualitative results when observations from Sweden, the US and the UK are dropped.

Alternative Data Set Calibration

There are several ways of calibrating the data set. Some choices are indisputable, such as removing observations with nonsensical values, while others may have alternative options. Several alternative ways to calibrate the data set have been tested, such as only including affiliates with revenue or assets above a certain threshold[127]. An alternative total debt ratio variable to replace the missing years has also been tested, created by subtracting the account named equity from total assets. None of these tests provide any new insights.

Changing the requirements of the parent's ownership share somewhat affects the results. The default is to include affiliates where the Norwegian parent's total direct plus indirect ownership share exceeds 50%. If this is changed to only include affiliates in which the parent has direct majority ownership, the significant effects found in the base regressions for total debt becomes slightly more significant in the main sample, and the results carry over to the extended sample (see Table F6). An even harsher criterion of direct ownership share of 100% reinforces the significant effects in the main sample. However, in the extended sample, thin-capitalization rules now show some significantly positive effects on total debt (see Table F7).

7.4 Discussion of Results

The analysis has shown that the results are very sensitive to the sample selection, which seems to be partly due to non-expected behavior by quite many of the observed affiliates. Separate analyzes of the countries that always had a rule, and the affiliates of the two largest parents, indicated a significantly negative relationship between debt ratios and the tax rate. The affiliates of the two largest parents even exert a significant increase in parent debt ratios when a thin-capitalization rule is implemented. There is no evident explanation for these effects, and it strongly contradicts theoretical predictions.

[127] Two threshold values for revenue and assets have been tested: 1 million NOK and 3 million NOK.

An issue with the full samples may be that many of the included countries had no changes in their tax rate or thin-capitalization rule during the sample period, making it hard to identify the effects of interest. This hypothesis gains some support by the significant results found in the subsample of only countries that implemented a rule. On the contrary, these results may be partially due to the elimination of the observations discussed in the previous paragraph.

Another possible explanation for why the effects of thin-capitalization rules are not very pronounced may be that affiliates of Norwegian MNCs, in general, do not have debt in excess of the defined safe haven ratios. The subsample of observations with parent debt ratios in the fifth quintile was able to identify significant effects of thin-capitalization rules on parent debt ratios, while none of the other quintiles showed significant effects. This may indicate that few affiliates in our data set are in fact restricted by thin-capitalization rules, and thus the effects may be harder to identify in the full samples.

This thesis focuses on explicitly defined thin-capitalization rules. However, as pointed out by Buettner et al. (2012, p. 933), countries may also restrict the use of excessive debt by means of general substance over form rules, such as the arm's length principle. The presence of such rules may lead to underestimated effects of both tax rate changes and thin-capitalization rules.

In the theoretical model, thin-capitalization rules are assumed to offer some leeway. The existence of loopholes will weaken the pronounced effects of thin-capitalization rules. If the partly weak results found in this thesis are due to loopholes, the results indicate that firms are able to circumvent the rules and, thus, that the rules are not effective in restricting the use of debt. On the other hand, comparable studies have been able to obtain evidence of the rules being effective in the same countries as studied in this thesis.

The abovementioned reasons for why the effect of thin-capitalization rules may be hard to detect do not explain why we do not find robust evidence of the normal tax rate sensitivity of debt. For parent debt, an explanation may be that parent debt is motivated by other reasons than tax rate differentials since Norway is not a low-tax country. For debt in general, a problem with the analysis is that we do not have the exact tax rates that firms are faced with when making capital structure decisions. Since our tax rate variable differs from the actual tax rates that influence firms' behavior, we will have a measurement error in our tax

variable, and the estimated tax rate coefficients will be biased towards zero (Wooldridge, 2014, pp. 255-261). It is next to impossible to find the firm-specific tax rates faced by every single affiliate in our data set, since countries often impose several types of taxes for corporations, and some apply different tax rates to different industries[128].

This thesis assumes that thin-capitalization rules, if such rules are present, and tax rates are the main drivers of the capital structure of MNCs. In addition, we control for other characteristics of the affiliates and their host countries that are likely to affect the use of debt. In reality, there will also be other factors influencing the capital structure decision that we are not able to control for. This can create noise in our data and, thus, make it harder to find significant coefficients of the explanatory variables.

Finally, the composition of the data set at hand may be a concern. As have been mentioned before, we only have electronically submitted responses to the "Utenlandsoppgave". The data set is thus most likely not an entirely random sample of affiliates of Norwegian MNCs. This is even less likely if the decision to submit electronically versus by paper is dependent on firm characteristics. For instance, companies with excessively high debt levels may be more likely to submit a stack of papers to conceal their numbers, even though the survey is used for statistical purposes. If that is the case, our data set will be biased towards companies with lower debt levels, which are less likely to be restricted by thin-capitalization rules.

[128] See for instance the variation in corporate tax rates for various legal entities in Greece, listed in OECD (2001, p. 119) Table 28: *Main legal entities and their corporate income tax rate.*

8. Conclusions

Multinational companies' enhanced opportunities to exploit the tax advantages of debt have the last few decades gained greater attention among tax authorities, which have resulted in the emergence of thin-capitalization rules. This thesis examines the effects of such rules on the capital structure decision of foreign affiliates of Norwegian MNCs, and is inspired by a similar study on German MNCs by Buettner et al. (2012). The aim is to answer the research question: Do thin-capitalization rules reduce leverage in foreign affiliates of Norwegian MNCs?

Thin-capitalization rules are theoretically predicted to reduce the level, as well as the tax rate sensitivity, of both internal and total debt for restricted firms. Our empirical analysis makes use of variation over time in countries' tax rates, and the presence and tightness of thin-capitalization rules. Two samples are tested; a main sample consisting of European and OECD countries for the years 1996 – 2004, and an extended sample where 25 countries are added and the period extended to 1994 – 2006. To further search for evidence of the effects of thin-capitalization rules, several subsamples are tested. As dependent variables we have total and parent debt, where the latter serves to identify the effects of thin-capitalization rules on internal debt.

In our least restrictive regression model, the main sample provides some evidence supporting that thin-capitalization rules reduce the tax rate sensitivity of internal and total debt, but no evidence supporting a direct reduction in the levels of debt. For total debt, a rule with an approximately sample average safe haven debt-to-equity ratio of 4:1 is estimated to reduce the tax rate sensitivity to zero. However, the results for both kinds of debt are not robust to the extended sample.

In a subsample including only the countries that implemented a rule during the sample period, a thin-capitalization rule with a safe haven ratio of 4:1 is estimated to reduce the parent debt-to-assets ratio by 4.7 (2.8) percentage points for the main (extended) sample. Equivalently, it is estimated that the tax rate sensitivity of a 10 percentage points increase in the tax rate is reduced by 40% (25%). The subsamples for total debt are small, but the level

and tax rate sensitivity show evidence of being reduced in the main sample. However, the results are weaker in the extended sample.

Another subsample split the full samples into five subsamples based on affiliates' debt levels, to try to separate the restricted from the unrestricted affiliates. Firms with parent debt ratios in the fifth quintile provide robust evidence supporting that the level and the tax rate sensitivity of parent debt is reduced for the highest leveraged firms. Quantitatively, the level effect is estimated to be of about equal size as in the subsamples of countries that implemented a rule. The total debt ratios of the highest leveraged affiliates do not show strong evidence of being affected by thin-capitalization rules. None of the lower quintiles are significantly affected by thin-capitalization rules.

Identification on the Norwegian data has proven more challenging than comparable studies on German and US data. Overall, to the extent we find evidence of the effects of thin-capitalization rules, the evidence supports that thin-capitalization rules are effective in reducing the incentive to use internal debt. The strongest evidence is found in countries that implemented a rule and for affiliates with the highest debt levels. This suggests that the rules have an effect on internal debt in the firms they are aimed at. We only find weak evidence of thin-capitalization rules affecting total debt. A possible explanation may be that firms can substitute external for internal debt if the thin-capitalization rules only restrict the use of internal debt. The weak effects on total debt may then suggest that thin-capitalization rules are not very effective in increasing the corporate tax base.

A weakness of the analysis is that we are limited to total and parent debt, and we are therefore not able to build a complete model of international debt shifting, including non-parent internal debt shifting and external debt shifting. Furthermore, countries without explicit thin-capitalization rules might have other rules in place restricting excessive interest deductions. The existence of such rules may lead to an underestimation of thin-capitalization rules in our analysis, especially in the full samples. This thesis treats all thin-capitalization rules as equal, but in reality rules differ to a great extent, and it is not given that all kinds of rules are equally effective. Further research taking more properties of thin-capitalization rules, including loopholes, into account may thus be helpful in providing more accurate estimates of the effects of thin-capitalization rules. This could especially be valuable in regards to the effects on total debt.

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Appendix A

Optimal capital structure for a given level of K_i

$$\mathcal{L}(D_i^I, D_i^E, \lambda) = \sum_i \{(1-t_i)\cdot F(K_i) - r\cdot K_i + t_i\cdot r\cdot [D_i^I + D_i^E] - (1-t_i)\cdot [C^I(b_i^I) + C^E(b_i^E)] \cdot K_i - \lambda\cdot (r\cdot D_i^I)\}$$

FOC Internal debt[129]:

$$\frac{\partial \mathcal{L}}{\partial D_i^I} = t_i\cdot r - (1-t_i)\cdot \left[\frac{\partial C^I(b_i^I)}{\partial b_i^{I\cdot}}\cdot \frac{db^I}{dD_i^{I\cdot}}\right]\cdot K_i - \lambda\cdot r = 0$$

$$= (t_i - \lambda)\cdot r - (1-t_i)\cdot \left[\frac{\partial C^I(b_i^I)}{\partial b_i^{I\cdot}}\cdot \frac{1}{K_i}\right]\cdot K_i$$

$$= (t_i - \lambda)\cdot r - (1-t_i)\cdot \frac{\partial C^I(b_i^I)}{\partial b_i^{I\cdot}}$$

$$(t_i - \lambda)\cdot r = (1-t_i)\cdot \frac{\partial C^I(b_i^I)}{\partial b_i^I}$$

FOC External debt[130]:

$$\frac{\partial \mathcal{L}}{\partial D_i^E} = t_i\cdot r - (1-t_i)\cdot \left[\frac{\partial C^E(b_i^E)}{\partial b_i^{E\cdot}}\cdot \frac{db^E}{dD_i^{E\cdot}}\right]\cdot K_i = 0$$

$$= t_i\cdot r - (1-t_i)\cdot \left[\frac{\partial C^E(b_i^E)}{\partial b_i^{E\cdot}}\cdot \frac{1}{K_i}\right]\cdot K_i$$

$$= (t_i - \lambda)\cdot r - (1-t_i)\cdot \frac{\partial C^E(b_i^E)}{\partial b_i^{E\cdot}}$$

$$(t_i - \lambda)\cdot r = (1-t_i)\cdot \frac{\partial C^E(b_i^E)}{\partial b_i^{E\cdot}}$$

$$t_i\cdot r = (1-t_i)\cdot \frac{\partial C^E(b_i^E)}{\partial b_i^E}$$

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[129] $b_i^I = \frac{D_i^I}{K_i}$, $\frac{db_i^I}{dD_i^I} = \frac{1}{K_i}$

[130] $b_i^E = \frac{D_i^E}{K_i}$, $\frac{db_i^E}{dD_i^E} = \frac{1}{K_i}$

Tax rate sensitivity of optimal debt ratios[131]

Internal debt

$$\frac{db_i^I}{dt_i} = -\frac{\frac{\partial \mathcal{L}/\partial D_i^I}{\partial t_i}}{\frac{\partial \mathcal{L}/\partial D_i^I}{\partial b_i^I}} = -\frac{r+\partial C^I(b_i^I)/\partial b_i^I}{-(1-t_i)\cdot(\partial^2 C^I(b_i^I)/\partial b_i^{I2})} = \frac{r+\partial C^I(b_i^I)/\partial b_i^I}{(1-t_i)\cdot(\partial^2 C^I(b_i^I)/\partial b_i^{I2})}$$

External debt

$$\frac{db_i^E}{dt_i} = -\frac{\frac{\partial \mathcal{L}/\partial D_i^E}{\partial t_i}}{\frac{\partial \mathcal{L}/\partial D_i^E}{\partial b_i^E}} = -\frac{r+\partial C^E(b_i^E)/\partial b_i^E}{-(1-t_i)\cdot(\partial^2 C^E(b_i^E)/\partial b_i^{E2})} = \frac{r+\partial C^E(b_i^E)/\partial b_i^E}{(1-t_i)\cdot(\partial^2 C^E(b_i^E)/\partial b_i^{E2})}$$

[131] $H(x,y) \equiv 0 \Leftrightarrow \frac{\partial H}{\partial x}dx + \frac{\partial H}{\partial y}dy = 0 \Leftrightarrow \frac{dy}{dx} = -\frac{\partial H/\partial x}{\partial H/\partial y}$

Appendix B

This appendix explains how the variable tight allows for identification of the effects of thin-capitalization rules. The model is directly adopted from Buettner et al. (2012), and a similar, but less extensive explanation is found in the original paper.

Buettner et al. (2012) divide firms into two "regimes", based on whether an affiliate's debt ratio is above the allowable safe haven ratio or not. The two regimes are separated by an indicator variable, $d_{i,t}$, which equals 1 if an affiliate has excess debt, and 0 if it is unrestricted[132]. In the model, affiliates with excess debt face strictly binding thin-capitalization rules, which theoretically imply that the tax rate sensitivity will not be the same for the two regimes. Buettner et al. (2012) presents the following two different equations, describing the relationship between the debt ratio and tax rate for the two regimes

$$y_{i,t}^{0} = \left(1 - d_{i,t}\right) \cdot \tilde{y}_{i,t}^{0} = (1 - d_{i,t}) \cdot (\beta_1^0 \mathcal{T}_{i,t} + \beta_2 X_{i,t} + \alpha_i + \epsilon_{i,t}) \quad (1)$$

$$y_{i,t}^{1} = d_{i,t} \cdot \tilde{y}_{i,t}^{1} = d_{i,t} \cdot (\beta_1^1 \mathcal{T}_{i,t} + \beta_2 X_{i,t} + \alpha_i + \epsilon_{i,t}) \quad (2)$$

where the tax rate, $\mathcal{T}_{i,t}$, and the control variables, $X_{i,t}$, are observed, while $\tilde{y}_{i,t}^{0}$ and $\tilde{y}_{i,t}^{1}$ are latent variables depending on the outcome of $d_{i,t}$. Note that it is assumed that the only difference between the two regimes is the tax rate sensitivity, which is seen by the difference in the expected value of $\beta_1^{d_{i,t}}$. For affiliates not facing restrictions, i.e. $d_{i,t}$=0, the tax rate sensitivity should be positive, and thus $\beta_1^0 > 0$. For affiliates facing strictly binding restrictions, $d_{i,t}$=1, the tax rate sensitivity is expected to be zero, $\beta_1^1 = 0$.

To deal with the difficulties in assigning an affiliate to a regime, Buettner et al. (2012) exploit the relationship between the probability of a rule being binding, i.e. an affiliate being restricted ($d_{i,t}$=1), and a tightness-measure of the thin-capitalization rule. The tightness of a rule in country *j* at period *t* is defined as

$$TIGHT_{i,t} = \frac{1}{1+\sigma_{i,t}} \quad (3)$$

[132] Note that $d_{i,t} = 0$ also represent the case for countries without thin-capitalization rules.

where $\sigma_{i,t}$ is the safe haven debt-to-equity ratio. The tight variable captures the complete possible range of debt-to-equity ratios in the interval of 0-1. It takes the value of 0 if no rule is present ($\sigma_{i,t} \to \infty$), and takes the value of 1 in the most restrictive case of $\sigma_{i,t} = 0$. The relationship between the tight variable and the indicator variable is described by a linear probability function

$$d_{i,t} = \varphi \cdot TIGHT_{i,t} + u_{i,t} \tag{4}$$

where φ is a positive parameter and $u_{i,t}$ is random disturbance. It is now possible to formulate a general regression equation, based on the two regimes' separate regression equations and the relationship between $d_{i,t}$ and tight. By pooling equation (1) and (2), and inserting equation (4) for $d_{i,t}$, the following regression equation is obtained

$$\begin{aligned}
y_{i,t} &= \left[\left(1 - d_{i,t}\right) \cdot \beta_1^0 \mathcal{T}_{i,t} + \left(1 - d_{i,t}\right) \cdot \left(\beta_2 X_{i,t} + \alpha_i + \epsilon_{i,t}\right)\right] + \left[d_{i,t} \cdot \beta_1^1 \mathcal{T}_{i,t} + d_{i,t} \cdot \right. \\
&\left. \left(\beta_2 X_{i,t} + \alpha_i + \epsilon_{i,t}\right)\right] \\
&= \beta_1^0 \mathcal{T}_{i,t} - d_{i,t} \cdot \beta_1^0 \mathcal{T}_{i,t} + d_{i,t} \cdot \beta_1^1 \mathcal{T}_{i,t} + \left(\beta_2 X_{i,t} + \alpha_i + \epsilon_{i,t}\right) \\
&= \beta_1^0 \mathcal{T}_{i,t} + \mathcal{T}_{i,t} \cdot d_{i,t} \cdot (\beta_1^1 - \beta_1^0) + \left(\beta_2 X_{i,t} + \alpha_i + \epsilon_{i,t}\right) \\
&= \beta_1^0 \mathcal{T}_{i,t} + \mathcal{T}_{i,t} \cdot (\varphi \cdot TIGHT_{i,t}) \cdot (\beta_1^1 - \beta_1^0) + \left(\beta_2 X_{i,t} + \alpha_i + e_{i,t}\right) \\
&= \beta_1^0 \cdot \mathcal{T}_{i,t} + \theta \cdot \mathcal{T}_{i,t} \cdot TIGHT_{i,t} + \left(\beta_2 X_{i,t} + \alpha_i + e_{i,t}\right) \qquad (5)
\end{aligned}$$

where $\theta = \varphi \cdot (\beta_1^1 - \beta_1^0)$ and $y_{i,t} = \max(y_{i,t}^0, y_{i,t}^1)$.

Looking at equation (5), we see that the standard tax rate effect of debt is captured by β_1^0, and expected to be positive. The coefficient θ estimates how the presence and tightness of a thin-capitalization rule change the tax rate sensitivity of debt if rules are binding. θ is expected to be negative, since $(\beta_1^1 - \beta_1^0) < 0$ and $\varphi > 0$. This is in line with the theoretical prediction of thin-capitalization rules reducing the tax rate sensitivity. Further, we see that the tighter the rule is, the more the tax rate sensitivity is reduced.

In theory, the model above separates the effects of thin-capitalization rules on restricted firms from unrestricted firms. β_1^0 is the tax rate sensitivity for unrestricted firms, and θ is the difference in tax rate sensitivity between restricted and unrestricted firms. However, the tight

variable is measured at the country-level, meaning that in reality it will not be able to separate restricted firms from unrestricted firms within a country. Thus, the regression measures the average effect of thin-capitalization rules within a country. Identification of the effect is consequently dependent on a sufficient number of firms being restricted – for which the probability increase with the tightness.

In contrast to Buettner et al. (2012), we assume thin-capitalization rules to offer loopholes to some extent. As have been stressed, we are not able to explicitly control for loopholes, but the transformation from two separate regimes into one general regression equation shown above is still valid. First, note that the likelihood of rules being binding (and thus the likelihood of being restricted) is only dependent on the safe haven ratio. The safe haven ratio, and thus tightness, is the same regardless of loopholes, and, thus, the relationship between the likelihood of rules being binding and the tightness of the rule still holds. Next, recall that the theory section established that loopholes allow for the debt tax shield to remain positive even if the safe haven ratio is exceeded, but at the same time the utilization of loopholes increases the costs of debt. This means that restricted firms operate under another regime than unrestricted firms, even if the rules offer loopholes.

What does change is the expectancy of the tax rate sensitivity of restricted firms, β_1^1. In contrast to strictly binding rules, the tax rate sensitivity is expected to remain positive when there are loopholes, i.e. we expect $\beta_1^1 > 0$. However, this does not invalidate the model above, we merely have to adjust the theoretically quantitative expected outcome. To see this, remember that though we expect the tax rate sensitivity of restricted firms to stay positive, we expect it to be lower than the tax rate sensitivity of unrestricted firms, i.e. $\beta_1^0 > \beta_1^1 > 0$. Now, re-examining the coefficient of the interaction term between the tax rate and the tight measure, $\theta = \varphi \cdot (\beta_1^1 - \beta_1^0)$, we see that the expectancy of the coefficient to be negative still holds. The difference from Buettner et al. (2012) is that we would theoretically expect the coefficient to be smaller in magnitude. However, Buettner et al. (2012) does not control for loopholes, meaning that the empirical regressions are the same, so we expect the empirical results to be similar.

Equation (5) presented above is the regression equation in column (8) in the regression tables presented in this thesis. However, the relationship above can be used to generate all regressions involving TIGHT. For instance, the equation for column (7) can be obtained in

the following way: In the model above, assume that the tax rate effect is the same for the two regimes, and that there instead is a level effect that differs. In equations (1) and (2), that means assuming the tax rate effect to be equal for the two regimes, $\beta_{Tax}^{0} = \beta_{Tax}^{1} = \beta_1$, and adding a rule-dummy in both equations with different coefficients $\beta_{TCR}^{0}(= 0)$[133] and $\beta_{TCR}^{1}(< 0)$. The resulting regression is

$$y_{i,t} = \beta_1 \cdot \mathcal{T}_{i,t} + \beta_{TCR}^{0} \cdot TCR_{i,t} + \delta \cdot TCR_{i,t} \cdot TIGHT_{i,t} + \left(\beta_2 X_{i,t} + \alpha_i + e_{i,t}\right)$$

where $\delta = \varphi \cdot (\beta_{TCR}^{1} - \beta_{TCR}^{0}) < 0$. Since $\beta_{TCR}^{0} = 0$, the second term disappears, and in the third term $TCR_{i,t}$ can be dropped, since $TCR_{i,t}$ and $TIGHT_{i,t}$ are indicators for the same rule and almost perfectly correlated.

[133] The level effect on unrestricted firms and in countries without rules should be zero.

Appendix C

Survey form, Utenlandsoppgave, Statistics Norway

Statistisk sentralbyrå
Statistics Norway

Seksjon for kredittmarkedsstatistikk
Postboks 8131 Dep, 0033 Oslo
Tlf.: 21 09 00 00 Faks: 21 09 49 98

Utenlandsoppgave

Inntektsår

1. Registreringsopplysninger

Skatteyters navn og adresse		Organisasjonsnr. Fødselsnr.
Kommunenr. og -navn	Telefon	Bransje

2. Opplysninger om det utenlandske selskap eller innretning

Navn og adresse	Hovedaktivitet	Rettslig form
	Navn og adresse på direkte eier hvis det utenlandske selskap eller innretning er helt eller delvis indirekte eiet av skatteyter eller av innretning hvor skatteyter har bestemmende innflytelse.	

3. Skatteyters eierandel mv. i det utenlandske selskap eller innretning (NOK 1000)

Aksjer/andeler ved regnskapsårets slutt	Antall	Pålydende pr. aksje/andel i valuta	Historisk kostpris i alt (NOK 1000)	Eierandel i %	Stemmeber. andel i %	Skatteyters/direkte eiers andel av utdelt utbytte	
						I NOK 1000	i %
- direkte eiet							
- indirekte eiet (se spesielt om utbytteopplysninger i veiledningen pkt. 3)							

Innflytelse uten formelt eierskap ☐ Ja ☐ Nei

4. Skatteyters økonomiske tilknytning til det utenlandske selskap eller innretning (NOK 1000)

		(1)	(2)
1	Langsiktig lånefordring på (1) og lånegjeld til (2) det utenlandske selskap eller innretning	(1)	(2)
2	Inntektsførte renter av langsiktige lånefordringer på (1) og kostnadsførte renter på lånegjeld (2)	(1)	(2)
3	Kortsiktige fordringer på (1) og gjeld til (2) det utenlandske selskap eller innretning	(1)	(2)
4	Inntektsførte renter av kortsiktig fordring (1) og kostnadsførte renter på gjeld (2)	(1)	(2)
5	Skatteyters garantiansvar for det utenlandske selskaps/innretnings gjeld (1) og inntektsførte garantiprovisjoner (2)	(1)	(2)
6	Skatteyters kostnadsførte tap på garanti/lån eller annet mellomværende	(1)	(2)

5. Transaksjoner mellom det utenlandske selskap eller innretning og skatteyter (NOK 1000)

-		Utenlandske selskaps inntekter	Utenlandske selskaps kostnader
a	Salg/ kjøp av varer og/eller anleggsmidler		
b	Engangsvederlag og/eller løpende lisensavgift royalty for know how, opphavsrettigheter, rett til varemerke, patenter o.l.		
c	Leie, leasing, franchise eller befraktning		
d	Kommisjoner/provisjoner		
e	Forskning og utvikling, tekniske/administrative eller lignende tjenester		

6. Opplysninger fra utenlandsk selskaps eller innretnings resultatregnskap (NOK 1000)

Regnskapsperiode:	a Driftsinntekter		d Resultat før skatt	
	b Driftskostnader		e Skatter	
Omregningskurs:	c Nettoresultat av finansielle poster		f Årets overskudd	

7. Opplysninger fra utenlandsk selskaps eller innretnings balanse (NOK 1000)

Regnskapsperiode:	a Sum anleggsmidler		e herav varer/kundefordringer	
	b herav skip, maskiner, inventar o.l bygn, og annen fast eiend.		f Sum kortsiktig gjeld	
Omregningskurs:	c herav patenter og andre immatrielle eiendeler		g Sum langsiktig gjeld	
	d Sum omløpsmidler		h Aksjer-/andelskapital	
			i Sum egenkapital inkl. aksje-/andelskapital	

8. Underskrift

Sted	Dato	Skatteyters underskrift (gjentas med blokkskrift)

RA - 0567

Table C1: Available observations without missing values for dependent variables after duplicates, minority owned affiliates, and affiliates changing country have been removed

Year	Observations	Parent debt ratio	Total debt ratio
1990	2,359	0	0
1991	2,345	0	0
1992	2,337	1	0
1993	2,267	3	0
1994	2,226	2,028	0
1995	2,264	2,110	0
1996	2,395	2,194	0
1997	2,473	2,275	0
1998	2,491	2,331	0
1999	3,023	2,644	2,340
2000	3,546	2,421	2,414
2001	4,047	3,495	3,488
2002	4,221	2,905	3,051
2003	4,234	3,151	3,054
2004	3,982	2,805	2,906
2005	4,125	2,595	2,852
2006	4,077	2,315	2,667
Total	**52,412**	**33,273**	**22,772**

Table C2: Number, share and mean debt ratios of foreign affiliates by country

Country	N	Share (%)	Mean Parent Debt	N	Share(%)	Mean Total Debt	Main sample
Argentina	48	0.31%	0.1461	36	0.37%	0.4942	-
Australia	208	1.35%	0.1457	139	1.45%	0.5995	Yes
Austria	141	0.91%	0.0223	95	0.99%	0.5272	Yes
Belgium	335	2.17%	0.0786	209	2.17%	0.5042	Yes
Bulgaria	20	0.13%	0.0000	14	0.15%	0.3146	Yes
Brazil	173	1.12%	0.1057	161	1.68%	0.4373	-
Canada	353	2.29%	0.1481	224	2.33%	0.5522	Yes
Chile	89	0.58%	0.1019	61	0.63%	0.4245	-
China	139	0.90%	0.1114	123	1.28%	0.5268	-
Colombia	18	0.12%	0.0717	15	0.16%	0.6225	-
Croatia	13	0.08%	0.4284	10	0.10%	0.7026	Yes
Cyprus	44	0.28%	0.1272	21	0.22%	0.4400	Yes
Czech Republic	135	0.87%	0.1013	106	1.10%	0.5120	Yes
Germany	1076	6.97%	0.1074	620	6.45%	0.6146	Yes
Denmark	1291	8.36%	0.0828	741	7.71%	0.6024	Yes
Egypt	32	0.21%	0.0881	28	0.29%	0.5210	-
Estonia	184	1.19%	0.1411	169	1.76%	0.5552	Yes
Finland	486	3.15%	0.1755	302	3.14%	0.5989	Yes
France	714	4.62%	0.0999	419	4.36%	0.5715	Yes
Greece	69	0.45%	0.1462	53	0.55%	0.5834	Yes
Guatemala	14	0.09%	0.3075	8	0.08%	0.7018	-
Hong Kong	168	1.09%	0.1148	90	0.94%	0.5354	-
Hungary	65	0.42%	0.0899	48	0.50%	0.4978	Yes
Iceland	23	0.15%	0.1123	14	0.15%	0.4113	-
India	51	0.33%	0.0756	44	0.46%	0.4958	-
Indonesia	47	0.30%	0.1161	37	0.39%	0.6252	-
Ireland	144	0.93%	0.0969	87	0.91%	0.5740	Yes
Italy	314	2.03%	0.1422	213	2.22%	0.7613	Yes
Japan	109	0.71%	0.2860	69	0.72%	0.6151	Yes
Lithuania	113	0.73%	0.1770	99	1.03%	0.5974	Yes
Luxembourg	66	0.43%	0.1008	36	0.37%	0.3419	Yes
Latvia	114	0.74%	0.2217	106	1.10%	0.5832	Yes
Malaysia	138	0.89%	0.0936	99	1.03%	0.6244	-
Malta	5	0.03%	0.1165	6	0.06%	0.3595	Yes
Mexico	40	0.26%	0.1409	29	0.30%	0.6694	Yes
Netherlands	531	3.44%	0.0703	343	3.57%	0.5078	Yes
New Zealand	39	0.25%	0.2621	30	0.31%	0.6969	Yes
Pakistan	0	0.00%	-	6	0.06%	0.6837	-
Panama	16	0.10%	0.2154	11	0.11%	0.7735	-
Peru	10	0.06%	0.0000	15	0.16%	0.5592	-
Philippines	32	0.21%	0.2164	29	0.30%	0.7256	-
Poland	266	1.72%	0.1678	216	2.25%	0.4798	Yes
Portugal	206	1.33%	0.1853	124	1.29%	0.5958	Yes
Romania	21	0.14%	0.2023	20	0.21%	0.4150	-
Russia	69	0.45%	0.1172	52	0.54%	0.4537	-
Singapore	446	2.89%	0.1198	272	2.83%	0.4974	-
Slovakia	31	0.20%	0.1787	24	0.25%	0.4508	Yes
Slovenia	2	0.01%	0.0000	0	0.00%	-	Yes
Spain	298	1.93%	0.1668	199	2.07%	0.5654	Yes
South Africa	60	0.39%	0.2135	49	0.51%	0.6957	-
South Korea	67	0.43%	0.1206	44	0.46%	0.4206	Yes
Sri Lanka	13	0.08%	0.0229	9	0.09%	0.3338	-
Sweden	2927	18.96%	0.1062	1671	17.39%	0.6169	Yes
Switzerland	204	1.32%	0.1116	108	1.12%	0.5024	Yes
Thailand	52	0.34%	0.1530	31	0.32%	0.5053	-
Turkey	30	0.19%	0.0827	31	0.32%	0.5407	Yes
UK	1707	11.06%	0.1212	958	9.97%	0.5551	Yes
Ukraine	27	0.17%	0.0092	22	0.23%	0.4764	-
USA	1339	8.67%	0.1349	772	8.03%	0.5482	Yes
Venezuela	47	0.30%	0.0942	27	0.28%	0.3378	-
Vietnam	21	0.14%	0.0233	16	0.17%	0.3881	-
Total	15440	100%	0.1184	9610	100%	0.2840	

Table C3: Correlation matrix of regression variables in the main sample

	Parent debt ratio	Total debt ratio	STR	TCR	STR x TCR	TIGHT	STR x TIGHT	Loss carry-forward	Log of lending rate	Log of revenue
Total debt ratio	**0.326**									
STR	0.016	-0.0113								
TCR	0.012	**-0.0902**	**0.382**							
STR x TCR	0.019	**-0.080**	**0.592**	**0.958**						
TIGHT	0.014	**-0.084**	**0.314**	**0.891**	**0.844**					
STR x TIGHT	*0.020*	**-0.078**	**0.485**	**0.890**	**0.905**	**0.974**				
Loss carryforward	**0.122**	**0.128**	0.013	0.005	0.009	0.015	0.017			
Log of lending rate	**0.036**	0.021	**0.189**	*0.024*	**0.055**	-0.013	0.019	**0.0292**		
Log of revenue	-0.018	**0.217**	**0.080**	**0.087**	**0.089**	**0.102**	**0.107**	**-0.0686**	**-0.0365**	
Asset tangibility	**-0.065**	**-0.088**	**-0.066**	-0.008	**-0.026**	**-0.031**	**-0.039**	**0.0762**	**0.0310**	-0.013

Bolded *(italicized*) correlations are significant at the 1% (5%) level.

Table C4: Correlation matrix of regressions variables in extended sample

	Parent debt ratio	Total debt ratio	STR	TCR	STR x TCR	TIGHT	STR x TIGHT	Loss carry-forward	Log of lending rate	Log of revenue	Asset tangibility	Log inflation	Corruption
Total debt ratio	**0.340**												
STR	*0.018*	**0.032**											
TCR	0.011	**-0.029**	**0.373**										
STR x TCR	*0.017*	-0.014	**0.575**	**0.957**									
TIGHT	0.015	*-0.025*	**0.332**	**0.901**	**0.861**								
STR x TIGHT	*0.020*	-0.015	**0.490**	**0.892**	**0.914**	**0.975**							
Loss carryforward	**0.101**	**0.128**	**0.038**	*0.018*	**0.026**	**0.032**	**0.036**						
Log of lending rate	**0.027**	**-0.041**	**0.162**	**-0.124**	**-0.085**	**-0.137**	**-0.106**	0.011					
Log of revenue	**-0.021**	**0.192**	**0.050**	**0.082**	**0.078**	**0.093**	**0.093**	**-0.081**	**-0.048**				
Asset tangibility	**-0.066**	**-0.098**	**-0.042**	-0.008	**-0.025**	**-0.026**	**-0.034**	**0.077**	**0.060**	0.003			
Log of inflation	**0.032**	**-0.036**	**-0.040**	**-0.040**	**-0.052**	**-0.059**	**-0.065**	0.007	**0.326**	-0.015	*0.016*		
Corruption	**-0.050**	**0.054**	**-0.087**	**-0.021**	0.006	*0.015*	**0.026**	**-0.041**	**-0.477**	*0.017*	**-0.034**	**-0.337**	
Creditor rights	-0.014	-0.015	**-0.024**	**0.259**	**0.203**	**0.293**	**0.221**	-0.011	**-0.085**	0.009	-0.011	**0.0268**	**0.115**

Bolded *(italicized*) correlations are significant at the 1% (5%) level.

Appendix D

Main Samples Extended with Extra Control Variables

Parent debt ratio

Table D1: Main sample with log of inflation and corruption as extra control variables

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0413		0.0474	0.0320	0.1820*	0.1820*	0.0798	0.0436	0.1746*	0.1746*
	(0.046)		(0.047)	(0.049)	(0.103)	(0.103)	(0.057)	(0.046)	(0.103)	(0.103)
TCR		0.0106	0.0113		0.0745*	0.0113				
		(0.009)	(0.009)		(0.039)	(0.009)				
TIGHT							0.0654		0.2450*	0.0582
							(0.045)		(0.145)	(0.045)
STR x TCR				0.0179	-0.1949*	-0.1949*				
				(0.026)	(0.113)	(0.113)				
STR x TIGHT								0.1179	-0.5766	-0.5766
								(0.128)	(0.417)	(0.417)
Loss Carryforward	0.0189***	0.0191***	0.0189***	0.0189***	0.0191***	0.0191***	0.0190***	0.0189***	0.0190***	0.0190***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	-0.0305***	-0.0302***	-0.0300***	-0.0299***	-0.0331***	-0.0331***	-0.0304***	-0.0299***	-0.0331***	-0.0331***
	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Ln(Revenue)	0.0045**	0.0045**	0.0045**	0.0045**	0.0045**	0.0045**	0.0045**	0.0045**	0.0045**	0.0045**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0077	-0.0076	-0.0077	-0.0077	-0.0078	-0.0078	-0.0079	-0.0078	-0.0080	-0.0080
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln(Inflation)	0.0029*	0.0027*	0.0028*	0.0029*	0.0027*	0.0027*	0.0029*	0.0029*	0.0027*	0.0027*
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0100**	-0.0089**	-0.0095**	-0.0099**	-0.0081*	-0.0081*	-0.0091**	-0.0097**	-0.0083*	-0.0083*
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	9,863	9,863	9,863	9,863	9,863	9,863	9,863	9,863	9,863	9,863
R^2	0.066	0.066	0.066	0.066	0.067	0.067	0.066	0.066	0.067	0.067
Nr. of affiliates	2,729	2,729	2,729	2,729	2,729	2,729	2,729	2,729	2,729	2,729
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Total debt ratio

Table D2: Main sample with log of inflation and corruption as extra control variables

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0074		0.0038	0.0855	0.5286**	0.5286**	0.0826	0.0009	0.4578**	0.4578**
	(0.092)		(0.088)	(0.149)	(0.252)	(0.252)	(0.131)	(0.091)	(0.216)	(0.216)
TCR		-0.0069	-0.0068		0.1756***	-0.0325				
		(0.038)	(0.038)		(0.065)	(0.048)				
TIGHT							0.0975		0.7219**	-0.0321
							(0.125)		(0.284)	(0.160)
STR x TCR				-0.1167	-0.6423**	-0.6423**				
				(0.146)	(0.272)	(0.272)				
STR x TIGHT								-0.1429	-2.3272**	-2.3272**
								(0.486)	(1.103)	(1.103)
Loss Carryforward	0.0512***	0.0512***	0.0512***	0.0512***	0.0522***	0.0522***	0.0514***	0.0512***	0.0519***	0.0519***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	0.0105	0.0101	0.0101	0.0089	0.0100	0.0100	0.0112	0.0101	0.0093	0.0093
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Ln(Revenue)	0.0251***	0.0251***	0.0252***	0.0251***	0.0249***	0.0249***	0.0252***	0.0251***	0.0250***	0.0250***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0530*	-0.0533**	-0.0533**	-0.0543**	-0.0539**	-0.0539**	-0.0527*	-0.0532*	-0.0532*	-0.0532*
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Ln(Inflation)	0.0010	0.0010	0.0010	0.0012	0.0011	0.0011	0.0010	0.0009	0.0004	0.0004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Corruption	-0.0060	-0.0060	-0.0061	-0.0052	-0.0002	-0.0002	-0.0050	-0.0061	-0.0010	-0.0010
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
Observations	6,424	6,424	6,424	6,424	6,424	6,424	6,424	6,424	6,424	6,424
R^2	0.084	0.084	0.084	0.084	0.086	0.086	0.084	0.084	0.085	0.085
Nr. of affiliates	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140	2,140
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average

Main Samples Extended with Extra Years

Parent debt ratio

Table D3: Main sample, period extended to 1994-2006

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0490		-0.0416	-0.0550	0.0698	0.0698	-0.0303	-0.0477	0.0223	0.0223
	(0.047)		(0.048)	(0.051)	(0.090)	(0.090)	(0.056)	(0.047)	(0.090)	(0.090)
TCR		0.0105	0.0096		0.0635**	0.0097				
		(0.009)	(0.009)		(0.032)	(0.009)				
TIGHT							0.0317		0.1343	0.0290
							(0.046)		(0.120)	(0.046)
STR x TCR				0.0141	-0.1661*	-0.1661*				
				(0.027)	(0.093)	(0.093)				
STR x TIGHT								0.0539	-0.3250	-0.3250
								(0.135)	(0.355)	(0.355)
Loss Carryforward	0.0246***	0.0246***	0.0247***	0.0246***	0.0248***	0.0248***	0.0247***	0.0246***	0.0246***	0.0246***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Ln(Lending rate)	-0.0134*	-0.0126	-0.0127*	-0.0129*	-0.0146*	-0.0146*	-0.0132*	-0.0131*	-0.0146*	-0.0146*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Revenue)	0.0067***	0.0068***	0.0067***	0.0067***	0.0067***	0.0067***	0.0067***	0.0067***	0.0067***	0.0067***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0197*	-0.0198**	-0.0197*	-0.0197*	-0.0197**	-0.0197**	-0.0197*	-0.0197*	-0.0197**	-0.0197**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Observations	13,686	13,686	13,686	13,686	13,686	13,686	13,686	13,686	13,686	13,686
R^2	0.071	0.071	0.071	0.071	0.072	0.072	0.071	0.071	0.071	0.071
Nr. of affiliates	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Total debt ratio

Table D4: Main sample, period extended to 1999-2006

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0037		0.0117	-0.0135	0.4345**	0.4345**	0.1290	0.0028	0.4145**	0.4145**
	(0.088)		(0.088)	(0.113)	(0.190)	(0.190)	(0.106)	(0.086)	(0.185)	(0.185)
TCR		0.0300	0.0302		0.1868***	0.0115				
		(0.024)	(0.024)		(0.055)	(0.027)				
TIGHT							0.2006**		0.6849***	0.1197
							(0.087)		(0.240)	(0.101)
STR x TCR				0.0155	-0.5413***	-0.5413***				
				(0.083)	(0.189)	(0.189)				
STR x TIGHT								0.3272	-1.7442**	-1.7442**
								(0.307)	(0.826)	(0.826)
Loss Carryforward	0.0565***	0.0566***	0.0566***	0.0565***	0.0573***	0.0573***	0.0567***	0.0565***	0.0571***	0.0571***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	0.0389***	0.0393***	0.0393***	0.0389***	0.0415***	0.0415***	0.0386***	0.0387***	0.0389***	0.0389***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Ln(Revenue)	0.0280***	0.0280***	0.0280***	0.0281***	0.0278***	0.0278***	0.0281***	0.0281***	0.0279***	0.0279***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Asset tangibility	-0.0296	-0.0287	-0.0287	-0.0295	-0.0284	-0.0284	-0.0288	-0.0292	-0.0287	-0.0287
	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)	(0.020)
Observations	8,335	8,335	8,335	8,335	8,335	8,335	8,335	8,335	8,335	8,335
R^2	0.086	0.086	0.086	0.086	0.088	0.088	0.086	0.086	0.087	0.087
Nr. of affiliates	2,343	2,343	2,343	2,343	2,343	2,343	2,343	2,343	2,343	2,343
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Main Samples Extended with Extra Countries

Parent debt ratio

Table D5: Main sample, 1996-2004, with extra countries

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0199		0.0258	0.0155	0.1482*	0.1482*	0.0482	0.0214	0.1360	0.1360
	(0.045)		(0.046)	(0.047)	(0.086)	(0.086)	(0.056)	(0.046)	(0.086)	(0.086)
TCR		0.0085	0.0089		0.0665**	0.0073				
		(0.009)	(0.009)		(0.032)	(0.009)				
TIGHT							0.0478		0.2193*	0.0332
							(0.043)		(0.122)	(0.044)
STR x TCR				0.0095	-0.1828*	-0.1828*				
				(0.028)	(0.094)	(0.094)				
STR x TIGHT								0.0635	-0.5743	-0.5743
								(0.132)	(0.372)	(0.372)
Loss Carryforward	0.0186***	0.0187***	0.0186***	0.0186***	0.0187***	0.0187***	0.0187***	0.0186***	0.0187***	0.0187***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Ln(Lending rate)	-0.0285***	-0.0282***	-0.0280***	-0.0283***	-0.0295***	-0.0295***	-0.0282***	-0.0283***	-0.0297***	-0.0297***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)
Ln(Revenue)	0.0032*	0.0032*	0.0032*	0.0032*	0.0032*	0.0032*	0.0032*	0.0032*	0.0032*	0.0032*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0123	-0.0123	-0.0123	-0.0123	-0.0124	-0.0124	-0.0124	-0.0124	-0.0125	-0.0125
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Observations	11,152	11,152	11,152	11,152	11,152	11,152	11,152	11,152	11,152	11,152
R^2	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
Nr. of affiliates	3,106	3,106	3,106	3,106	3,106	3,106	3,106	3,106	3,106	3,106
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Total debt ratio

Table D6: Main sample 1999-2004, with extra countries

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0551		-0.0548	-0.0170	0.2313	0.2313	0.0050	-0.0550	0.1807	0.1807
	(0.087)		(0.083)	(0.131)	(0.207)	(0.207)	(0.114)	(0.086)	(0.175)	(0.175)
TCR		0.0018	0.0005		0.1004*	-0.0205				
		(0.031)	(0.031)		(0.052)	(0.040)				
TIGHT							0.0804		0.3959*	-0.0207
							(0.101)		(0.227)	(0.144)
STR x TCR				-0.0624	-0.3732*	-0.3732*				
				(0.123)	(0.223)	(0.223)				
STR x TIGHT								0.0031	-1.2858	-1.2858
								(0.428)	(0.948)	(0.948)
Loss Carryforward	0.0485***	0.0485***	0.0485***	0.0486***	0.0490***	0.0490***	0.0486***	0.0485***	0.0488***	0.0488***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	-0.0101	-0.0094	-0.0101	-0.0109	-0.0072	-0.0072	-0.0084	-0.0101	-0.0078	-0.0078
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Ln(Revenue)	0.0224***	0.0224***	0.0224***	0.0224***	0.0223***	0.0223***	0.0224***	0.0224***	0.0223***	0.0223***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0805***	-0.0806***	-0.0805***	-0.0812***	-0.0813***	-0.0813***	-0.0802***	-0.0805***	-0.0809***	-0.0809***
	(0.026)	(0.026)	(0.026)	(0.025)	(0.025)	(0.025)	(0.026)	(0.026)	(0.026)	(0.026)
Observations	7,340	7,340	7,340	7,340	7,340	7,340	7,340	7,340	7,340	7,340
R^2	0.078	0.078	0.078	0.078	0.079	0.079	0.078	0.078	0.079	0.079
Nr. of affiliates	2,468	2,468	2,468	2,468	2,468	2,468	2,468	2,468	2,468	2,468
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Creditor Rights Included as a Control Variable

Main sample – Parent debt ratio

Table D7: Main sample, with creditor rights as an additional control variable

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0201		0.0300	0.0011	0.1778*	0.1778*	0.0757	0.0240	0.1755*	0.1755*
	(0.046)		(0.048)	(0.048)	(0.104)	(0.104)	(0.059)	(0.047)	(0.104)	(0.104)
TCR		0.0175**	0.0179**		0.0846**	0.0175*				
		(0.009)	(0.009)		(0.040)	(0.009)				
TIGHT							0.0909**		0.2738*	0.0824*
							(0.045)		(0.146)	(0.044)
STR x TCR				0.0356	-0.2072*	-0.2072*				
				(0.025)	(0.113)	(0.113)				
STR x TIGHT								0.1904	-0.5908	-0.5908
								(0.126)	(0.416)	(0.416)
Loss Carryforward	0.0189***	0.0191***	0.0190***	0.0190***	0.0192***	0.0192***	0.0191***	0.0190***	0.0191***	0.0191***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	-0.0299***	-0.0293***	-0.0292***	-0.0288***	-0.0328***	-0.0328***	-0.0299***	-0.0289***	-0.0330***	-0.0330***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Ln(Revenue)	0.0039**	0.0040**	0.0040**	0.0039**	0.0039**	0.0039**	0.0040**	0.0040**	0.0039**	0.0039**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0175	-0.0175	-0.0176	-0.0175	-0.0176	-0.0176	-0.0178	-0.0177	-0.0179	-0.0179
	(0.011)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Creditor rights	-0.0501*	-0.0498*	-0.0503*	-0.0505*	-0.0489	-0.0489	-0.0513*	-0.0512*	-0.0504*	-0.0504*
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Observations	9,646	9,646	9,646	9,646	9,646	9,646	9,646	9,646	9,646	9,646
R^2	0.067	0.067	0.067	0.067	0.068	0.068	0.067	0.067	0.068	0.068
Nr. of affiliates	2,658	2,658	2,658	2,658	2,658	2,658	2,658	2,658	2,658	2,658
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Table D8: Main sample, excluding observations where creditor rights are missing

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0129		0.0227	-0.0057	0.1766*	0.1766*	0.0664	0.0164	0.1711	0.1711
	(0.046)		(0.048)	(0.048)	(0.104)	(0.104)	(0.059)	(0.047)	(0.104)	(0.104)
TCR		0.0175**	0.0178**		0.0872**	0.0173*				
		(0.009)	(0.009)		(0.040)	(0.009)				
TIGHT							0.0878*		0.2795*	0.0789*
							(0.045)		(0.146)	(0.045)
STR x TCR				0.0346	-0.2155*	-0.2155*				
				(0.025)	(0.114)	(0.114)				
STR x TIGHT								0.1781	-0.6191	-0.6191
								(0.128)	(0.419)	(0.419)
Loss Carryforward	0.0192***	0.0193***	0.0193***	0.0192***	0.0194***	0.0194***	0.0193***	0.0193***	0.0193***	0.0193***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	-0.0283***	-0.0277***	-0.0276***	-0.0272***	-0.0314***	-0.0314***	-0.0283***	-0.0274***	-0.0315***	-0.0315***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Ln(Revenue)	0.0038**	0.0039**	0.0039**	0.0039**	0.0039**	0.0039**	0.0039**	0.0039**	0.0039**	0.0039**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0173	-0.0174	-0.0175	-0.0174	-0.0175	-0.0175	-0.0177	-0.0175	-0.0177	-0.0177
	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Observations	9,646	9,646	9,646	9,646	9,646	9,646	9,646	9,646	9,646	9,646
R^2	0.066	0.067	0.067	0.066	0.067	0.067	0.067	0.066	0.067	0.067
Nr. of affiliates	2,658	2,658	2,658	2,658	2,658	2,658	2,658	2,658	2,658	2,658
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Extended sample – Total debt ratio

Table D9: Extended sample, with creditor rights as an additional control variable

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0775		-0.0561	-0.1353	0.1146	0.1146	0.0428	-0.0694	0.1267	0.1267
	(0.078)		(0.080)	(0.090)	(0.146)	(0.146)	(0.099)	(0.079)	(0.146)	(0.146)
TCR		0.0430***	0.0420***		0.1048**	0.0316**				
		(0.015)	(0.015)		(0.043)	(0.016)				
TIGHT							0.1930***		0.3420*	0.1582**
							(0.070)		(0.185)	(0.076)
STR x TCR				0.0942*	-0.2258*	-0.2258*				
				(0.049)	(0.135)	(0.135)				
STR x TIGHT								0.5112**	-0.5673	-0.5673
								(0.229)	(0.615)	(0.615)
Loss Carryforward	0.0559***	0.0557***	0.0558***	0.0557***	0.0560***	0.0560***	0.0559***	0.0558***	0.0560***	0.0560***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	0.0156	0.0172	0.0174	0.0160	0.0190	0.0190	0.0166	0.0157	0.0172	0.0172
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln(Revenue)	0.0237***	0.0237***	0.0237***	0.0237***	0.0236***	0.0236***	0.0238***	0.0238***	0.0237***	0.0237***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Asset tangibility	-0.0495***	-0.0487***	-0.0487***	-0.0489***	-0.0488***	-0.0488***	-0.0491***	-0.0491***	-0.0492***	-0.0492***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Ln(Inflation)	0.0033	0.0033	0.0032	0.0033	0.0031	0.0031	0.0032	0.0033	0.0031	0.0031
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0062	-0.0057	-0.0059	-0.0066	-0.0044	-0.0044	-0.0044	-0.0054	-0.0038	-0.0038
	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Creditor rights	0.0254*	0.0219	0.0224	0.0234*	0.0228	0.0228	0.0213	0.0222	0.0218	0.0218
	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Observations	9,364	9,364	9,364	9,364	9,364	9,364	9,364	9,364	9,364	9,364
R^2	0.077	0.078	0.078	0.077	0.078	0.078	0.078	0.077	0.078	0.078
Nr. of affiliates	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Table D10: Extended sample, excluding observations where creditor rights are missing

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0723		-0.0508	-0.1333	0.1180	0.1180	0.0515	-0.0644	0.1326	0.1326
	(0.079)		(0.080)	(0.090)	(0.147)	(0.147)	(0.099)	(0.079)	(0.146)	(0.146)
TCR		0.0441***	0.0433***		0.1054**	0.0330**				
		(0.015)	(0.016)		(0.044)	(0.016)				
TIGHT							0.2001***		0.3440*	0.1666**
							(0.070)		(0.186)	(0.076)
STR x TCR				0.0986**	-0.2233*	-0.2233*				
				(0.049)	(0.135)	(0.135)				
STR x TIGHT								0.5378**	-0.5472	-0.5472
								(0.230)	(0.614)	(0.614)
Loss Carryforward	0.0556***	0.0555***	0.0556***	0.0555***	0.0558***	0.0558***	0.0557***	0.0556***	0.0558***	0.0558***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	0.0147	0.0165	0.0166	0.0152	0.0183	0.0183	0.0159	0.0149	0.0165	0.0165
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln(Revenue)	0.0238***	0.0238***	0.0238***	0.0238***	0.0237***	0.0237***	0.0239***	0.0239***	0.0238***	0.0238***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Asset tangibility	-0.0496***	-0.0488***	-0.0487***	-0.0490***	-0.0488***	-0.0488***	-0.0491***	-0.0492***	-0.0492***	-0.0492***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Ln(Inflation)	0.0034	0.0033	0.0033	0.0033	0.0032	0.0032	0.0032	0.0033	0.0032	0.0032
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0059	-0.0054	-0.0056	-0.0064	-0.0041	-0.0041	-0.0041	-0.0051	-0.0035	-0.0035
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Observations	9,364	9,364	9,364	9,364	9,364	9,364	9,364	9,364	9,364	9,364
R^2	0.077	0.077	0.078	0.077	0.078	0.078	0.078	0.077	0.078	0.078
Nr. of affiliates	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Excluding Affiliates Changing Majority Owner

Main sample – Parent debt ratio

Table D11: Main sample, excluding affiliates changing majority owner

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0038		-0.0070	0.0140	0.1435	0.1435	-0.0050	-0.0059	0.1248	0.1248
	(0.055)		(0.055)	(0.059)	(0.112)	(0.112)	(0.067)	(0.055)	(0.112)	(0.112)
TCR		-0.0058	-0.0059		0.0653	-0.0064				
		(0.011)	(0.011)		(0.040)	(0.011)				
TIGHT							-0.0020		0.2481	-0.0167
							(0.051)		(0.154)	(0.053)
STR x TCR				-0.0351	-0.2211*	-0.2211*				
				(0.034)	(0.119)	(0.119)				
STR x TIGHT								-0.1096	-0.8175*	-0.8175*
								(0.161)	(0.478)	(0.478)
Loss Carryforward	0.0136**	0.0135**	0.0136**	0.0135**	0.0137**	0.0137**	0.0136**	0.0135**	0.0136**	0.0136**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	-0.0184	-0.0184	-0.0185	-0.0192	-0.0224*	-0.0224*	-0.0184	-0.0186	-0.0224*	-0.0224*
	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.012)	(0.013)	(0.013)
Ln(Revenue)	0.0057**	0.0057**	0.0057**	0.0056**	0.0056**	0.0056**	0.0057**	0.0057**	0.0056**	0.0056**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0058	-0.0058	-0.0058	-0.0057	-0.0059	-0.0059	-0.0058	-0.0057	-0.0059	-0.0059
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Observations	7,388	7,388	7,388	7,388	7,388	7,388	7,388	7,388	7,388	7,388
R^2	0.009	0.009	0.009	0.009	0.010	0.010	0.009	0.009	0.010	0.010
Nr. of affiliates	2,256	2,256	2,256	2,256	2,256	2,256	2,256	2,256	2,256	2,256
Parent Fixed Effects	no	no	no	no	no	no	no	no	no	no
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample average.

Extended sample – Total debt ratio

Table D12: Extended sample, excluding affiliates changing majority owner

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.0948		-0.0871	-0.0797	0.2142	0.2142	0.0075	-0.0894	0.2214	0.2214
	(0.100)		(0.099)	(0.116)	(0.166)	(0.166)	(0.109)	(0.098)	(0.161)	(0.161)
TCR		0.0139	0.0119		0.1301***	-0.0046				
		(0.022)	(0.022)		(0.046)	(0.025)				
TIGHT							0.1653**		0.5668***	0.0746
							(0.084)		(0.202)	(0.101)
STR x TCR				-0.0280	-0.4159***	-0.4159***				
				(0.077)	(0.160)	(0.160)				
STR x TIGHT								0.2407	-1.5192**	-1.5192**
								(0.304)	(0.724)	(0.724)
Loss Carryforward	0.0529***	0.0527***	0.0529***	0.0529***	0.0533***	0.0533***	0.0530***	0.0529***	0.0532***	0.0532***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	0.0325**	0.0327**	0.0330**	0.0324**	0.0361***	0.0361***	0.0331**	0.0325**	0.0350***	0.0350***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Ln(Revenue)	0.0233***	0.0234***	0.0233***	0.0233***	0.0232***	0.0232***	0.0234***	0.0234***	0.0233***	0.0233***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0206	-0.0204	-0.0202	-0.0208	-0.0208	-0.0208	-0.0201	-0.0203	-0.0207	-0.0207
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)
Ln(Inflation)	0.0024	0.0025	0.0023	0.0024	0.0021	0.0021	0.0023	0.0024	0.0020	0.0020
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Corruption	-0.0083	-0.0081	-0.0083	-0.0082	-0.0053	-0.0053	-0.0070	-0.0081	-0.0051	-0.0051
	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
Observations	7,224	7,224	7,224	7,224	7,224	7,224	7,224	7,224	7,224	7,224
R^2	0.046	0.046	0.046	0.046	0.047	0.047	0.047	0.046	0.048	0.048
Nr. of affiliates	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234	2,234
Parent Fixed Effects	no	no	no	no	no	no	no	no	no	no
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Affiliates of the two Largest Parents

Main sample – Parent debt ratio

Table D13: Affiliates of the two largest parents included in the main sample

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-0.1738**		-0.1597**	-0.2637***	-0.1912*	-0.1912*	-0.0694	-0.1699**	-0.1969	-0.1969
	(0.079)		(0.079)	(0.093)	(0.109)	(0.109)	(0.082)	(0.079)	(0.129)	(0.129)
TCR		0.0476***	0.0460***		0.0325	0.0455***				
		(0.013)	(0.012)		(0.037)	(0.012)				
TIGHT							0.1636***		-0.0436	0.1595***
							(0.058)		(0.180)	(0.056)
STR x TCR				0.1318***	0.0401	0.0401				
				(0.036)	(0.111)	(0.111)				
STR x TIGHT								0.5063***	0.6268	0.6268
								(0.182)	(0.582)	(0.582)
Loss Carryforward	-0.0128**	-0.0129**	-0.0130**	-0.0131**	-0.0130**	-0.0130**	-0.0125**	-0.0126**	-0.0126**	-0.0126**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	-0.0264	-0.0225	-0.0261	-0.0227	-0.0250	-0.0250	-0.0280	-0.0245	-0.0236	-0.0236
	(0.024)	(0.025)	(0.024)	(0.024)	(0.025)	(0.025)	(0.024)	(0.024)	(0.026)	(0.026)
Ln(Revenue)	-0.0007	0.0004	0.0002	0.0001	0.0002	0.0002	-0.0002	-0.0001	-0.0002	-0.0002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	0.0157	0.0146	0.0142	0.0144	0.0143	0.0143	0.0139	0.0142	0.0143	0.0143
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	992	992	992	992	992	992	992	992	992	992
R^2	0.058	0.063	0.067	0.067	0.067	0.067	0.063	0.064	0.064	0.064
Nr. of affiliates	253	253	253	253	253	253	253	253	253	253
Parent Fixed Effects	no	no	no	no	no	no	no	no	no	no
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Extended sample – Total debt ratio

Table D14: Affiliates of the two largest parents included in the extended sample

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	-1.1092***		-1.1111***	-1.3661**	-1.5043	-1.5043	-1.2514***	-1.1501***	-1.1887**	-1.1887**
	(0.424)		(0.425)	(0.605)	(0.970)	(0.970)	(0.421)	(0.412)	(0.518)	(0.518)
TCR		-0.0088	0.0174		-0.0492	0.0963				
		(0.026)	(0.028)		(0.167)	(0.187)				
TIGHT							-0.1692		-0.0602	-0.2123
							(0.296)		(0.582)	(0.350)
STR x TCR				0.2882	0.4490	0.4490				
				(0.555)	(1.082)	(1.082)				
STR x TIGHT								-0.6625	-0.4692	-0.4692
								(1.083)	(2.120)	(2.120)
Loss Carryforward	0.0165	0.0127	0.0165	0.0167	0.0168	0.0168	0.0165	0.0162	0.0163	0.0163
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Ln(Lending rate)	-0.0464	-0.0265	-0.0460	-0.0461	-0.0471	-0.0471	-0.0491	-0.0491	-0.0493	-0.0493
	(0.055)	(0.059)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
Ln(Revenue)	0.0212***	0.0209***	0.0213***	0.0213***	0.0213***	0.0213***	0.0213***	0.0213***	0.0213***	0.0213***
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Asset tangibility	0.0431	0.0378	0.0431	0.0442	0.0447	0.0447	0.0435	0.0426	0.0428	0.0428
	(0.086)	(0.085)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)	(0.086)
Ln(Inflation)	0.0155	0.0204	0.0156	0.0161	0.0164	0.0164	0.0157	0.0152	0.0154	0.0154
	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Corruption	0.0240	0.0169	0.0237	0.0200	0.0185	0.0185	0.0231	0.0242	0.0238	0.0238
	(0.028)	(0.033)	(0.028)	(0.027)	(0.028)	(0.028)	(0.028)	(0.028)	(0.027)	(0.027)
Observations	723	723	723	723	723	723	723	723	723	723
R^2	0.082	0.067	0.082	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Nr. of affiliates	230	230	230	230	230	230	230	230	230	230
Parent Fixed Effects	no	no	no	no	no	no	no	no	no	no
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Regressions Excluding Affiliates of the Two Largest Parents

Extended sample – Total debt ratio

Table D15: Extended sample excluding affiliates of the two largest parents

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0627		0.0782	0.0503	0.3193**	0.3193**	0.1400	0.0662	0.2914**	0.2914**
	(0.084)		(0.082)	(0.102)	(0.155)	(0.155)	(0.099)	(0.084)	(0.148)	(0.148)
TCR		0.0222	0.0238		0.1192***	0.0100				
		(0.021)	(0.021)		(0.044)	(0.024)				
TIGHT							0.1305		0.4144**	0.0667
							(0.080)		(0.191)	(0.097)
STR x TCR				0.0233	-0.3371**	-0.3371**				
				(0.073)	(0.153)	(0.153)				
STR x TIGHT								0.2241	-1.0731	-1.0731
								(0.294)	(0.694)	(0.694)
Loss Carryforward	0.0566***	0.0568***	0.0566***	0.0566***	0.0570***	0.0570***	0.0567***	0.0566***	0.0569***	0.0569***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	0.0188	0.0201*	0.0198*	0.0189	0.0225*	0.0225*	0.0195*	0.0189	0.0208*	0.0208*
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
Ln(Revenue)	0.0278***	0.0278***	0.0278***	0.0278***	0.0277***	0.0277***	0.0279***	0.0279***	0.0278***	0.0278***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Asset tangibility	-0.0460**	-0.0452**	-0.0453**	-0.0458**	-0.0454**	-0.0454**	-0.0456**	-0.0458**	-0.0457**	-0.0457**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Ln(Inflation)	0.0017	0.0015	0.0016	0.0017	0.0015	0.0015	0.0016	0.0017	0.0015	0.0015
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0148**	-0.0149**	-0.0145**	-0.0149**	-0.0122*	-0.0122*	-0.0136*	-0.0145*	-0.0124*	-0.0124*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Observations	8,887	8,887	8,887	8,887	8,887	8,887	8,887	8,887	8,887	8,887
R^2	0.082	0.083	0.083	0.083	0.084	0.084	0.083	0.083	0.083	0.083
Nr. of affiliates	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Appendix E

*Table E1: Mean values of the variables parent debt ratio and total debt ratio before and after the introduction of a thin-capitalization rule. The table includes all observations in countries with a meaningful number of observations. *,**,*** indicates if the mean value ex-post is statistically different from the value ex-ante at the 10%, 5%, and 1% levels.*

	Parent debt ratio				Total debt ratio			
	Observations		Mean		Observations		Mean	
Country	Before	After	Before	After	Before	After	Before	After
Argentina	17	31	0.117	0.162	0	36	-	0.494
Chile	41	48	0.077	0.123	14	47	0.441	0.420
Denmark	581	710	0.096	0.072**	0	741	-	0.602
Italy	256	58	0.136	0.170	142	71	0.766	0.752
Latvia	63	51	0.227	0.216	47	59	0.589	0.578
Lithuania	82	31	0.187	0.152	59	40	0.596	0.600
Luxembourg	47	19	0.126	0.039	15	21	0.428	0.281
Poland	59	207	0.202	0.158	0	216	-	0.480
Portugal	33	173	0.329	0.158***	0	124	-	0.596
Russia	37	32	0.136	0.096	15	37	0.378	0.484

*Table E2: Mean values of the variables parent debt ratio and total debt ratio before and after the introduction of a thin-capitalization rule. The table only includes observations from affiliates that are observed both before and after the change. *,**,*** indicates if the mean value ex-post is statistically different from the value ex-ante at the 10%, 5%, and 1% levels.*

	Parent debt ratio			Total debt ratio		
	Number of	Mean		Number of	Mean	
Country	affiliates	Before	After	affiliates	Before	After
Argentina	3	0.135	0.067	0	-	-
Chile	6	0.049	0.135	6	0.416	0.401
Denmark	104	0.092	0.075	0	-	-
Italy	22	0.151	0.163	23	0.767	0.793
Latvia	10	0.252	0.248	11	0.567	0.599
Lithuania	11	0.181	0.150	10	0.604	0.643
Luxembourg	9	0.223	0.020	8	0.527	0.150*
Poland	16	0.253	0.158	0	-	-
Portugal	18	0.291	0.198	0	-	-
Russia	8	0.160	0.050	7	0.334	0.333

*Table E3: Mean values of the variables parent debt ratio and total debt ratio before and after a change in the tightness of a thin-capitalization rule. The table includes all observations in the given countries. *,**,*** indicates if the mean value ex-post is statistically different from the value ex-ante at the 10%, 5%, and 1% levels.*

	Parent debt ratio				Total debt ratio			
	Observations		Mean		Observations		Mean	
Country	Before	After	Before	After	Before	After	Before	After
Tightened								
Australia	65	43	0.171	0.217	0	29	-	0.726
Canada	195	158	0.162	0.131	55	169	0.557	0.551
Germany	664	412	0.120	0.104	164	456	0.608	0.617
Hungary	29	36	0.089	0.091	10	38	0.677	0.451**
Loosened								
Australia	43	100	0.217	0.099***	29	110	0.726	0.566***
Spain	46	252	0.227	0.156*	0	0	-	-

*Table E4: Mean values of the variables parent debt ratio and total debt ratio before and after a change in the tightness of a thin-capitalization rule. The table only includes observations from affiliates that are observed both before and after the change. *,**,*** indicates if the mean value ex-post is statistically different from the value ex-ante at the 10%, 5%, and 1% levels.*

	Parent debt ratio			Total debt ratio		
	# of	Mean		# of	Mean	
Country	affiliates	Before	After	affiliates	Before	After
Tightened						
Australia	10	0.173	0.181	0	-	-
Canada	26	0.169	0.156	25	0.541	0.527
Germany	69	0.102	0.082	66	0.628	0.615
Hungary	5	0.199	0.205	5	0.701	0.536
Loosened						
Australia	16	0.157	0.129	17	0.691	0.636
Spain	24	0.263	0.215	0	-	-

Subsample: Never Rule

Table E5: Subsample of the main and extended sample, including only countries that did not have a rule in the period 1996-2004 in the main subsample and 1994-2006 in the extended subsample

	Parent debt ratio		Total debt ratio	
	(1)	(2)	(3)	(4)
	Main sample	Extended sample	Main sample	Extended sample
STR	0.2598	-0.1366	0.6805**	-0.0683
	(0.177)	(0.131)	(0.262)	(0.229)
Loss Carryforward	0.0120	0.0284***	0.0451***	0.0514***
	(0.007)	(0.006)	(0.012)	(0.008)
Ln(Lending rate)	-0.0655**	0.0001	-0.0173	0.0025
	(0.029)	(0.015)	(0.035)	(0.025)
Ln(Revenue)	-0.0002	0.0031	0.0342***	0.0251***
	(0.003)	(0.003)	(0.006)	(0.004)
Asset tangibility	-0.0364*	-0.0331**	-0.0063	-0.0104
	(0.019)	(0.015)	(0.035)	(0.025)
Ln(Inflation)		0.0011		-0.0012
		(0.001)		(0.003)
Corruption		-0.0113*		-0.0288**
		(0.006)		(0.012)
Observations	3,218	5,749	2,085	3,612
R^2	0.107	0.087	0.100	0.088
Nr. of affiliates	949	1,339	727	1,052
Parent Fixed Effects	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Table E6: Subsample of the main and extended sample, including only countries that did not have a rule in the period 1996-2004 in the main subsample and 1994-2006 in the extended subsample (Excluding affiliates of the two largest parents)

	Parent debt ratio		Total debt ratio	
	(1)	(2)	(3)	(4)
	Main sample	Extended sample	Main sample	Extended sample
STR	0.2862	-0.1194	0.7222***	-0.0059
	(0.177)	(0.136)	(0.259)	(0.228)
Loss Carryforward	0.0152*	0.0323***	0.0465***	0.0535***
	(0.009)	(0.007)	(0.013)	(0.009)
Ln(Lending rate)	-0.0612*	0.0085	-0.0237	0.0032
	(0.032)	(0.015)	(0.037)	(0.025)
Ln(Revenue)	0.0012	0.0039	0.0367***	0.0284***
	(0.004)	(0.003)	(0.007)	(0.005)
Asset tangibility	-0.0439**	-0.0374**	-0.0225	-0.0182
	(0.021)	(0.017)	(0.033)	(0.023)
Ln(Inflation)		0.0021		-0.0010
		(0.001)		(0.003)
Corruption		-0.0151**		-0.0319***
		(0.007)		(0.012)
Observations	2,960	5,313	1,958	3,413
R^2	0.111	0.091	0.109	0.094
Nr. of affiliates	888	1,250	688	996
Parent Fixed Effects	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Subsample: Always Rule

Parent debt ratio

Table E7: Subsample of the main and extended sample, including only countries that had a rule during 1996-2004 in the main subsample and 1994-2006 in the extended subsample

	Dependent variable: Parent debt ratio									
	Main subsample					**Extended subsample**				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
STR	-0.1582**	-0.2712*	-0.1599**	-0.7263*	-0.7263*	-0.1576***	-0.1901*	-0.1571***	-0.4892*	-0.4892*
	(0.062)	(0.145)	(0.062)	(0.407)	(0.407)	(0.055)	(0.105)	(0.054)	(0.284)	(0.284)
TIGHT		-0.1444		-0.7404	-0.2326		-0.0463		-0.4392	-0.0924
		(0.141)		(0.507)	(0.174)		(0.109)		(0.355)	(0.123)
STR x TIGHT			-0.2365	1.5674	1.5674			-0.0255	1.0704	1.0704
			(0.333)	(1.163)	(1.163)			(0.270)	(0.862)	(0.862)
Loss Carryforward	0.0178***	0.0176***	0.0177***	0.0177***	0.0177***	0.0200***	0.0200***	0.0200***	0.0202***	0.0202***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(Lending rate)	-0.0338**	-0.0355***	-0.0350**	-0.0345***	-0.0345***	-0.0523***	-0.0524***	-0.0524***	-0.0490***	-0.0490***
	(0.013)	(0.014)	(0.013)	(0.013)	(0.013)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Ln(Revenue)	0.0085***	0.0084***	0.0085***	0.0085***	0.0085***	0.0102***	0.0101***	0.0101***	0.0102***	0.0102***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	0.0276	0.0280	0.0278	0.0284	0.0284	0.0036	0.0036	0.0036	0.0039	0.0039
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Ln(Inflation)						0.0103**	0.0103**	0.0103**	0.0099**	0.0099**
						(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Corruption						-0.0128**	-0.0134**	-0.0130**	-0.0125*	-0.0125*
						(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	5,022	5,022	5,022	5,022	5,022	6,769	6,769	6,769	6,769	6,769
R^2	0.057	0.057	0.057	0.057	0.057	0.072	0.072	0.072	0.072	0.072
Nr. of affiliates	1,329	1,329	1,329	1,329	1,329	1,472	1,472	1,472	1,472	1,472
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Total debt ratio

Table E8: Subsample of the main and extended sample, including only countries that had a rule during 1996-2004 in the main subsample and 1994-2006 in the extended subsample

	Dependent variable: Total debt ratio									
	Main subsample					**Extended subsample**				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
STR	-0.1907**	-0.2823*	-0.1971**	-0.9643*	-0.9643*	-0.1052	-0.0789	-0.1052	-0.9192	-0.9192
	(0.075)	(0.153)	(0.079)	(0.519)	(0.519)	(0.072)	(0.148)	(0.071)	(0.576)	(0.576)
TIGHT		-0.1049		-0.9857	-0.1920		0.0344		-1.0666	-0.0342
		(0.130)		(0.647)	(0.133)		(0.134)		(0.746)	(0.137)
STR x TIGHT			-0.1789	2.4494	2.4494			0.2351	3.1864	3.1864
			(0.377)	(1.825)	(1.825)			(0.395)	(2.155)	(2.155)
Loss Carryforward	0.0541***	0.0540***	0.0540***	0.0541***	0.0541***	0.0584***	0.0584***	0.0584***	0.0585***	0.0585***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Ln(Lending rate)	0.0006	0.0001	0.0002	0.0023	0.0023	0.0128	0.0126	0.0125	0.0155	0.0155
	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Ln(Revenue)	0.0217***	0.0216***	0.0217***	0.0216***	0.0216***	0.0270***	0.0270***	0.0270***	0.0269***	0.0269***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0872**	-0.0870**	-0.0871**	-0.0866**	-0.0866**	-0.0607**	-0.0608**	-0.0608**	-0.0605**	-0.0605**
	(0.035)	(0.035)	(0.035)	(0.035)	(0.035)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
Ln(Inflation)						0.0114**	0.0114**	0.0113**	0.0120***	0.0120***
						(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Corruption						-0.0079	-0.0080	-0.0078	-0.0060	-0.0060
						(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Observations	3,974	3,974	3,974	3,974	3,974	5,296	5,296	5,296	5,296	5,296
R^2	0.093	0.093	0.093	0.093	0.093	0.092	0.092	0.092	0.093	0.093
Nr. of affiliates	1,299	1,299	1,299	1,299	1,299	1,476	1,476	1,476	1,476	1,476
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Subsample: Implemented Rule

Extended sample – Parent debt ratio

Table E9: Subsample of the extended sample, including observations for 1994-2006, but only from countries that implemented a rule during 1995-2006

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.2950***		0.2966***	0.3106***	0.3113**	0.3113**	0.3020***	0.3202***	0.3065**	0.3065**
	(0.111)		(0.107)	(0.110)	(0.120)	(0.120)	(0.107)	(0.110)	(0.119)	(0.119)
TCR		-0.0168	-0.0171		0.0010	-0.0185				
		(0.013)	(0.012)		(0.041)	(0.014)				
TIGHT							-0.1066*		-0.0826	-0.1079*
							(0.055)		(0.181)	(0.058)
STR x TCR				-0.0572	-0.0605	-0.0605				
				(0.042)	(0.141)	(0.141)				
STR x TIGHT								-0.3274*	-0.0783	-0.0783
								(0.180)	(0.602)	(0.602)
Loss Carryforward	0.0256***	0.0250***	0.0254***	0.0255***	0.0255***	0.0255***	0.0252***	0.0253***	0.0252***	0.0252***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Lending rate)	-0.0006	0.0132	0.0021	0.0035	0.0035	0.0035	0.0007	0.0025	0.0012	0.0012
	(0.021)	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Ln(Revenue)	0.0044	0.0041	0.0043	0.0043	0.0043	0.0043	0.0044	0.0043	0.0044	0.0044
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Asset tangibility	-0.0185	-0.0164	-0.0170	-0.0165	-0.0164	-0.0164	-0.0168	-0.0161	-0.0166	-0.0166
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Ln(Inflation)	0.0049	0.0046	0.0051	0.0051	0.0051	0.0051	0.0053	0.0051	0.0052	0.0052
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Corruption	0.0058	0.0022	0.0052	0.0055	0.0055	0.0055	0.0053	0.0057	0.0054	0.0054
	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)
Observations	2,891	2,891	2,891	2,891	2,891	2,891	2,891	2,891	2,891	2,891
R^2	0.118	0.116	0.119	0.119	0.119	0.119	0.120	0.120	0.120	0.120
Nr. of affiliates	663	663	663	663	663	663	663	663	663	663
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Main sample – Total debt ratio

Table E10: Subsample of the main sample, including observations for 1999-2004, but only from countries that implemented a rule during 2000-2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt
STR	0.6800		0.5630	0.8080	0.8738	0.8738	0.5947	0.8369	0.9660	0.9660
	(0.876)		(0.694)	(0.612)	(0.600)	(0.600)	(0.756)	(0.661)	(0.641)	(0.641)
TCR		-0.1637**	-0.1611**		0.0507	-0.2048***				
		(0.070)	(0.066)		(0.116)	(0.061)				
TIGHT							-0.6931*		0.5079	-1.1530***
							(0.378)		(0.585)	(0.385)
STR x TCR				-0.6426***	-0.7885*	-0.7885*				
				(0.183)	(0.384)	(0.384)				
STR x TIGHT								-3.6003***	-5.1261**	-5.1261**
								(1.197)	(2.143)	(2.143)
Loss Carryforward	0.0451	0.0341	0.0341	0.0439*	0.0471*	0.0471*	0.0347	0.0420*	0.0484*	0.0484*
	(0.028)	(0.024)	(0.024)	(0.024)	(0.027)	(0.027)	(0.025)	(0.024)	(0.027)	(0.027)
Ln(Lending rate)	0.0022	-0.0473	-0.0829	-0.0783	-0.0699	-0.0699	-0.0724	-0.0895	-0.0737	-0.0737
	(0.116)	(0.102)	(0.125)	(0.113)	(0.113)	(0.113)	(0.133)	(0.120)	(0.118)	(0.118)
Ln(Revenue)	0.0015	0.0008	0.0005	-0.0044	-0.0054	-0.0054	0.0020	-0.0029	-0.0052	-0.0052
	(0.020)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)	(0.019)
Asset tangibility	0.1618	0.1298	0.1252	0.1167	0.1179	0.1179	0.1359	0.1204	0.1218	0.1218
	(0.108)	(0.104)	(0.102)	(0.100)	(0.100)	(0.100)	(0.103)	(0.101)	(0.101)	(0.101)
Observations	347	347	347	347	347	347	347	347	347	347
R^2	0.120	0.160	0.163	0.185	0.186	0.186	0.145	0.172	0.176	0.176
Nr. of affiliates	108	108	108	108	108	108	108	108	108	108
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Extended sample – Total debt ratio

Table E11: Subsample of the extended sample, including observations for 1999-2006, but only from countries that implemented a rule during 2000-2006

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.4385		0.2995	0.3587	0.3662	0.3662	0.3820	0.3946	0.4169	0.4169
	(0.299)		(0.287)	(0.292)	(0.291)	(0.291)	(0.297)	(0.300)	(0.298)	(0.298)
TCR		-0.0715**	-0.0646**		0.0063	-0.0824**				
		(0.033)	(0.032)		(0.050)	(0.039)				
TIGHT							-0.1809		0.1510	-0.3050
							(0.135)		(0.272)	(0.205)
STR x TCR				-0.2545**	-0.2739	-0.2739				
				(0.120)	(0.210)	(0.210)				
STR x TIGHT								-0.8985	-1.4071	-1.4071
								(0.608)	(1.243)	(1.243)
Loss Carryforward	0.0453**	0.0436**	0.0435**	0.0450**	0.0452**	0.0452**	0.0441**	0.0448**	0.0456**	0.0456**
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)
Ln(Lending rate)	-0.0463	-0.0512	-0.0549	-0.0369	-0.0353	-0.0353	-0.0532	-0.0408	-0.0320	-0.0320
	(0.050)	(0.049)	(0.049)	(0.050)	(0.053)	(0.053)	(0.050)	(0.050)	(0.055)	(0.055)
Ln(Revenue)	0.0040	0.0032	0.0031	0.0021	0.0020	0.0020	0.0033	0.0024	0.0020	0.0020
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Asset tangibility	-0.0265	-0.0363	-0.0383	-0.0365	-0.0361	-0.0361	-0.0324	-0.0323	-0.0306	-0.0306
	(0.096)	(0.094)	(0.093)	(0.093)	(0.093)	(0.093)	(0.094)	(0.094)	(0.094)	(0.094)
Ln(Inflation)	0.0016	-0.0022	-0.0020	-0.0024	-0.0023	-0.0023	-0.0006	-0.0014	-0.0012	-0.0012
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Corruption	0.0879**	0.0627*	0.0752*	0.0633	0.0627	0.0627	0.0821**	0.0719*	0.0677	0.0677
	(0.040)	(0.036)	(0.041)	(0.041)	(0.042)	(0.042)	(0.041)	(0.043)	(0.044)	(0.044)
Observations	678	678	678	678	678	678	678	678	678	678
R^2	0.091	0.098	0.100	0.102	0.102	0.102	0.094	0.096	0.096	0.096
Nr. of affiliates	186	186	186	186	186	186	186	186	186	186
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Table E12: Extension of regression (8) in Table 11, Table 12, Table E10 and Table E11. TIGHT is split based on the definition of the safe haven ratio; ratios defined in terms of total debt-to-equity and related party debt-to-equity

Implemented rule	**Parent debt**		**Total debt**	
	Main sample	Extended sample	Main sample	Extended sample
STR	0.4142***	0.3221***	0.9048	0.4715*
	(0.125)	(0.119)	(0.605)	(0.283)
STR x TIGHT	-0.8316***	-0.4656**	-1.2271	-1.9723***
(total debt)	(0.299)	(0.232)	(1.759)	(0.632)
STR x TIGHT	-0.5867	-0.3489	-3.8334***	-0.3598
(related party debt)	(0.621)	(0.260)	(1.199)	(0.744)
Loss Carryforward	0.0429***	0.0303***	0.0524*	0.0423**
	(0.011)	(0.008)	(0.028)	(0.020)
Ln(Lending rate)	0.0142	0.0254	-0.0393	-0.0699
	(0.029)	(0.019)	(0.115)	(0.054)
Ln(Revenue)	0.0074	0.0072*	-0.0069	0.0040
	(0.005)	(0.004)	(0.019)	(0.012)
Asset tangibility	-0.0214	-0.0091	0.1223	-0.0237
	(0.032)	(0.025)	(0.100)	(0.091)
Ln(Inflation)		0.0004		-0.0024
		(0.004)		(0.007)
Corruption		0.0031		0.0886**
		(0.009)		(0.044)
Observations	1,598	2,662	347	678
R^2	0.120	0.124	0.184	0.104
Nr. of affiliates	442	616	108	186
Parent Fixed Effects	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Appendix F

Subsamples Based on Quintiles of Debt

Extended sample - Parent debt ratio

Table F1: Extended sample for quintile 5 of parent debt ratio

	Dependent variable: Parent debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.4150***		0.3729***	0.4339***	0.5166***	0.5166***	0.3446***	0.4001***	0.3941**	0.3941**
	(0.127)		(0.127)	(0.124)	(0.166)	(0.166)	(0.133)	(0.126)	(0.177)	(0.177)
TCR		-0.0399**	-0.0295*		0.0424	-0.0319**				
		(0.016)	(0.016)		(0.061)	(0.016)				
TIGHT							-0.1132		-0.0120	-0.1143*
							(0.069)		(0.263)	(0.068)
STR x TCR				-0.1056**	-0.2294	-0.2294				
				(0.048)	(0.181)	(0.181)				
STR x TIGHT								-0.3501*	-0.3158	-0.3158
								(0.198)	(0.760)	(0.760)
Loss Carryforward	0.0544***	0.0550***	0.0538***	0.0540***	0.0542***	0.0542***	0.0538***	0.0539***	0.0539***	0.0539***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Lending rate)	-0.0367*	-0.0383*	-0.0406**	-0.0406**	-0.0395**	-0.0395**	-0.0398**	-0.0398*	-0.0398**	-0.0398**
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Ln(Revenue)	-0.0077	-0.0080*	-0.0075	-0.0075	-0.0076	-0.0076	-0.0076	-0.0076	-0.0076	-0.0076
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Asset tangibility	-0.0763**	-0.0761**	-0.0759**	-0.0762**	-0.0765**	-0.0765**	-0.0755**	-0.0758**	-0.0758**	-0.0758**
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Ln(Inflation)	0.0090***	0.0083***	0.0090***	0.0088***	0.0086***	0.0086***	0.0090***	0.0088***	0.0089***	0.0089***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0331***	-0.0302***	-0.0324***	-0.0317***	-0.0310***	-0.0310***	-0.0331***	-0.0326***	-0.0327***	-0.0327***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)
Observations	3,088	3,088	3,088	3,088	3,088	3,088	3,088	3,088	3,088	3,088
R^2	0.115	0.113	0.116	0.116	0.117	0.117	0.116	0.116	0.116	0.116
Nr. of affiliates	1,099	1,099	1,099	1,099	1,099	1,099	1,099	1,099	1,099	1,099
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Extended sample - Total debt ratio

Table F2: Extended sample for quintile 5 of total debt ratio

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.1028**		0.0976**	0.1179**	0.0811	0.0811	0.0922*	0.1007**	0.0856	0.0856
	(0.050)		(0.049)	(0.052)	(0.081)	(0.081)	(0.056)	(0.050)	(0.082)	(0.082)
TCR		-0.0108	-0.0094		-0.0163	-0.0094				
		(0.008)	(0.008)		(0.028)	(0.008)				
TIGHT							-0.0135		-0.0249	-0.0125
							(0.036)		(0.105)	(0.036)
STR x TCR				-0.0250	0.0210	0.0210				
				(0.023)	(0.084)	(0.084)				
STR x TIGHT								-0.0347	0.0383	0.0383
								(0.110)	(0.321)	(0.321)
Loss Carryforward	0.0079***	0.0081***	0.0080***	0.0080***	0.0080***	0.0080***	0.0079***	0.0079***	0.0079***	0.0079***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Ln(Lending rate)	0.0200**	0.0190**	0.0200**	0.0201**	0.0199**	0.0199**	0.0200**	0.0200**	0.0199**	0.0199**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Revenue)	-0.0034**	-0.0037**	-0.0035**	-0.0035**	-0.0035**	-0.0035**	-0.0034**	-0.0034**	-0.0034**	-0.0034**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Asset tangibility	-0.0115	-0.0120	-0.0115	-0.0116	-0.0114	-0.0114	-0.0114	-0.0115	-0.0113	-0.0113
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln(Inflation)	-0.0025*	-0.0025*	-0.0024	-0.0024*	-0.0024	-0.0024	-0.0025*	-0.0025*	-0.0025*	-0.0025*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Corruption	0.0018	0.0017	0.0013	0.0014	0.0013	0.0013	0.0016	0.0017	0.0016	0.0016
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	1,922	1,922	1,922	1,922	1,922	1,922	1,922	1,922	1,922	1,922
R^2	0.085	0.083	0.086	0.086	0.086	0.086	0.085	0.085	0.085	0.085
Nr. of affiliates	954	954	954	954	954	954	954	954	954	954
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Table F3: Extended subsample of quintile 4 and 5 of total debt ratio

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt	Total debt
STR	0.1355***		0.1348***	0.1398***	0.1772***	0.1772***	0.1747***	0.1443***	0.1696***	0.1696***
	(0.043)		(0.042)	(0.046)	(0.061)	(0.061)	(0.047)	(0.042)	(0.062)	(0.062)
TCR		-0.0036	-0.0009		0.0156	-0.0015				
		(0.009)	(0.008)		(0.022)	(0.008)				
TIGHT							0.0499		0.0412	0.0508
							(0.035)		(0.091)	(0.038)
STR x TCR				-0.0075	-0.0526	-0.0526				
				(0.026)	(0.066)	(0.066)				
STR x TIGHT								0.1507	0.0295	0.0295
								(0.121)	(0.317)	(0.317)
Loss Carryforward	0.0274***	0.0275***	0.0274***	0.0275***	0.0275***	0.0275***	0.0273***	0.0273***	0.0273***	0.0273***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Ln(Lending rate)	-0.0055	-0.0059	-0.0055	-0.0055	-0.0052	-0.0052	-0.0056	-0.0056	-0.0056	-0.0056
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln(Revenue)	-0.0011	-0.0012	-0.0011	-0.0011	-0.0011	-0.0011	-0.0010	-0.0010	-0.0010	-0.0010
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	-0.0052	-0.0055	-0.0052	-0.0053	-0.0056	-0.0056	-0.0054	-0.0051	-0.0053	-0.0053
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Ln(Inflation)	-0.0025	-0.0027	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025	-0.0025
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0069	-0.0068	-0.0069	-0.0070	-0.0069	-0.0069	-0.0061	-0.0061	-0.0061	-0.0061
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	3,844	3,844	3,844	3,844	3,844	3,844	3,844	3,844	3,844	3,844
R^2	0.084	0.081	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.084
Nr. of affiliates	1,544	1,544	1,544	1,544	1,544	1,544	1,544	1,544	1,544	1,544
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Excluding Countries with Constant Tax Rates

Extended sample – Total debt ratio

Table F4: Extended sample, excluding countries with constant tax rates

VARIABLES	(1) Total debt	(2) Total debt	(3) Total debt	(4) Total debt	(5) Total debt	(6) Total debt	(7) Total debt	(8) Total debt	(9) Total debt	(10) Total debt
STR	0.0148		0.0228	0.0180	0.2984*	0.2984*	0.1039	0.0194	0.2682*	0.2682*
	(0.088)		(0.088)	(0.107)	(0.155)	(0.155)	(0.099)	(0.087)	(0.148)	(0.148)
TCR		0.0167	0.0170		0.1244***	0.0009				
		(0.021)	(0.021)		(0.043)	(0.024)				
TIGHT							0.1486*		0.4571**	0.0773
							(0.077)		(0.189)	(0.093)
STR x TCR				-0.0055	-0.3810**	-0.3810**				
				(0.073)	(0.152)	(0.152)				
STR x TIGHT								0.2606	-1.1720*	-1.1720*
								(0.283)	(0.686)	(0.686)
Loss Carryforward	0.0582***	0.0582***	0.0582***	0.0582***	0.0586***	0.0586***	0.0583***	0.0582***	0.0584***	0.0584***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	0.0091	0.0101	0.0101	0.0090	0.0132	0.0132	0.0101	0.0093	0.0116	0.0116
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)
Ln(Revenue)	0.0251***	0.0251***	0.0251***	0.0251***	0.0249***	0.0249***	0.0252***	0.0252***	0.0250***	0.0250***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0605***	-0.0599**	-0.0599***	-0.0606***	-0.0601***	-0.0601***	-0.0599**	-0.0601***	-0.0602**	-0.0602**
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Ln(Inflation)	0.0030	0.0029	0.0030	0.0030	0.0027	0.0027	0.0029	0.0030	0.0027	0.0027
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Corruption	-0.0091	-0.0089	-0.0089	-0.0091	-0.0058	-0.0058	-0.0075	-0.0087	-0.0061	-0.0061
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Observations	7,508	7,508	7,508	7,508	7,508	7,508	7,508	7,508	7,508	7,508
R^2	0.080	0.080	0.080	0.080	0.081	0.081	0.081	0.080	0.081	0.081
Nr. of affiliates	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Excluding Sweden, the USA and the UK

Main sample – Parent debt ratio

Table F5: Main sample, excluding observations from Sweden, the USA and the UK

VARIABLES	(1) Parent debt	(2) Parent debt	(3) Parent debt	(4) Parent debt	(5) Parent debt	(6) Parent debt	(7) Parent debt	(8) Parent debt	(9) Parent debt	(10) Parent debt
STR	0.0450		0.0451	0.0419	0.2264**	0.2264**	0.0783	0.0443	0.2424**	0.2424**
	(0.056)		(0.056)	(0.061)	(0.110)	(0.110)	(0.063)	(0.056)	(0.113)	(0.113)
TCR		0.0090	0.0090		0.0928**	0.0084				
		(0.011)	(0.011)		(0.041)	(0.011)				
TIGHT							0.0658		0.3706**	0.0462
							(0.050)		(0.157)	(0.052)
STR x TCR				0.0044	-0.2605**	-0.2605**				
				(0.031)	(0.118)	(0.118)				
STR x TIGHT								0.0730	-1.0011**	-1.0011**
								(0.153)	(0.475)	(0.475)
Loss Carryforward	0.0256***	0.0256***	0.0256***	0.0256***	0.0259***	0.0259***	0.0257***	0.0256***	0.0259***	0.0259***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
Ln(Lending rate)	-0.0278**	-0.0271**	-0.0273**	-0.0276**	-0.0327**	-0.0327**	-0.0276**	-0.0273**	-0.0334**	-0.0334**
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.014)
Ln(Revenue)	0.0075***	0.0076***	0.0076***	0.0075***	0.0075***	0.0075***	0.0076***	0.0076***	0.0075***	0.0075***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Asset tangibility	0.0054	0.0053	0.0052	0.0054	0.0052	0.0052	0.0048	0.0052	0.0050	0.0050
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Observations	5,547	5,547	5,547	5,547	5,547	5,547	5,547	5,547	5,547	5,547
R^2	0.063	0.063	0.064	0.063	0.065	0.065	0.064	0.063	0.065	0.065
Nr. of affiliates	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Excluding Affiliates that are Less than 50 % Directly Owned

Extended sample – Total debt ratio

Table F6: Extended sample, including only affiliates that are majority owned

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.1116		0.1334	0.1051	0.5121***	0.5121***	0.1931	0.1130	0.4533**	0.4533**
	(0.109)		(0.107)	(0.123)	(0.183)	(0.183)	(0.126)	(0.110)	(0.177)	(0.177)
TCR		0.0265	0.0291		0.1787***	0.0034				
		(0.022)	(0.022)		(0.053)	(0.023)				
TIGHT							0.1438		0.6342***	0.0286
							(0.090)		(0.228)	(0.102)
STR x TCR				0.0131	-0.5410***	-0.5410***				
				(0.074)	(0.175)	(0.175)				
STR x TIGHT								0.1419	-1.8688**	-1.8688**
								(0.316)	(0.787)	(0.787)
Loss Carryforward	0.0582***	0.0584***	0.0581***	0.0582***	0.0590***	0.0590***	0.0583***	0.0582***	0.0587***	0.0587***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(Lending rate)	-0.0064	-0.0041	-0.0048	-0.0063	0.0001	0.0001	-0.0051	-0.0063	-0.0024	-0.0024
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Ln(Revenue)	0.0229***	0.0228***	0.0229***	0.0229***	0.0225***	0.0225***	0.0229***	0.0230***	0.0227***	0.0227***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0424*	-0.0411*	-0.0414*	-0.0423*	-0.0417*	-0.0417*	-0.0421*	-0.0423*	-0.0420*	-0.0420*
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Ln(Inflation)	0.0035	0.0033	0.0035	0.0035	0.0033	0.0033	0.0035	0.0035	0.0033	0.0033
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Corruption	-0.0224**	-0.0228**	-0.0222**	-0.0225**	-0.0191**	-0.0191**	-0.0210**	-0.0222**	-0.0196**	-0.0196**
	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)	(0.009)
Observations	6,358	6,358	6,358	6,358	6,358	6,358	6,358	6,358	6,358	6,358
R^2	0.093	0.093	0.093	0.093	0.095	0.095	0.093	0.093	0.095	0.095
Nr. of affiliates	1,778	1,778	1,778	1,778	1,778	1,778	1,778	1,778	1,778	1,778
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample.

Excluding Affiliates that are not 100% Directly Owned

Extended sample – Total debt ratio

Table F7: Extended sample, including only affiliates that are 100% directly owned

	Dependent variable: Total debt ratio									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STR	0.0452		0.0859	0.0195	0.7450***	0.7450***	0.2171	0.0530	0.6928***	0.6928***
	(0.141)		(0.140)	(0.154)	(0.219)	(0.219)	(0.162)	(0.142)	(0.219)	(0.219)
TCR		0.0527**	0.0545**		0.3044***	0.0129				
		(0.026)	(0.026)		(0.065)	(0.025)				
TIGHT							0.2737**		1.1394***	0.0859
							(0.110)		(0.287)	(0.113)
STR x TCR				0.0489	-0.8997***	-0.8997***				
				(0.082)	(0.209)	(0.209)				
STR x TIGHT								0.3743	-3.2512***	-3.2512***
								(0.360)	(0.953)	(0.953)
Loss Carryforward	0.0632***	0.0636***	0.0634***	0.0632***	0.0648***	0.0648***	0.0636***	0.0632***	0.0644***	0.0644***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Ln(Lending rate)	-0.0129	-0.0096	-0.0099	-0.0125	-0.0031	-0.0031	-0.0106	-0.0125	-0.0071	-0.0071
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Ln(Revenue)	0.0239***	0.0239***	0.0239***	0.0239***	0.0234***	0.0234***	0.0240***	0.0240***	0.0237***	0.0237***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Asset tangibility	-0.0475**	-0.0455*	-0.0457*	-0.0470*	-0.0469*	-0.0469*	-0.0470*	-0.0472*	-0.0478**	-0.0478**
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Ln(Inflation)	0.0065**	0.0062**	0.0063**	0.0065**	0.0060*	0.0060*	0.0064**	0.0065**	0.0061*	0.0061*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Corruption	-0.0244**	-0.0246**	-0.0241**	-0.0245**	-0.0200*	-0.0200*	-0.0218*	-0.0236**	-0.0202*	-0.0202*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)
Observations	5,141	5,141	5,141	5,141	5,141	5,141	5,141	5,141	5,141	5,141
R^2	0.079	0.080	0.081	0.079	0.086	0.086	0.081	0.079	0.084	0.084
Nr. of affiliates	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520
Parent Fixed Effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year & Affiliate FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Heteroskedasticity-robust standard errors clustered at the country-year level in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Column (6) and (10) rerun the regressions in column (5) and (9), respectively, where STR is measured as the difference from the sample

Appendix G

Sources For Tax Rates and Thin-Capitalization Rules

Sources for Tax Rates

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Appendix H

STATA Do-File for the Base Regressions

```
clear
cd "C:\Data"
set more off
ssc instal egenmore

use utloppgaven_1990_2005_avid.dta
rename frtk_id parent_id
rename objektnr fa_id
rename aar yr
rename sektor sector
rename land country
rename landkode country_code
rename hakt activity_fa
rename eanddir dir_own
rename eandind indir_own
rename lang_fordring lt_parentdebt
rename kort_fordring st_parentdebt
rename lang_gjeld lt_debt_fromfa
rename kort_gjeld st_debt_fromfa
rename driftsinntekter revenue
rename driftskostnader expenses
rename res_av_fin_poster netfinancial_result
rename res_etter_fin_poster profit_less_finresult
rename res_foer_skatt profit_before_tax
rename skatt tax_paid
rename overskudd profit
rename sum_anleggsmidler fixed_assets
label variable fixed_assets "Fixed assets in affiliate"
rename sum_omloepsmidler current_assets
rename debt_s tot_st_debt
rename debt_l tot_lt_debt
rename egenkapital equity_capital
save utloppgaven_1990_2005_changed, replace

clear
use utloppgaven_2006_avid.dta
rename frtk_id parent_id
rename objektnr fa_id
rename aar yr
rename bransje business
rename landnavn country
rename landkode country_code
rename land country_abbr
rename hakt activity_fa
rename eanddir dir_own
rename eandind indir_own
```

```
rename langford lt_parentdebt
rename kortford st_parentdebt
rename langgjeld lt_debt_fromfa
rename kortgjeld st_debt_fromfa
rename bdrinnt revenue
rename drkostn expenses
rename resefin netfinancial_result
rename resbetsk profit_before_tax
rename skatter tax_paid
rename oversk profit
rename sumanl fixed_assets
label variable fixed_assets "Fixed assets in affiliate"
rename sumoml current_assets
rename kort_gjeld tot_st_debt
rename lang_gjeld tot_lt_debt
rename ek equity_capital
save utloppgaven_2006_changed, replace

clear
use utloppgaven_1990_2005_changed
append using utloppgaven_2006_changed
save Merged_data set_1990_2006, replace

clear
import excel "C:\Data\Exceldata\Dashboard.xlsx", sheet("Dashboard") firstrow
merge m:m country_code yr using Merged_data set_1990_2006, keep(match using)
drop _merge
save Merged_data set_1990_2006_control_variables, replace
erase Merged_data set_1990_2006.dta

* Extract annual firm information
forvalues i=1994/2006 {
	clear
	display `i'
	use "Q:\Kunnskapsøkonomien\Sifon\sifon`i'_avid"
		if `i'<2001 {
		keep frtk_ID aar totutla2 stutla2 stutland2 sifon_kons_ID
		rename frtk_ID parent_id
		rename aar yr
		rename totutla2 total_foreign_own_percent
		rename stutla2 largest_foreign_own_percent
		rename stutland2 countrycode_largest_foreign_own
		rename sifon_kons_ID MNC_parent
		}
		if `i'>=2001 {
		keep frtk_id aargang storste_utenlandsk_eierandel storst_utenlandsk_eier_landkode
> kons_id
		destring(aargang), gen(yr)
		rename frtk_id parent_id
		rename storste_utenlandsk_eierandel largest_foreign_own_percent
```

```
            rename storst_utenlandsk_eier_landkode letters_largest_foreign_own
            rename kons_id MNC_parent
            }
      save "C:\Data\temp`i'", replace
      }

 * Append the temporary files to a panel
 use "C:\Data\temp1994"
      forvalues i=1995/2006 {
      display `i'
      append using "C:\Data\temp`i'"
      erase "C:\Data\temp`i'.dta"
      }
sort parent_id yr
save parent_ownership_data, replace
erase "C:\Data\temp1994.dta"

* Extract annual unconsolidated accounts information for parent
forvalues i=1994/2006 {
      clear
      display `i'
            if `i'<=2006 {
            use "Q:\Kunnskapsøkonomien\Regnskap 1992-2012\rskap_sel_`i'_0411_avid"
            }
            keep frtk_id aar totinn lonnsos resfs sumeiend gjeld driftsrs
            rename frtk_id parent_id
            rename aar yr
            rename totinn parent_income
            rename lonnsos parent_wage_expense
            rename resfs parent_result_before_tax
            rename sumeiend parent_assets
            rename gjeld debt_in_parent
            rename driftsrs parent_EBITDA
            save "C:\Data\temp`i'.dta", replace
      }

* Append the temporary files to a panel
use "C:\Data\temp1994.dta"
      forvalues i=1995/2006 {
      display `i'
      append using "C:\Data\temp`i'.dta"
      erase temp`i'.dta
      }
sort parent_id yr
compress
save parent_finance_data, replace
erase "C:\Data\temp1994.dta"

* Merge firm information to the accounts information
merge 1:1 parent_id yr using parent_ownership_data, keep(match using)
```

```
tab _merge
drop _merge

* Save the final data set
sort parent_id yr
save parent_data, replace
erase parent_ownership_data.dta
erase parent_finance_data.dta

merge m:m parent_id yr using Merged_data set_1990_2006_control_variables, keep(match using)
drop _merge
save Merged_data set_with_parentdata, replace
erase Merged_data set_1990_2006_control_variables.dta

clear
import excel "C:\Data\Exceldata\Taxrates.xlsx", sheet("Dashboard") firstrow
drop countryName
merge m:m iso3code country_code yr using Merged_data set_with_parentdata, keep(match using)
drop _merge
save Merged_data set_1990_2006_STRs, replace
erase Merged_data set_with_parentdata.dta

clear
import excel "C:\Data\Exceldata\TC rules.xlsx", sheet("Data") firstrow
label variable debt_rule "0 = no rule, 1 = total debt, 2 = related party debt"
gen tight = 1-debt_ratio
merge m:m country_code iso3code yr using Merged_data set_1990_2006_STRs, keep(match using)
drop _merge
save Merged_data set_1990_2006_full, replace
erase Merged_data set_1990_2006_STRs.dta

* Generating variables
gen tot_debt = tot_st_debt + tot_lt_debt
gen tot_capital = tot_debt + equity_capital
gen tot_assets = fixed_assets + current_assets
gen tot_debt_ratio = tot_debt/tot_assets
gen tot_own = dir_own + indir_own
gen tot_parentdebt = lt_parentdebt + st_parentdebt
gen fixed_assets_ratio = fixed_assets/tot_assets
gen parent_debt_ratio = tot_parentdebt/tot_assets

label variable tot_debt "Total debt in fa"
label variable tot_capital "Total capital in fa"
label variable tot_own "Total parent ownership in fa"
label variable tot_debt_ratio "Total debt divided by total assets in fa"
label variable tot_assets "Total assets in fa"
label variable tot_parentdebt "Total gross parent debt in fa"
label variable fixed_assets_ratio "Fixed assets ratio in fa"
label variable parent_debt_ratio "Total parent debt divided by total assets in fa"
```

```
save merged_data set_1990_2006_preparedvariables, replace
erase Merged_data set_1990_2006_full.dta

******* Preparing data set ************************************************************
clear
use merged_data set_1990_2006_preparedvariables

* 2. Remove pure duplicates
bysort fa_id parent_id yr: gen duplic = _n
drop if duplic>1

* 3. Remove minority owned firms and observations
keep if tot_own > 50
replace tot_own=100 if tot_own > 100

* 4. Remove duplicates on fa-year level and fa's changing country
bysort fa_id yr: gen duplic2 = _N
drop if duplic2>1
bysort fa_id: gen affiliate_change_country = 1 if iso3code[_n]!=iso3code[_n-1] & _n>1
bysort fa_id: egen fa_changed_country = mean(affiliate_change_country)
drop if fa_changed_country!=.

**** Creating some regression variables before data calibration **********

* Loss carryforward 5 years
bysort fa_id: gen loss_carryforward = 0
bysort fa_id: replace loss_carryforward = 1 if profit[_n]<0 & profit[_n+1]<0 & profit[_n+2]<0 & _n==1
bysort fa_id: replace loss_carryforward = 1 if profit[_n-1]<0 & profit[_n-1]!=.
bysort fa_id: replace loss_carryforward = 1 if (profit[_n-1]+profit[_n])<0
bysort fa_id: replace loss_carryforward = 1 if (profit[_n-2]+profit[_n-1]+profit[_n])<0
bysort fa_id: replace loss_carryforward = 1 if (profit[_n-3]+profit[_n-2]+profit[_n-1]+profit[_n])< 0
bysort fa_id: replace loss_carryforward = 1 if (profit[_n-4]+profit[_n-3]+profit[_n-2]+profit[_n-1]
> +profit[_n])<0
bysort fa_id: replace loss_carryforward = 1 if (profit[_n-5]+profit[_n-4]+profit[_n-3]+profit[_n-2]
> +profit[_n-1]+profit[_n])<0

* Indicators for likely errors in revenue
bysort fa_id: gen too_small_rev=1 if revenue[_n]*900<revenue[_n-1] & revenue[_n]*900<revenue[_n+1]
> & revenue[_n+1]!=. & revenue[_n-1]!=. & revenue[_n]>0
bysort fa_id: gen too_large_rev=1 if revenue[_n]>900*revenue[_n-1] & revenue[_n]>900*revenue[_n+1]
> & revenue[_n]!=. & revenue[_n-1]>0 & revenue[_n+1]>0

bysort fa_id: egen median_nace = median(nace)

save data set, replace

********* Remove errors or missing values in data set*
*********************************************
* 5. Remove nonsensical values
drop if fixed_assets<0
```

```
drop if current_assets<0
drop if st_parentdebt<0
drop if lt_parentdebt<0
drop if lt_debt_fromfa<0
drop if st_debt_fromfa<0
drop if tot_st_debt<0
drop if tot_lt_debt<0
drop if revenue<0

* 6. Remove obs with missing values in both the relevant variables
drop if parent_debt_ratio==. & tot_debt_ratio==.

* 7. Remove if obserations before 1994
drop if yr<1994

********* Calibrating the data set ************************************************************
* 8. Remove obs with equity<0
drop if equity_capital<0

* 9. Remove financial service providers
drop if median_nace>65000 & median_nace<=67200 | median_nace==.
gen financial_obs = 1 if nace>=65000 & nace<=67200
bysort fa_id: egen financial_fa = mean(financial_obs)
drop if financial_fa!=.

* 10. Remove affiliates not part of a Norwegian MNC
drop if largest_foreign_own_percent>50 & largest_foreign_own_percent!=.

* 11. Remove obs with extreme changes in revenue
drop if too_small_rev==1 | too_large_rev==1

* 12. Remove obs where revenue is zero
drop if revenue==0

* 13. Remove obs where parent debt exceeds total debt
replace parent_debt_ratio = . if tot_debt*1.05<tot_parentdebt & tot_parentdebt!=.

* 14. Remove obs where total or parent debt ratio is above 1
replace tot_debt_ratio =. if tot_debt_ratio>1.01 & tot_debt_ratio!=.
replace tot_debt_ratio=1 if tot_debt_ratio>1 & tot_debt_ratio<1.01
replace parent_debt_ratio = . if parent_debt_ratio>1.01 & parent_debt_ratio!=.
replace parent_debt_ratio=1 if parent_debt_ratio>1 & parent_debt_ratio<1.01
drop if parent_debt_ratio==. & tot_debt_ratio==.

* 15. Remove obs without TC info or control-variables
drop if missing(debt_ratio)
drop if lendingrate==.
drop if revenue==.

save extendedsample, replace
```

```
* 16. Remove countries not used in Buettner et al. (2012)
keep if mainsample==1

* 17. Remove observations not in the period 1996-2004
drop if yr<1996 | yr>2004

save mainsample, replace
********** Generating explanatory variables **********
clear
use extendedsample
gen STR_TCR = STR * TCR
gen STR_tight = STR * tight
gen ln_revenue = ln(revenue)
gen ln_lendingrate = ln(lendingrate)
gen ln_inflation = ln(inflation)
replace ln_inflation = 0 if inflation<=0
gen ln_corruption = ln(corruption)

egen mean_tax = mean(STR)
gen adj_STR = STR - mean_tax
gen adj_STR_TCR = 0
gen adj_STR_tight = 0
replace adj_STR_tight = adj_STR * tight
replace adj_STR_TCR = adj_STR * TCR

sort yr iso3code
gen country_yr_string = string(yr) + iso3code
egen country_yr = group(country_yr_string)

sort yr
tab yr, gen(Dyr)
sort parent_id
tab parent_id, gen(Dparent)

gen TCR_par = 0
gen TCR_tot = 0
replace TCR_par = 1 if debt_rule==2
replace TCR_tot = 1 if debt_rule==1
gen tight_par = 0
gen tight_tot = 0
replace tight_par = tight if debt_rule==2
replace tight_tot = tight if debt_rule==1

********************************************************************************
xtset fa_id yr

*For Main sample:
* 1.1 regression: Parent debt ratio
qui xtreg parent_debt_ratio STR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
```

```
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax11
qui xtreg parent_debt_ratio TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax12
qui xtreg parent_debt_ratio STR TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax13
qui xtreg parent_debt_ratio STR STR_TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax14
qui xtreg parent_debt_ratio STR TCR STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax15
qui xtreg parent_debt_ratio adj_STR TCR adj_STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax16
qui xtreg parent_debt_ratio STR tight Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax17
qui xtreg parent_debt_ratio STR STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
>  fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax18
qui xtreg parent_debt_ratio STR tight STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax19
qui xtreg parent_debt_ratio adj_STR tight adj_STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
>  ln_revenue fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store tax110

* 1.2 regression: Total debt ratio
*For Extended sample:
qui xtreg tot_debt_ratio STR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate fixed_assets
> _ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot11
qui xtreg tot_debt_ratio TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate fixed_assets
> _ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot12
qui xtreg tot_debt_ratio STR TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot13
qui xtreg tot_debt_ratio STR STR_TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot14
qui xtreg tot_debt_ratio STR TCR STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot15
qui xtreg tot_debt_ratio adj_STR TCR adj_STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot16
```

```
qui xtreg tot_debt_ratio STR tight Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate fixed_
> assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot17
qui xtreg tot_debt_ratio STR STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot18
qui xtreg tot_debt_ratio STR tight STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
> fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot19
qui xtreg tot_debt_ratio adj_STR tight adj_STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
>  ln_revenue fixed_assets_ratio if mainsample==1 & yr>1995 & yr<2005, fe ro cluster(country_yr) nonest
est store taxTot110

* 2.1 regression: Parent debt ratio
qui xtreg parent_debt_ratio STR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax21
qui xtreg parent_debt_ratio TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax22
qui xtreg parent_debt_ratio STR TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax23
qui xtreg parent_debt_ratio STR STR_TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax24
qui xtreg parent_debt_ratio STR TCR STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax25
qui xtreg parent_debt_ratio adj_STR TCR adj_STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax26
qui xtreg parent_debt_ratio STR tight Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax27
qui xtreg parent_debt_ratio STR STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
>  fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax28
qui xtreg parent_debt_ratio STR tight STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax29
qui xtreg parent_debt_ratio adj_STR tight adj_STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store tax210

*2.2 regression: Total debt ratio
qui xtreg tot_debt_ratio STR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate fixed_assets
> _ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot21
qui xtreg tot_debt_ratio TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate fixed_assets
```

```
> _ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot22
qui xtreg tot_debt_ratio STR TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot23
qui xtreg tot_debt_ratio STR STR_TCR Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot24
qui xtreg tot_debt_ratio STR TCR STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
>  fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot25
qui xtreg tot_debt_ratio adj_STR TCR adj_STR_TCR Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot26
qui xtreg tot_debt_ratio STR tight Dyr* Dparent* loss_carryforward ln_revenue ln_lendingrate
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot27
qui xtreg tot_debt_ratio STR STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate ln_revenue
> fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot28
qui xtreg tot_debt_ratio STR tight STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
> ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot29
qui xtreg tot_debt_ratio adj_STR tight adj_STR_tight Dyr* Dparent* loss_carryforward ln_lendingrate
>  ln_revenue fixed_assets_ratio ln_inflation corruption, fe ro cluster(country_yr) nonest
est store taxTot210

* Regression outputs
outreg2 [tax11 tax12 tax13 tax14 tax15 tax16 tax17 tax18 tax19 tax110] using tableMainParent.rtf,
> r2 se replace ctitle(Parent debt) bdec(4) keep(STR STR_TCR TCR tight STR_tight loss_carryforward
>  ln_lendingrate ln_revenue fixed_assets_ratio) sortvar(STR TCR tight STR_TCR STR_tight loss_car
> ryforward ln_lendingrate ln_revenue fixed_assets_ratio) addtext(Year & Affiliate FE, yes, Parent
> Fixed Effects, yes)
outreg2 [taxTot11 taxTot12 taxTot13 taxTot14 taxTot15 taxTot16 taxTot17 taxTot18 taxTot19 taxTot110
> ] using tableMainTotal.rtf, r2 se replace ctitle(Total debt) bdec(4) keep(STR STR_TCR TCR tight
>  STR_tight loss_carryforward ln_lendingrate ln_revenue fixed_assets_ratio) sortvar(STR TCR tight
>  STR_TCR STR_tight loss_carryforward ln_lendingrate ln_revenue fixed_assets_ratio) addtext(Year
> & Affiliate FE, yes, Parent Fixed Effects, yes)
outreg2 [tax21 tax22 tax23 tax24 tax25 tax26 tax27 tax28 tax29 tax210] using tableExtendedParent.rtf,
> r2 se replace ctitle(Parent debt) bdec(4) keep(STR STR_TCR TCR tight STR_tight loss_carryforward
> ln_lendingrate ln_revenue fixed_assets_ratio ln_inflation corruption) sortvar(STR TCR tight
>  STR_TCR STR_tight loss_carryforward ln_lendingrate ln_revenue fixed_assets_ratio ln_inflation
>  corruption) addtext(Year & Affiliate FE, yes, Parent Fixed Effects, yes)
outreg2 [taxTot21 taxTot22 taxTot23 taxTot24 taxTot25 taxTot26 taxTot27 taxTot28 taxTot29 taxTot210
> ] using tableExtendedTotal.rtf, r2 se replace ctitle(Total debt) bdec(4) keep(STR STR_TCR TCR
> tight STR_tight loss_carryforward ln_lendingrate ln_revenue fixed_assets_ratio ln_inflation
> corruption) sortvar(STR TCR tight STR_TCR STR_tight loss_carryforward ln_lendingrate ln_revenue
> fixed_assets_ratio ln_inflation corruption) addtext(Year & Affiliate FE, yes, Parent Fixed Effects, yes)
```