

NHH



The Fellowship of the Thin Capitalization Rules

- *An empirical analysis of the effect of earnings stripping rules in Norway, Finland, Spain and Germany*

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Abstract

Governments across Europe have recently introduced tax reforms to counter the growing problem of multinational companies exploiting loopholes in tax regulations. We have analysed the effect of one type of tax regulation, earnings stripping rules, in selected European countries. Specifically, we study how the capital structure of multinational firms in Germany, Spain, Finland and Norway are affected when subjected to a transition from either safe harbour rules or from no prior regulations, to earnings stripping rules.

Firms analysed in Spain, Finland and Norway were not previously regulated by thin capitalization rules, and we find significant evidence of a reduction in the total debt-to-asset ratio as a response to the introduction of the earnings stripping rules. In Germany, we find evidence of an increase in the total debt-to-asset ratio as a response to the transition from safe harbour rules to earnings stripping rules.

We conclude that firms without prior regulation will reduce their debt levels, when being subject to an earnings stripping rule. However, the effect of earnings stripping rules in countries with prior regulations is dependent on the relative tightness of the new and old rules.

For Finland, Spain and Norway we believe the earnings stripping rules have had the desired effect, as MNCs of these countries have reduced their total debt-to-asset ratio. Whether the German rules have had the desired effect is inconclusive, but we argue that the earnings stripping rules are an improvement on the previous legislation.

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1 Introduction

Throughout history, firms have been searching for competitive advantages to succeed in their quest for supremacy. Through the tax benefits of debt, companies have been strategically adapting their capital structure. These benefits, also known as the tax preference to equity, have given birth to tax avoidance strategies. International corporations have gradually been employing these strategies as a part of their core tax planning activity¹. In recent years, legal tax avoidance has become the common norm among large corporations, as the opportunity cost of not employing such strategies is too substantial. There have been several investigations into multinational companies' (MNC) use of these strategies, and researchers found that the methods are employed efficiently and legally by many of the largest firms around the world. In 2013, the Telegraph published an article describing how Apple tried to find the "Holy Grail" of tax avoidance by using their foreign entities to avoid their tax obligations in the US (Trotman, 2013). By exploiting these entities, Apple managed to reduce their effective tax rate to 0.05%. Apple and other tech-giants are once again in the line of fire, as the "Paradise Papers"-scandal revealed that several companies are using tax paradises to a greater extent than what was publicly declared in 2013 (Lund, 2017). Apple is far from being alone in this endeavour, as Statoil and Statkraft also have been criticised for their tax planning activities. In 2013, Aftenposten published an article explaining how Statoil and Statkraft use internal banks located in Belgium in order to reduce taxes by approximately 1 billion NOK in 2012 (Bjørnstad, 2013). OECD estimated the total loss of such actions to account for 4-10% of global tax revenue in 2015 (OECD, 2015b, p. 15)².

Taxes are avoided for one party's benefit at the expense of another. The other party is in this setting the firm's tax domicile that experience a distorted tax base. This type of distortion has made governments more aware of multinational's ability to avoid taxes. As a result, governments and organisations are trying to protect their tax base by introducing national tax regulations. One of these regulations is called earnings stripping rules, which aim to increase the costs of engaging in such tax avoidance strategies³. These rules have been introduced in

¹ Debt preference over equity is further explained in section 2.1.

² Types of strategies include profit shifting through intangibles or interest (OECD, 2013, p. 14). In our thesis we will focus on profit shifting through transfer pricing and debt shifting.

³ The rules are further explained in section 2.4

European countries over the last years. Earnings stripping rules restrict the amount of deductible interest a firm may obtain from its internal debt and/or external debt, based on a financial measure.

It is, however, still an open question whether earnings stripping rules are effective in curbing international tax avoidance. In this study, we will examine the ESRs introduced in Germany, Spain, Finland and Norway. The countries are comparable through their similar approach to the earnings stripping rules. All four currently employ a limit to the amount of deductible interest costs based on EBITDA⁴. Spain and Germany have set that limit to 30%, while Norway and Finland have chosen a stricter ratio of 25% of EBITDA⁵. However, their previous regulations differ from one another, which provides a foundation to analyse and compare the rule's impact in different tax regimes. We will in our thesis test if the new regulation has had the desired effect on multinational companies' capital structure. Specifically, we investigate if the earnings stripping rules have managed to reduce the total debt-to-asset ratio of multinationals, and in turn, to what extent these countries have successfully curbed thin capitalization. Both Spain and Germany had regulations prior to their introduction of earnings stripping rules. We will analyse the reactions of MNCs in these countries to the reaction of MNCs in Norway and Finland. Thus, we put forward the following research question:

How has the introduction of earnings stripping rules affected the capital structure of multinational companies in Germany, Spain, Norway and Finland, and does the transition from safe harbour rules, or no previous regulation, to earnings stripping rules affect the impact?

Through data collected from the Amadeus database, we are able to analyse all multinational and domestic affiliates over a period of ten years⁶. In our analysis, the multinational companies serve as the group treated by the regulation, as they are most likely to be affected. Consequently, the domestic affiliates serve as the control group. We test the effect of introducing earnings stripping rules and compare the results based on previous regulations.

⁴ Earnings Before Interest, Tax, Depreciation and Amortization

⁵ The Norwegian ratio was 30% upon its introduction, and later revised and changed to 25% (Deloitte, 2016, p. 13).

⁶ Our dataset is further explained in section 5.1.

Our dataset includes total debt of the affiliates, but does not separate the level of internal and external debt. Though the tax regulations vary, some target internal debt other target total debt. By restricting the interest cost of the affiliates, the rules should trigger a reduction in affiliates' debt levels. As such, we are still able to analyse the effect of introducing earnings stripping rules in the four countries.

Our results show a significant reaction in multinationals' capital structure. The firms are adapting their total debt-to-asset ratios as a reaction to the earnings stripping rules. Norway, Finland and Spain all experience lower debt-levels among their treated firms. We find the opposite reaction in Germany, indicating that the firms react differently when previously restricted by strict safe harbour rules. Our findings indicate that earnings stripping rules are considered as a tighter rule, when compared to the safe harbour rules. To our knowledge, we are the first to explicitly examine the transition from an original thin capitalization rule (safe harbour rule) to a modern thin capitalization rule (earnings stripping rule), and compare to the transition of introducing thin capitalization rules (TCRs) with no prior regulation.

Over the next section, we will start with explaining the problem of tax avoidance, before we will examine the relevant tax avoidance strategies and the difference between internal and external debt. Secondly, we will explain the thin capitalization rules, and the design of earnings stripping and safe harbour rules. This will serve as a quick review of the different approaches, before we provide a thorough explanation of the differences in institutional setting in section 2.5. Afterwards, we introduce the literature previously written in regard to the underlying issue, section 3. Then, in section 4, we will explain theoretically background for the related issue and the present the hypotheses. We will present our data, and elaborate on its content and limitations in section 5, before we explain our empirical approach in section 6. Our results will be presented and analysed in section 7 and 8, and we will give our conclusion in section 9.

2 Definitions, basic mechanisms and institutional setting

2.1 The capital structure of the multinational

Miller & Modigliani (1958) famously gave birth to the theory of cost of capital. Their proposal was that firm value is unaffected by source of financing when facing perfect capital markets, as firm value is determined by each firm's ability to utilize underlying assets to generate cash flows⁷. In realistic capital markets, tax and other imperfections do exist⁸, invalidating some key aspects of the MM1 proposal. In particular, the interest costs related to debt are usually tax deductible, while costs of equity are usually not. Consequently, debt is tax preferred over equity as the method of financing.

A company can finance their operations through three alternatives, external debt, internal debt or equity. Firstly, the firms may choose to borrow from the market, thus financing operations through external debt. External debt represents the capital firms obtain from third party-lenders, which is the type of financing usually given by financial institutions. The firms do not have power to influence the interest rates as they are price-takers, thus taking the market interest rate as fixed. There are limitations to external debt, because demands and covenants are set by the market. Secondly, an alternate source of financing is internal debt. Companies can borrow capital internally from within the group, both from domestic or foreign entities. When using intra-group loans, firms may choose their own interest rate, and set their own demands connected to the loan. The third source available to finance their operations is equity⁹.

⁷ Popularly called the Miller and Modigliani first theorem, henceforth we will use MM1.

⁸ Barnea, Haugen & Senbet (1981, p. 9) describes, among others, informational asymmetries and transaction costs as examples of imperfections.

⁹ Obtained through issuance of shares or from investors. This will not be the focus of our thesis as there are normally no tax benefits of equity.

2.2 Tax avoidance strategies

Two of the most common tax avoidance strategies are transfer pricing and debt shifting. When a product is transferred from one entity within a firm to another, that product is given a price, enabling the firm to value the product correctly. This price is called the product's transfer price. As the price is set internally, the firms may decide upon their own transfer prices. Consequently, some low-taxed MNCs choose to set an artificially high transfer price when distributing their products to high-tax entities, thus shifting profits to the low-tax countries. In the context of debt financing, the product shifted is the debt provided by one affiliate within the same corporate group, and the price paid is the artificially high interest. Transfer pricing is in our thesis defined as the artificially high interest rate, while the excessive debt enforced on affiliates exemplifies the debt shifting strategy. To demonstrate, as the receiver of a loan pays interest to the provider of the debt, the interest becomes revenue for the provider and costs for the receiver. The provider of the loan is assumed to be tax domiciled in a low-tax country, and pays a low tax for its revenues from interest. However, as the tax is deductible for the receiver, which is domiciled in a high tax country, the receiver will deduct its cost at a higher rate than the provider is taxed for its revenue. Following this mechanism, the MNC can exploit the tax differences in the tax domiciles it operates, by employing these tax avoidance strategies. In conclusion, MNCs will have incentives and opportunity to excessively increase the leverage of the high-taxed firms.

2.3 Regulation

Due to regulation, MNCs are unable to exploit these loopholes to their full extent. The fundamental concept of the regulation is called "the arm's length principle" (ALP). Prices on goods sold between related companies will be evaluated relative to what the price of the same good would have been in the open market, employing "an arm's length" between the related firms. The deviation from the market price will determine whether the price between related entities is artificially high or low, indicating abusive use of transfer pricing.

In our context, the goods sold between related parties are intra-group loans, priced with interest. The ALP dictates the interest rate and other specifications the lender would demand from the receiver if they were unrelated. In principle, the ALP would be able to evaluate each situation uniquely, by regarding all the economic aspects of the firm and closely evaluate its environment. In theory, every firm would be given a maximum amount of debt which should be only marginally different from the maximum amount of debt a third party-

lender would provide. However, implementing such a principle is both time-demanding and costly. A unique review of every firm and their situation is cumbersome, and would demand countless hours of work. Additionally, one would need intricate knowledge of what factors are important in the respective industry. For the tax authorities, it is practically impossible to evaluate to what degree each firm complies with the ALP. Consequently, MNCs can easily circumvent this regulation. (OECD, 2012)

2.4 Thin capitalization rules

As the arm's length principle is not sufficient to prevent MNCs from thinly capitalizing their affiliates, additional regulation is necessary. To thinly capitalize an affiliate means to minimize the amount of equity, and increase the level of debt (Farrar & Mawani, 2008, p. 10). This affiliate would be financed by a small portion of equity compared to debt, or a thin level of equity. To prevent such actions, many governments introduce the so-called TCRs. "Thin capitalization rules" is used as an umbrella term for the set of rules that restrict the deductibility of interest cost through debt levels or other measures¹⁰. These rules are meant to confine the movement of profit amongst multinational companies' subsidiaries, and as such, enforce them to lower their debt-ratios, or through other means restrict the amount deductible. These rules have developed over time as MNCs started using more intricate strategies to minimize taxation costs and circumvent the rules¹¹.

The rules are often divided into two different practices, specific and non-specific TCRs. Specific thin capitalization rules restrict tax deductibility of debt if a pre-specified debt-to-equity ratio is exceeded. The majority of these rules are so-called "safe harbour rules", henceforth SHRs. Non-specific TCRs restricts tax deductibility of interest costs relative to an earnings measure. These set of rules are often called "earnings stripping rules", henceforth ESRs.

¹⁰Own definition. The definitions of thin capitalization rules, and what the rules cover, differ a lot. Different regulations are used as TCRs and non-TCRs interchangeably, that's why we will use this interpretation from here on as done by Gresik et al. (2017). See figure 1 for further explanation.

¹¹ The predecessors of thin capitalization rules are to be found in the late 1970s in France and Canada (Blouin, Huizinga, Laeven, & Nicodème, 2014, p. 7).

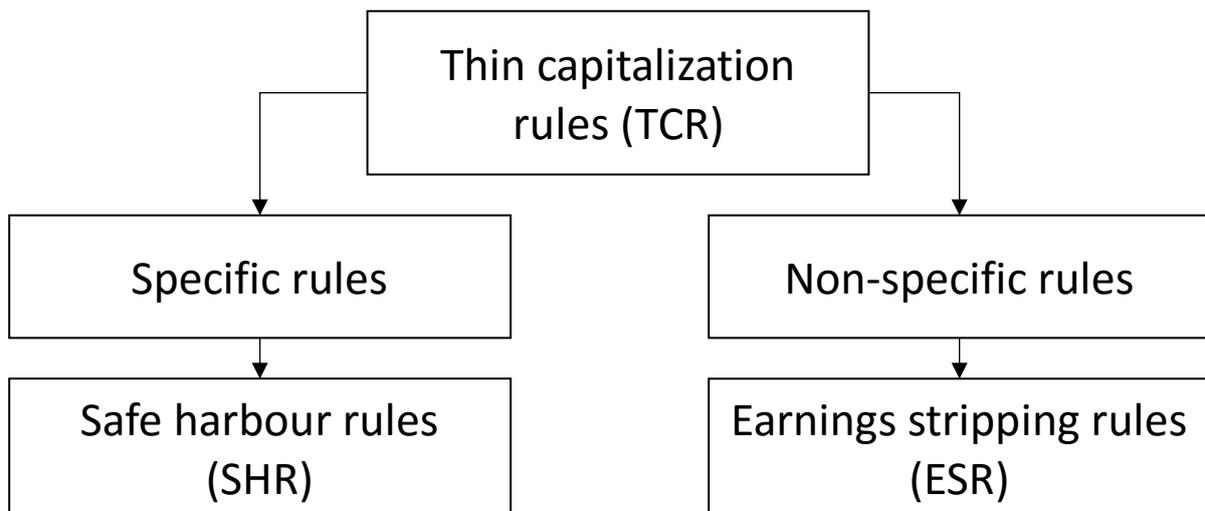


Figure 1: Structure of thin capitalization rules
 Source: Own illustration

Empirical results show diverging effects of both set of rules in different countries, and the answer to which regulation is most effective is still being researched. As a result, countries have attacked the issue with both the specific and the non-specific approach. Some governments have chosen to combine the two sets of rules¹², while other countries do not have TCRs, but limit debt financing through other types of regulation¹³.

2.4.1 Safe harbour rules (SHRs)

To negate the trend that MNCs choose to load affiliates with debt in high-tax countries, certain countries introduced safe harbour rules. The rules target affiliates' internal debt through an equity-based ratio (Schindler & Schjelderup, 2016, p. 264). SHRs set a maximum internal debt-to-equity ratio to which the interest costs associated with internal debt remain deductible. The interest costs of exceeding debt will not be tax deductible. This restricts the incentive to increase internal leverage, by removing debt-benefits beyond the limit. For instance, an affiliate is restricted by an internal debt-to-equity ratio of 2:1. Said affiliate has equity of 100,000 and internal debt of 250,000. As a result, 200,000 of the internal debt's interest cost will remain tax deductible. The remaining 50,000 of internal debt will not create any deductible interest costs, as it exceeds the limit. The safe harbour rules apply to internal debt, and does not directly restrict external debt (Schindler & Schjelderup, 2016, p. 264).

¹² Examples of these countries are Japan and Denmark (Gresik, Schindler, & Schjelderup, 2017, p. 69)

¹³ Gresik et al. (2017, p. 69) lists Hong Kong, Sweden and United Kingdom as countries with own, specialized rules.

The external debt is restricted by the market through the covenants set by external lenders. A highly leveraged affiliate will not be able to borrow excessive debt from a third-party lender as the lender would demand extreme interest rates to make up for the risk associated with large debt levels. In this situation, the high interest rates would exceed the gains from obtaining the debt.

The SHR-ratio may vary between tax regimes. For instance, Germany put a maximum internal debt-to-equity ratio to 1.5:1¹⁴. While this is a rather a strict policy, other tax regimes have chosen a more lenient approach¹⁵. As SHRs only restrict the stock of deductible debt, it does not impose any restrictions on interest rates and transfer pricing.

2.4.2 Earnings stripping rules (ESRs)

Isenbergh (2005, p. 33) was one of the first to categorize rules that aim to use interest barriers to cut off excessive interest cost in highly leveraged affiliates in the U.S.:

“This manoeuvre is known in the tax lexicon as “interest stripping” or “earnings stripping” because taxable income is stripped from the U.S. tax environment by interest deductions.”

Earnings stripping rules attack the issue of tax avoidance differently than the safe harbour approach explained above. The ESRs limit the amount of deductible interest by defining a maximum cap, which is often based on a financial measure of the firm. Usually the ratio is based on interest costs compared with EBITDA¹⁶. By setting a threshold of 30 % of EBITDA the regulation effectively forces a cap on the amount of deductible interest costs (Schindler & Schjelderup, 2016, p. 277) Different from SHRs, an earnings stripping rule restricts both the stock of debt and the interest rate, and transfer pricing in general. Any over-invoicing of interest (or any other factor) will make the earnings stripping rule tighter as interest expense increases, or EBITDA decreases (Schindler & Schjelderup, 2016, p. 277).

¹⁴ In the case of Germany, the ratio of the first TCR were 3:1 for non-bank corporations, until 2001 when they tightened the ratio to 1,5:1 (Weichenrieder & Windischbauer, 2008, p. 3).

¹⁵ For an overview of safe haven debt-to-equity ratios, see Buettner Overesch, Schreiber, & Wamser, (2012, p. 937)

¹⁶ There are other possible measures, but the most common are EBIT and EBITDA.

2.5 Current legislation

The four sample countries we have chosen to analyse have similarities and differences regarding the approaches to counter the problems of thin capitalization. All countries have chosen earnings stripping rules, but replace this tax reform by different or no regulations. The resemblance in current institutional setting, and the distinction in previous regulation makes the countries effect to the new rule suited for comparison. We find it important to thoroughly review the countries previous and current legislation to be able to discuss the effects of new regulation. Therefore, in the following paragraphs, we will describe the specifications and design of the institutional settings in Norway, Finland, Germany and Spain which are relevant to our research question.

2.5.1 Norway

With no prior attempt to curb thin capitalization, the introduction of earnings stripping rules in 2014 marked a change in the Norwegian tax legislation. The ESRs were proposed in 2013, and put into action from the fiscal year of 2014 (Skatteloven, 1999). Norway introduced a barrier of deductible interest costs at 30% of EBITDA, which were later modified to 25% (NOU, 2014). The Norwegian restrictions only apply to interest from internal debt, not interest from external debt. The reason for not including external interest costs are that tax planning with the use of external debt is more difficult, compared to internal interest cost (Prop. 1 LS, 2014, p. 109). As the receiver of the loan are unable to influence the interest rates of external debt in equal manner as internal interest rate, the cost of tax planning increases. This is based on the assumption that the interest rate of external debt is set exogenously the market, where affiliates are price-takers.

Interest costs associated with internal debt exceeding the specified ratio will not be tax deductible. The rules include a lower limit, at which firms with less than MNOK 5 net interest cost are exempted by the rules. The regulation also includes a clause where the financial institutions are exempted of the rules¹⁷. Additionally, the petroleum industry is exempted from the regulation¹⁸ (Skatteloven, 1999). The regulation was heavily influenced by the forthcoming Finnish rules, and the pre-existing German rules (Prop. 1 LS, 2014).

¹⁷ Financial institutions are defined in Skatteloven § 6-41 (8)

¹⁸ Additional exemptions, not relevant to our dataset, are explained in Skatteloven § 6-41

Additionally, Norwegian corporations have experienced minor changes in the corporate income tax rates. In 2014, the rate was lowered from 28% to 27% (KPMG, 2017). This tax rate change is assumed to affect all corporations equally.

2.5.2 Finland

Without previous TCRs, Finland's new regulation was first proposed in 2012, and put into effect in 2014. The ratio put forward by the Finnish government was that the amount of deductible interest costs associated with internal debt, is limited to 25% of EBITDA. Analogous to the legislation in Norway, any amount exceeding the limit will not be deductible when calculating the corporate taxation costs. However, interest expenses are deductible if the equity ratio of the consolidated corporation does not exceed the same ratio for the affiliate. Corporations with less than 500,000 EUR of interest costs, are exempted from the regulation. To exemplify, if a firm has 700,000 EUR, the amount of tax deductible interest is dependent on the firm's EBITDA. As the amount of interest breach the lower limit, the full amount is subject to the restrictions set by the firms EBITDA. If the firm has an EBITDA of 1,000,000, the amount of deductible interest is 300,000. Finland also exclude companies in the banking and insurance sectors from the law, as these sectors' main income originate from interest costs. (Finlex, 2012)

Finland has also changed the corporate income tax rates in the sample period. From 2005 the tax rate has declined by 6% relative to 2017 (KPMG, 2017). Again, this tax rate change is assumed to affect all corporations equally.

2.5.3 Germany

Following the new corporate tax act in 2008, corporations in Germany were subject to several changes (Dreßler & Scheuering, 2015, p. 4). Firstly, the act reduced the corporate income tax with ten percentage points, which we assume to affect all corporations equally. In addition to the reduction of corporate income tax, the German government introduced a new set of thin capitalization rules. Substituting the former SHRs, Germany transitioned to ESRs in 2008. Previously, the government set a limit that the debt-to-equity ratio could not exceed 1.5. Any exceeding internal debt was not deductible (Dreßler & Scheuering, 2015). The new regulations set the limit of deductible interest costs at 30% of EBITDA. Contrary to the Finnish and Norwegian rules, the German ESRs target total interest costs. Interest is capped for both external and internal debt (The German Federal Government, 2007). However, the rules included a lower limit meaning that firms with a total net interest expense below

1,000,000 EUR were not affected. The rules were in 2009 adjusted following criticism claiming that the rules were too strict. This adjustment added three escape clauses to the German legislation (Dreßler & Scheuering, 2015, p. 5). The first clause raised the previous lower limit to 3,000,000 EUR, and unused EBITDA were allowed to be applied to income the following year. As a result, firms were now able to carry forward deductible EBITDA from the previous year, and as such increase the amount deductible the following year. The firms are allowed to carry forward unused EBITDA for 5 years. The second clause affects affiliates that are stand-alone or part of a consolidated tax group. If part of a consolidated tax group, the whole group is evaluated as a single company (Buslei & Simmler, 2012, p. 7). As a result, if the consolidated statement of group does not show sign of “harmful financing”, the entire group is freed of the restrictions. Thirdly, affiliates with equity ratio no lower than one percentage point below the consolidated group’s equity ratio is exempted from the restrictions. Both the second and third clause are overruled if any member of the group rely on significant shareholder debt financing (Buslei & Simmler, 2012, p. 7). Through the second clause, domestic affiliates are able to “escape” from the ESR’s restrictions. There are no incentives for domestic affiliates to take part in transfer pricing or debt shifting activities, and as a result, both domestic corporate groups and stand-alone affiliates are exempted. Similar to the previous countries, the banking and insurance sectors are exempted from the regulations.

2.5.4 Spain

Spain also had SHRs before the introduction of earnings stripping rules in 2012. These SHRs only applied for companies with a controlling parent company outside of the EU/EEA¹⁹. Spanish affiliates with controlling interests within the EU and domestic affiliates were considered equal in terms of tax purposes. The Non-EU firms were subject to a debt-to-equity ratio of 3:1, where maximum deductible internal debt was restricted. Exceeding internal debt was not deductible (Latham & Watkins, 2012, p. 2). In 2010, Spanish authorities proposed the new earnings stripping rules, and these were put in action from the fiscal year of 2012 (Royal Decree-Law 12/2012)²⁰. The limit of deductible interest costs is set to 30% of EBITDA. As opposed to the previous regulation, the new rule applied for all

¹⁹ From now on called Non-EU firms.

²⁰ There are two countries that joined the EU/EEA in the period between 2005 and 2012, Bulgaria and Romania. There are only 3 firms from these countries with affiliates in Spain. As a result, we have left them in the EU-group.

entities in Spain, both domestic and multinational companies. Interest cost connected to both the internal and external debt is restricted. The exceptions are firms with less than 1,000,000 EUR of net financial expenses, and independent companies (Clemente-Almendros & Sogorb-Mira, 2016, p. 367). Independent companies are not part of a group, and are unable to obtain debt outside of the external market. These companies are exempted much like the second clause in Germany. Additionally, the rules are not applicable to companies in the banking and insurance sectors. (Royal Decree-Law 12/2012)

Tax rates in Spain have also been reduced, from 35% to 28% throughout the sample period. (KPMG, 2017). Again, this tax rate change is assumed to affect all corporations equally.

Country	Previous legislation	New legislation	Type of restriction	Year of introduction	Minimum interest	Special clauses
Norway	-	25% of EBITDA (ESR)	Related party debt	2014	5,000,000 NOK	Petroleum ²¹
Finland	-	25% of EBITDA (ESR)	Related party debt	2014	500,000 €	Group wide leverage ²²
Germany	1,5:1 (SHR)	30% of EBITDA (ESR)	Total debt	2008	1,000,000 €	Escape clauses ²³
Spain	3:1 (SHR)	30% of EBITDA (ESR)	Total debt	2012	1,000,000 €	EU/Non-EU

Table 1: Summary of current legislation

Table 1 summarizes current legislations in the four countries. The most relevant differences between the specifications of the rules are prior regulation and for whom the rules apply. Firstly, we see that Spain and Germany are the only ones with regulations prior to the ESRs. Secondly, these countries restrict total debt, while Norway and Finland restrict solely internal debt. These differences make up the foundation for why we believe that the effects of the ESRs are interesting to analyse.

²¹ Petroleum sector defined as: crude petroleum mining and extraction of oil, production of natural gas, and recovery of hydrocarbon liquids and activities of operating and/or developing oil and gas field properties, as classified in NACE Rev. 2 (Eurostat, 2008).

²² The restrictions do not apply if the taxpayer's equity-to-assets ratio is equal to, or greater than the equity-to-assets ratio of the consolidated group. (Finlex, 2012)

²³ As explained in section 2.5.3.

3 Related Literature

3.1 Related literature on capital structure

In 1958, Miller & Modigliani published the first theory of capital structure (MM1), which was based on the assumptions explained in section 2.1. As these assumptions were unrealistic, the paper was later revised by the same authors to control for interest deductibility and taxes. This resulted in the updated MM1-proposal where Miller & Modigliani (1963) brings to life the first evidence of debt preference over equity, sparking the beginning of numerous tax avoidance strategies.

Hines (1999) shows one of the first evidences of taxation-effects on domestic, international real investment, and transfer pricing in American affiliates. The study shows the degree of corporate responsiveness, i.e. firms' ability and motivation to adapt and circumvent international tax policies. Among other significant discoveries²⁴, Hines suggests that multinational corporations are willing to shift profits from the U.S. to more favourable tax-legislations, introducing tax distortion as an international problem.

According to the findings of Graham (2003), tax benefits from debt add to firm value, and firms subjected to a high tax rate take advantage of debt more aggressively than low-taxed corporation. This is supported by Desai, Foley & Hines (2004) who empirically prove that higher tax rates increase debt-ratios of both external and internal entities, of rule-bound multinational corporations. They further prove that costly internal debt is preferred over external debt, and interest costs increase in line with internal debt. In conclusion, Desai et al. (2004) were the first to define the determinants for capital structure in multinationals, pointing at tax rate differences as a major influence.

To conceptualize the findings stated above, Mintz and Smart (2004) constructed a theoretical model, showing the dynamics of how MNCs exploit tax differences. The study of Canadian-based corporations and their national and international affiliates revealed that intra-group loans and debt shifting are used excessively to load high-taxed affiliates with debt. The debt

²⁴ Hines sparks the debate for tax competition between tax legislations as the study shows that MNCs are willing to change tax domicile if profitable, and suggests maintaining a tax-rate marginally below major trading partners to increase tax competitive advantage.

is issued from a low-taxed affiliate which serves as a “debt-provider” (henceforth internal bank) from the corporate group, creating interest income which is taxed lower than the high tax-affiliate²⁵. Consequently, MNCs are better off exploiting the differences in the tax rate among the tax-jurisdictions, than financing the affiliates separately.

As Mintz & Smart focuses on how internal debt is utilized, Huizinga, Laeven & Nicodème (2008) contributes to the field of study by investigating how external debt is utilized. MNCs will use external debt shifting, i.e. place external debt in high tax-affiliates to receive interest deductibility minimize overall tax payments. Furthermore, the study suggests that a change in tax rate in one country will be balanced out by increasing or decreasing debt in the other affiliates, to keep the overall debt-level in check. Specifically, as the incentives for debt increases in one country, incentives to decrease debt in other affiliates will keep the MNCs indebtedness unchanged. However, the magnitude of tax-rate sensitivity is challenged in more recent studies (Dharmapala, 2014, p. 31)²⁶.

Egger, Eggert and Winner (2010) studied German plant-owners and investigated how foreign ownership influenced the tax-payments of multinationals. Using the Amadeus database for total debt, the studies reveal that MNCs have substantially lower tax-payments than purely domestic firms. The study identifies two main channels of tax savings, transfer pricing and debt shifting. They argue that multinationals probably use transfer pricing a greater extent than debt shifting (Egger, Eggert, & Winner, 2010, p. 105). Evidence of transfer pricing are in later years extensively documented²⁷.

The case of debt shifting is more widely studied in Møen, Schindler, Schjelderup & Tropina (2011) who were able to differentiate between internal and external debt. Møen et al. provide a theoretical model which compiles three mechanisms that affects leverage-ratio. Huizinga et al. (2008) stated that there exists an optimal debt-level, and Møen et al.’s study takes the issue one step further and concludes that it is optimal for the MNC to include both internal and external debt in their capital structure.

²⁵ This mechanism is explained more thoroughly in section 2.2.

²⁶ Dharmapala (2014, pp. 1-2) shows that from the early 1990’s, the tax rate sensitivity has shrunk to one third of what it originally was.

²⁷ See for instance Dharmapala (2014), Blouin et al. (2014) or Egger & Stimmelmayer (2017).

3.2 Literature relating to thin capitalization rules

As stated in the previous section, tax-planning activities exist to maximize MNCs' profits, and we know that multinationals around the world are exploiting tax differences for financial benefit. This section presents the empirical evidence of the effects of international tax laws that regulate excessively leveraged financing structures, and the MNCs' responses to these. Our contribution to the field of study is to investigate the impact of ESRs, in regimes with existing and non-existing TCRs. For this reason, it is essential to understand the previous regulation's impact on capital structure. This section will provide evidence of the effects of SHRs and ESRs, which enables us to understand what mechanisms that are in place when transitioning to the ESRs.

From a governmental point of view, the importance of a TCR is to protect the country's national tax base, and thereby maximize national tax revenue (Gresik, Schindler, & Schjelderup, 2017). Gresik et al. studied what type of rules and what combination of rules are the most effective from a welfare perspective. With respect to this, Gresik et al. (2017, p. 74) theoretically explains why an ESR alone generates higher national income than a SHR alone, and higher income than an ESRs in conjunction with a SHR. This finding supports the main recommendations from Action Plan 4 by the OECD (2015a). By simulation, Gresik et al. (2017, p. 69) found that national income of the host country will increase with 0.05% to 0.8% when switching from an SHR to an ESR.

Overesch & Wamser (2010) study the effect of SHRs on multinationals, using data which examines German corporations from 1996-2004. These researchers look at the SHRs imposed on German multinationals in 2001 and 2004. Prior to 2001, the safe haven ratio was 3:1, but tightened to 1.5:1 by the tax reform introduced that year²⁸. The 2004 reform shut down loopholes for holding companies, tightening the rule to 3:1 for every corporation (Overesch & Wamser, 2010, p. 565). The empirical evidence shows that enforcement of the TCRs significantly lowered the amount of internal (Overesch & Wamser, 2010, p. 571).

Buettner, Overesch, Schreiber and Wamser (2012) use the same data source as Overesch & Wamser (MiDi)²⁹, and study the effect of the SHRs in 36 different countries, 28 of which are

²⁸ For holding companies, this ratio was 9:1 prior to 2001, and 3:1 after 2001 (Overesch & Wamser, 2010, p. 566).

²⁹ «Mikrodatenbank Direktinvestitionen» or MiDi, is the German central bank's statistical database on foreign direct investment.

European. Their large dataset comprise data from 1996-2004, and differs between internal and external debt. Their findings show that SHRs lead to reduced incentives to use debt shifting as a tax planning strategy. Additionally, they put forward evidence for substitutability of external debt for internal debt when imposing SHRs, although the effect is limited (Buettner et al., 2012, p. 937)

Blouin, Huizinga, Laeven, and Nicodème (2014) contribute to the field of study as they investigate how SHRs affect capital structure in American foreign affiliates. The report collected data ranging from 1982 to 2004 and used financial data from 54 foreign subsidiaries to show that TCRs reduce both total debt-to-asset-ratio and internal lending from the parent company. Furthermore, the first year-impact of the new SHR on affiliate level is found as significant and seems to be a part of the long-term effect. Furthermore, they found that MNCs react quickly to an introduction of a TCR. As a result, total and internal leverage responds immediately to interest deductibility restrictions.

Buslei & Simmler (2012) are the first study to investigate the effect of ESRs. These researchers examined the introduction of the ESR in Germany in 2008. Applying data from 2006 and 2008 from the Dafne database³⁰, Buslei & Simmler study the effect using the difference-in-difference method for statistical analysis. Their results show a significant reduction of debt-levels of multinational companies, thus providing the first evidence for the effectiveness of an ESR. They were able to separate internal and external debt, where both types experienced a significant reduction as reaction to the rule. Furthermore, firms that are almost exempted from the rules because of low interest cost, exert larger reduction in debt-levels compared to all affected firms. A third finding is that firms' investments are not affected by the introduction of the ESR. They put forward a plausible explanation for this, stating that affected firms may not use transfer pricing (Buslei & Simmler, 2012, p. 29).

Using the Dafne database of total leverage, Dreßler & Scheuering (2015) examined the introduction of the German ESR by using a difference-in-difference approach, including fixed effects. They discovered that the introduction of an ESR would lead to a reduction in leverage-ratio only if the firms had severely differing capital structure before the introduction. Their study could not provide a significant effect from ESRs among all

³⁰ The Dafne-database is a sub-sample of the Amadeus database by Bureau van Dijk.

corporations investigated. As these findings contradict earlier literature regarding MNCs' response to ESRs, they put forward explanations for the observed reactions. For instance, they argue that leverage was reduced independently of the new rule because of the financial crisis, and that the supposedly affected firms somehow avoided the new rule.

In line with Buslei & Simmler, Alberternst & Sureth-Sloane (2016) also estimates the effect of the ESRs in Germany. Their approach was to see whether the recommendations from the OECD, to fight tax avoidance through ESRs, were effective. Alberternst and Sureth-Sloane apply the difference-in-difference method, but distinguish themselves from previous research by applying a propensity score matching approach to identify the control and treatment group. They find significant reduction of total debt ratio of the affected German firms, with a magnitude of 4.7%. However, they conclude that the economic relevance of the introduction of the ESR is small, as many German firms are exempted from the regulation.

Following the German approach, Spain introduced ESRs in 2012 (Deloitte, 2017). Using total debt, Clemente-Almendros & Sogorb-Mira (2016) researched the change in capital structure of Spanish firms following the introduction of this tax reform. These researchers merge data from three different sources³¹, and focus on listed firms on the Spanish stock exchange over the period of 2007-2013. This study finds strong evidence in favour of the effectiveness of the ESRs, as the debt ratio for affected firms is significantly lowered with 12-18% (Clemente-Almendros & Sogorb-Mira, 2016, p. 380)³². The study also put forward evidence for no reduction in leverage ratios prior to the tax reform. In other words, none of the Spanish firms anticipated the new tax reform in any of the years from 2007 to 2011.

Harju, Kauppinen & Ropponen (2017) are the first to empirically study the effect of the Finnish ESR introduced in 2014. Using the ORBIS database of total leverage, the study obtained financial information from Finnish, Danish and Swedish corporations over the period of 2009-2015. Swedish and Danish firms are used to serve as control groups for the treated and untreated firms in Finland. Whereas previous research used debt-to-asset ratios as their independent variable, Harju et al. also employ the net financial expenses as their measurement of corporate response of the tax reform. They find that Finnish MNCs reduce

³¹ For further explanation of which databases are used, see Clemente-Almendros & Sogorb-Mira (2016, p. 371).

³² Affected corporations in Spain are defined in section 1.5.4.

financial expenses with 25-30% compared to unaffected firms. The study shows no signs of significant reduction in total debt. Furthermore, Harju et al. studies the effect of the tax reform on changes in EBITDA. They argue that if the EBITDA would change, this indicates a substitution of debt shifting to transfer pricing. However, they find no evidence indicating this.

With respect to the mechanisms of debt shifting and transfer pricing, Schindler and Schjelderup (2016) provides theoretical models for how multinationals will adapt when subjected to different TCRs. SHRs will reduce debt shifting, but lead to greater portions of transfer pricing. However, under a tax legislation with ESRs both debt shifting and transfer pricing may increase or decrease (Schindler & Schjelderup, 2016, p. 280)

Researchers	Year	Country	Focus of research	Results
Buslei & Simmler	2012	Germany	Internal and external debt	Internal debt: -3.5% External debt: -2.1%
Dreßler & Scheuering	2015	Germany	Internal and external debt	Insignificant results
Alberternst & Sureth-Sloane	2016	Germany	Total debt	-4.7%
Clemente-Almendros & Sogorb-Mira	2016	Spain	Total debt	-12-18%
Harju et al.	2017	Finland	Total debt and financial expenses	Total debt: Insignificant Financial expenses: -25 to -30%

Table 2 Summary of empirical research regarding ESRs

We have created a table to easily review the literature of the effects of ESRs. This literature is selected as the one's most relevant to our study as they also investigate the effects of an ESR. We can see that there have been ambiguous results concerning the significance of the impact. However, the majority of the findings suggest that debt levels should decline.

4 Theoretical analysis/framework

The issue of the thesis is to answer how ESRs have affected the total debt-to-asset-ratio of multinational firms in different tax legislations. To answer this, it is essential to understand why multinationals are affected by the rules, to what extent they are affected and how total debt is affected. Knowledge of these questions, supported by related literature, will lay the foundation for our three hypotheses.

We base our theoretical approach mainly on the framework provided by Møen et al. (2011, pp. 5-11) and use extensions, modifications and intuitions provided by cited authors.

4.1 Introduction

The revised MM1 (Miller & Modigliani, 1963) adjusts for taxes and imperfect markets. This can explain the difference between the value of a levered firm V_L and an unlevered firm V_U .

$$V_L = V_U + \text{Present Value of Tax Shield} = V_U + PV(TS) \quad (1)$$

We assume the tax shield to be strictly positive, making $V_U < V_L$. As the tax shield increases with leverage, the optimal capital structure of the MNC will be to lever up to 100%. Miller and Modigliani (1963, pp. 440-441) argues that in theory, all firms should make their financial decisions accordingly. However, in the following section, we will argue for the existence of an optimal debt level, which lies between the corner solutions of 0% and 100%.

4.2 Framework

In the following, the model by Møen et al. (2011, pp. 5-11) is presented.

A multinational firm has 100% ownership of all i affiliates in n countries. Applying a fixed amount of capital (real investment) K to produce one unit sold at price p , the production function for all affiliates is $y_i = p \cdot f(K_i)$. Holding real investment K fixed per affiliate, each affiliate chooses its debt-to-asset ratio to maximize tax savings. Cost of capital and cost of equity both carry a constant, strictly positive interest rate r . This level is set exogenously and is thereby fixed. Each affiliate is financed with a combination of equity E_i and debt D_i . As the affiliates have access to both internal and external capital markets, they are able to apply both kinds of debt. The total indebtedness of the affiliate is the sum of external debt D_i^E and internal debt D_i^I . Defining the leverage ratio as the amount of debt over capital, each affiliate has the following properties

$$\begin{aligned}
&\text{Leverage ratio in affiliate } i: b_i = b_i^E + b_i^I \\
&\text{External leverage ratio: } b_i^E = D_i^E / K_i \\
&\text{Internal leverage ratio: } b_i^I = D_i^I / K_i
\end{aligned} \tag{2}$$

As we know, capital structure is a combination of debt and equity. Employing what we know from the set of equations above, total capital can be defined as $K_i = D_i^E + D_i^I + E_i$.

4.3 Costs and benefits of financing alternatives

Contrary to what Miller & Modigliani (1963) proposed regarding the preference of debt over equity, Huizinga et al. (2008, p. 95) argue for an optimal combination of debt and equity. Assuming the latter is correct, there must exist costs related to each method of financing, making 100% debt financing inferior to a more balanced combination of debt and equity. In other words, both debt and equity must carry benefits and costs, which provide the basis for a trade-off between the two. This is in line with the trade-off theory by Kraus and Litzenberger (1973, p. 915), and we will in the following segments identify costs and benefits of internal and external debt.

4.3.1 Costs and benefits of external debt

The tax-benefit of external debt is the external debt tax shield. This tax shield is given when corporations compile debt from an independent, third party. Generated by the amount of external debt D_i^E , the interest rate r makes up the direct cost of using external debt. As interest cost is tax-deductible, the benefits of external debt are the tax savings generated in each affiliate, given formally by the equation below

$$t_i \cdot r \cdot D_i^E \tag{3}$$

There also exist non-tax benefits with respect to external debt, as this kind of debt can be used as a control mechanism to curb informational asymmetries. To reduce these asymmetries between shareholders and managers, external debt can be effectively utilized (Jensen, 1986, p. 324). One of these asymmetries can be described through the “principal/agent”-problem. This problem has been investigated thoroughly, and is properly explained by Jensen & Meckling (1976, p. 308). Agency costs occur when the principal hires an agent (the managers) to act on behalf of the principal (the shareholders). The costs of the firm arise because of the conflicts of interests, when shareholders desire to increase shareholder value, while managers want to run the company to benefit themselves. These asymmetries can be balanced out with the use of external debt. Managers can utilize the

signalling effect of overloading an affiliate with debt to make a statement to a lender that they will not default on the debt (Berk & DeMarzo, 2011, p. 535). In contrast, Jensen & Meckling (1976, p. 324) describe a situation in which information asymmetry also raises costs of external debt. The problem arises when equity holders will invest in overly risky projects to harvest profit from growth, after undertaking debt. However, the leveraging makes their risk limited, as equity-holders own a minority of the project relative to the debt holders. In such cases, the issuer of debt anticipates the equity holder's actions and require higher premiums than usual.

Furthermore, increasing external leverage provides the lender with a greater portion of the corporation's total capital (all else equal). When levering up, equity is reduced relative to debt, reducing the total solidity of the firm. Therefore, debtors will embed higher interest costs in financing the firm, as it anticipates bankruptcy costs (Warner, 1977, p. 345)³³. Equivalently, carrying more external debt increases the possibility of bankruptcy and related costs.

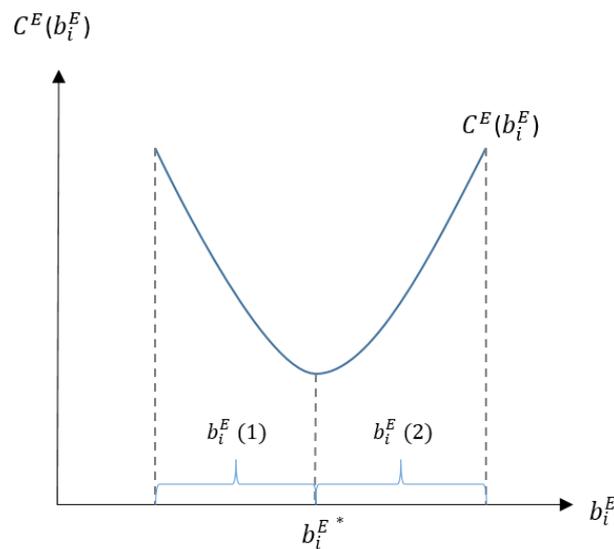
To this point, we have only considered costs of debt on affiliate level, and not on parent level. Møen et al. (2011) include the bankruptcy cost of the MNC as a part of their model. In line with Huizinga et al. (2008, p. 81), the amount of external debt gives an indication on the possibility of bankruptcy. Being subject to bankruptcy will have costs directly and indirectly linked to the default. Altman (1984, p. 1067) defines the direct costs of bankruptcy, or costs of financial distress, as costs related to legal fees, accounting fees, filing fees and other administrative costs. Indirect bankruptcy costs include the opportunity costs related to the discontinuation of operations³⁴. Furthermore, Altman (1984, p. 1067) argues that bankruptcy cost would necessarily need to be "relatively significant" for the costs to at some level

³³ Even though Warner argues that there exist bankruptcy costs embedded in financing cost, he claims that the expected cost of bankruptcy is surprisingly small.

³⁴ In the words of Berk & DeMarzo (2011, pp. 514-516), indirect costs of bankruptcy (opportunity costs) are loss of customers, loss of suppliers, loss of employees, loss of receivables, fire sales of assets, inefficient liquidation, and costs to creditors.

exceed the tax benefits gained from increased external leverage³⁵. However, we will not include bankruptcy costs as it does not change the outcome of the theoretical model³⁶.

Summarized, external debt carries both tax motivated and non-tax motivated benefits and costs. Following the terminology of Møen et al. (2011) the net sum of benefits and costs of external debt is defined as a function of the external leverage ratio of that affiliate, called agency cost $C^E(b_i^E)$. The existence of both benefits and costs will induce an optimal level of external debt, which is neither a corner solution of 0% or 100%.



*Graph 1: Trade-off between benefit and cost associated with external debt³⁷
Source: Own Illustration*

Insufficient external debt does not generate the optimal amount of tax shield and is associated with the unused possibility to remove agency cost, presented above as $b_i^E(1)$. Too much external debt will cause higher risk premiums because of informational asymmetries (Schindler & Schjelderup, 2016, p. 268) and increased possibility of bankruptcy (Fuest & Hemmelgarn, 2005, p. 513). This interval is presented as $b_i^E(2)$.

³⁵ Altman (1984, p. 1067) provides arguments both in favor of and in disfavor of whether bankruptcy cost affects the capital structure of the corporation or not.

³⁶ Increased bankruptcy cost will be a function of external debt, but exhibit the same properties as agency cost. Hence, including bankruptcy cost will only increase the level of costs related to external debt. Agency cost can be interpreted to include both agency costs and bankruptcy costs without altering any results.

³⁷ The model is designed by us, but we heavily rely on the lecture slides by Dirk Schindler in the course “FIE441 – Taxes and Business Strategy”, in the spring of 2017.

Summed up, to minimize the agency costs, an optimal external leverage ratio $b_i^E^*$ must exist between the two extremes, resulting in C^E exhibiting a convex shape.³⁸

Following the assumptions provided above and from Schindler and Schjelderup (2012, p. 638)³⁹, the properties of the derivatives of external costs are presented below.

$$C^E(b_i^E) > 0 \left\{ \begin{array}{ll} b_i^E \geq b_i^E^* & \left\{ \begin{array}{l} C^{E'}(b_i^E) > 0 \\ C^{E''}(b_i^E) > 0 \end{array} \right. \\ b_i^E < b_i^E^* & \left\{ \begin{array}{l} C^{E'}(b_i^E) < 0 \\ C^{E''}(b_i^E) > 0 \end{array} \right. \end{array} \right. \quad (4)$$

4.3.2 Costs and benefits of internal debt

The tax-benefit of internal debt is the internal debt tax shield. This tax shield is given when a corporation receives debt from a related party, as the debt's interest is tax-deductible. The amount of internal debt, D_i^I , combined with the interest rate, r , make up the cost of internal debt. Recalling from section 3.1 we know that debt shifting involves two parties, one affiliate in a high-tax regime and one in a low-tax regime. The affiliate subject to the lowest tax rate will be used as an internal bank. Interest income transferred here, will be taxed at the lowest tax rate possible for the MNC. Simultaneously, tax deductions on internal debt will occur in the affiliates facing a high tax-rate. Hence, the MNC will incur interest income taxed by the low tax rate (t_1), and get the interest costs in the high-taxed affiliate deducted. As a result, the MNC use the difference in tax rates, defined as the internal tax shield⁴⁰

$$(t_i - t_1) \cdot r \cdot D_i^I \quad (5)$$

The sum of all internal debt equals zero, as no internal debt is shifted out of the company. As the internal bank will always be the creditor, all debt manufactured here will appear on the debtor's balance sheet with opposite sign. Hence, we define the internal lending constraint formally as

³⁸ See Fuest & Hemmelgarn (2005) for more arguments for why costs of external debt are convex.

³⁹ To revisit the complete assumption, see "Assumption 1" (Schindler & Schjelderup, 2012, p. 638).

⁴⁰ To maximize the internal debt tax shield the issuer of the debt has to be the affiliate subject to the lowest tax rate (Mintz & Smart, 2004, p. 1152).

$$\sum_i r \cdot D_i^l = \sum_i r \cdot b_i^l \cdot K_i = 0 \quad (6)$$

In addition to the internal debt tax shield, internal debt also has non-tax benefits. Gertner, Scharfstein & Stein (1994, p. 1211) and Stein (1997, p. 131) argue that internal debt can efficiently allocate resources and reduce asymmetric information. Additionally, Hoshi, Kashyap & Scharfstein (2002, pp. 87-88) support these statements and add that internal debt is more flexible than external debt as it can be renegotiated often, and at low cost.

Capital markets can often be scarce, and external capital markets are not always able or willing to provide affiliates with more debt. Internal lending provides liquidity affiliates will need in order to finance projects. Otherwise, a lack of cash flow can make managers reluctant or unwilling to invest in profitable projects, raising the opportunity cost (Jensen, 1986, p. 1).

Furthermore, Fuest & Hemmelgarn (2005, p. 513) suggest that internal debt is not used to extreme proportions, meaning the internal leverage level must have an upper boundary. They continue by arguing that the boundary exists because national tax authorities are aware of the profit and debt shifting used by MNCs. As many governments introduce regulations to prevent thin capitalization, corporations dedicate more time and resources to circumvent the regulations. Typically, fees associated with engaging tax engineers and tax lawyers will increase with higher leverage, because guidance from tax experts is necessary to circumvent regulation (Møen et al. 2011, p. 6). Such costs, incurred by corporations attempting to circumvent regulation, will be referred to as concealment cost.

In the following part, concealment cost is defined as the sum of all costs and benefits, as a net cost term, $C^l(b_i^l)$. Similar to agency costs, concealment cost will exhibit convexity. The properties of the derivatives of concealment cost with respect to internal leverage rate are stated below. The positive sign of equation 7 confirms the convexity of this type of costs⁴¹.

⁴¹ We have not included the situation where internal debt is negative, as it does not provide any further insights relevant to our scenario.

$$C^I = C^I(b_i^I) > 0$$

$$\frac{\partial C^I(b_i^I)}{\partial b_i^I} > 0 \quad (7)$$

$$\frac{\partial^2 C^I(b_i^I)}{\partial (b_i^I)^2} > 0$$

4.3.3 The MNC

As we have defined the costs and benefits of each financing method, we can look at how the MNC will adjust the capital structure. This part will mainly follow the model created by Møen et al. (2011), with modifications by Schindler & Schjelderup (2012). Let π_i denote after tax profits of each affiliate i , and π be the consolidated profit for the entire MNC. Considering a one-period model, each affiliate will have the economic profit function π_i^e which is the price of the output produced, less cost of capital, agency and concealment cost. Similarly, each affiliate will have taxable profits π_i^t

$$\pi_i^e = p \cdot f(K_i) - [r + C^E(b_i^E) + C^I(b_i^I)] \cdot K_i \quad (8)$$

$$\pi_i^t = p \cdot f(K_i) - r \cdot [D_i^E + D_i^I] \quad (9)$$

The profit functions above are stated under the assumption that the cost of internal and external debt is not tax deductible⁴². In addition, normalizing the product price p to one leads to the true after tax-profit.

$$\pi_i = \pi_i^e - t_i \cdot \pi_i^t \quad (10)$$

$$\pi_i = (1 - t_i) \cdot f(K_i) - r \cdot K_i + t_i \cdot r \cdot [D_i^E + D_i^I] - [C^E(b_i^E) + C^I(b_i^I)] \cdot K_i \quad (11)$$

As we know, the sum of the after-tax profits of each affiliate is the total profits of the MNC. Consequently, we calculate the after-tax profits in each affiliate and aggregate across affiliate to find

$$\pi = \sum_i \pi_i \quad (12)$$

⁴² Although there exist arguments both for and against the tax deductibility of these costs, we still follow Møen et. al. (2011). Schindler & Schjelderup (2012, p. 639) present the contrary view.

Expanding equation 12 and including the internal lending constraint from equation 6, reveals the MNCs maximization problem

$$\begin{aligned} \mathcal{L}(b_i^E, b_i^I, \lambda) = \max_{(b_i^E, b_i^I)} \pi = \sum_i \langle (1 - t_i) \cdot f(K_i) - r \cdot K_i + t_i \cdot r \cdot [D_i^E + D_i^I] - \\ [C^E(b_i^E) + C^I(b_i^I)] \cdot K_i \rangle \\ - \lambda \left(\sum_i r \cdot b_i^I \cdot K_i \right) \end{aligned} \quad (13)$$

To simplify matters, we have transformed the optimization problem directly to the Lagrangian equation, enabling us to analyse optimal inputs for optimal capital structure. Theoretically, λ is the Lagrange multiplier used in maximization problems. Practically, λ is the shadow cost, also known as the tax payments of shifted interest.

4.4 The optimization problem

The theoretical analysis' main target is to investigate how total leverage is affected by certain debt parameters and changes in them. In order to perform this type of marginal sensitivity analysis, we want to know the marginal effect of a change in source of financing. In the following we will derive the first order conditions (FOCs) of internal and external debt to see how the MNC will adjust to both debt-inputs. Solving the Lagrangian equation, and correctly ordering the factors yields the FOCs

$$\frac{\partial \mathcal{L}}{\partial b_i^E}: \quad t_i r = \frac{\partial C^E(b_i^E)}{\partial b_i^E} > 0 \quad (14)$$

$$\frac{\partial \mathcal{L}}{\partial b_i^I}: \quad (t_i - \lambda)r = \frac{\partial C^I(b_i^I)}{\partial b_i^I} > 0 \quad (15)$$

Equation 14 tells us that the debt tax shield from external debt must equal the marginal agency cost in optimum. Intuitively, this is interpreted as the marginal revenue from incurring one unit of external debt. In turn, this equals the marginal cost of incurring that unit of debt. By employing one more unit of debt, the agency cost will surpass the debt tax shield, making this unit of debt unprofitable. Hence, the optimal amount of external debt is found when marginal tax savings from external debt balances marginal costs associated with that debt.

From the FOC in equation 15 we can see that the shadow price λ is, in optimum, as small as possible. The shadow price is the tax payments of shifted income meaning that λ will be equivalent with a tax rate. From section 4.3.2 we know that the lowest tax rate is that of the internal bank, thus making $\lambda = \min_i t_i = t_1$ in optimum (Schindler & Schjelderup, 2012)⁴³. As the left-hand side (LHS) of equation 15 is recognized as the debt tax shield of internal debt, we can state that the LHS will be the marginal earnings of incurring one extra unit of internal debt. The marginal earnings are here balanced by its counterpart on the right-hand side (RHS). The RHS is recognized as the marginal net cost of debt, as one unit of internal debt not only raises the debt tax shield, but also concealment costs. From traditional microeconomics, we conclude that if the MNC balances marginal earnings with marginal expenses, the FOCs will reveal the combination's optimum (Pindyck & Rubinfeld, 2013).

Summarized, the debt level of the MNC will increase as long as the benefit of the different tax shields exceeds the costs associated with each type of debt, making capital structure a combination of external and internal debt, and equity.

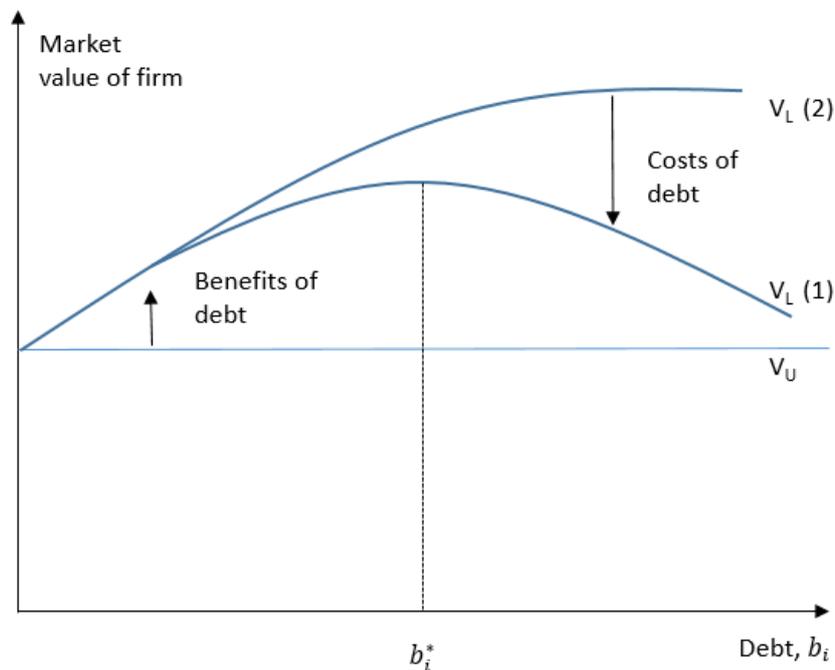
Equation 15 also gives us an interesting difference between MNCs and purely domestic firms. Considering the scenario where $i = 1$, then the LHS becomes zero. The intuition behind this is that if a firm faces the same tax rate as the internal bank, no internal debt tax shield is given. Therefore, no tax benefits exist for incurring more internal debt. Consequently, domestic firms can obtain internal debt, but the debt will be subject to the same tax rate, as such we can conclude that domestic firms have no tax incentive to use internal debt. As a result, MNCs will have higher total debt-levels than domestic firms (Schindler & Schjelderup, 2012, p. 640).

As we have seen, both internal and external debt exhibit costs and benefits, making a non-zero combination of the two optimal. Revisiting the comparison between the value of the firm, levered and unlevered, we can now extend equation 1 in section 4.1. to

$$V_L = V_U + PV(\text{benefits of debt}) - PV(\text{costs of debt}) \quad (16)$$

⁴³ To revisit the finding, see "Lemma 1" by Schindler & Schjelderup (2012, p. 640).

Recalling that total debt is the sum of external and internal debt, we can depict the difference between the levered and unlevered firm in graph 2.



Graph 2: Market value of levered/unlevered firms, with respect to the amount of debt. Source: Own illustration

Graph 2 shows the static trade-off theory of optimal capital structure, as freely interpreted by Shyam-Sunder & Myers (1999, p. 220). Benefits of debt (including tax shields) raise the value of the levered firm ($V_L (1)$) above the value of the unlevered firm (V_U). $V_L (2)$ represent the hypothetical situation where firm value is unaffected by the cost of debt. However, the costs associated with debt decreases firm value after the leverage level exceeds its optimum at b_i^* .

4.5 Effects of earnings stripping rules

In the following we will discuss the scenario where MNCs can increase debt-ratio beyond the tax deductibility limit of the ESR, but at a cost. Theoretically, the amount of tax deductions has a limit, but tax engineers and legal fees can help raise the limit for tax deductibility. As the limit of deductibility of the ESRs is dependent on EBITDA, this financial measure is subject to manipulation. Driving the EBITDA up, will increase the limit for tax deductibility, and there exist numerous methods to manipulate this (Berman & Knight, 2009). Through intra-group contributions between affiliates in a group, the EBITDA will increase, and as result, the limit of deduction as well (PWC, 2013, p. 4). Another way of circumvention is to establish new subsidiaries and move capital between them. As the

same amount of interest can be distributed to more subsidiaries, this method increases the maximum amount of deductible interest. This method of circumvention was proposed by Buslei & Simmler (2012, p. 7).

Typically, tax engineers will be hired and legal fees will be at a higher level than before. This type of expenditure will be a function of tightness of regulation and amount of internal leverage. As regulation is constricted, more resources are used to circumvent the regulation, which in extent raise the cost. Consequently, tightness of regulation in tax regime i will be denoted σ_i . As tightness is assumed non-negative, a slight modification is added to the function for concealment cost.

$$C^I = C^I(b_i^I, \sigma_i) \quad (17)$$

As tighter regulation increases the amount of costs needed to circumvent the regulation, an incremental unit of σ_i (tighter regulation) will lead to an increase of concealment cost. Formally, this relationship is described as

$$\frac{\partial C^I(b_i^I, \sigma_i)}{\partial \sigma_i} > 0 \quad (18)$$

As we can see from equation 18, the tightness parameter is only included in the function of concealment cost. This means that agency costs are not affected by how tight the regulation is, as these costs are not related to the strictness of the regulation, but are firm specific. Formally, we can represent this in the following way

$$\frac{\partial C^E(b_i^E)}{\partial \sigma_i} = 0 \quad (19)$$

4.5.1 Effect of tightening or introducing a TCR

Since we are studying the effects of debt-to-asset ratios of new TCRs in cases where there are previous legislations, and cases without previous restrictions, we need to study the sensitivity of tightness in both scenarios. Below we assume that an introduction of a rule in a tax regime with no previous ESRs is perceived similar as a tightening of the rule.

4.5.1.1 Tax regimes with previous rule

Adding the tightness parameter to the maximization problem⁴⁴, and taking the derivative with respect to internal leverage reveals the FOC from internal debt.

$$\frac{\partial \mathcal{L}}{\partial b_i^I}: \quad (t_i - \lambda)r = \frac{\partial C^I(b_i^I, \sigma_i)}{\partial b_i^I} \quad (20)$$

Once again, we can see that the MNC will balance marginal revenue (internal debt tax shield) with marginal cost (additional concealment cost) in optimum. As marginal tax savings is balanced against higher marginal costs, the multinational will decide upon a relatively lower part of internal debt.

As we are interested in the tightness of the rule we need the derivative of b_i^I with respect to the tightness of each affiliate σ_i

$$\frac{\partial b_i^I}{\partial \sigma_i} < 0 \quad (21)$$

Equation 21 reveals that there exists a negative relationship between an incremental increase in the tightness of the ESRs and the internal debt level. In practice, this means that MNCs will reduce the internal lending as rules are tightened. Intuitively, a tightening in ESRs increases the concealment costs, making the MNCs use more resources on legal fees and tax engineers, resulting in the RHS in equation 20 increasing, all else equal. Here, the tax shield is lower, and the company will decide upon a less leveraged capital structure.

4.5.1.2 Tax regimes with no previous rule

Considering the case where the tax regime has not yet introduced a TCR in its tax jurisdiction, we necessarily need to assume $\sigma_i = 0$. Intuitively, we can assume that no tax-engineering resources will be used when no rules exist to circumvent. Therefore, we can assume

⁴⁴ For simplicity, the maximization problem is not stated here. The only change to the maximization problem in equation 13 is the added tightness parameter in the concealment cost function.

⁴⁵ Using comparative statistics on equation 21, the complete calculation is as follows: $\frac{\partial b_i^I}{\partial \sigma_i} = -\frac{\partial^2 C^I(b_i^I, \sigma_i) / \partial b_i^I \partial \sigma_i}{\partial^2 C^I(b_i^I, \sigma_i) / \partial (b_i^I)^2} < 0$, since $\frac{\partial^2 C^I(b_i^I, \sigma_i)}{\partial b_i^I \partial \sigma_i} > 0$ and $\frac{\partial^2 C^I(b_i^I, \sigma_i)}{\partial (b_i^I)^2} > 0$.

$$C^I(b_i^I, \sigma_i) > C^I(b_i^I, 0) \quad (22)$$

Equation 22 tells us that concealment costs are greater for tax legislations with previous rule, than legislations without. This means that an implementation of a rule in a tax legislation will increase the concealment costs of the MNC. Similarly, we can interpret the introduction of a regulation as a tightening of the rules in this tax legislation. As seen from section 4.5.1.1, this tightening will increase concealment cost. Hence, we can conclude that an introduction of a rule will increase concealment costs of MNCs subjected to the rule.

Consequently, companies in tax regimes with no previous rule will, in theory, respond indistinguishably from companies in tax regimes with previous regulation when subjected to a tightening of a rule. Therefore, we generalize the findings in section 4.7.1.1, to also be applicable for tax regimes with no prior rule. As a result, the introduction of a new rule will affect the internal debt levels negatively, similar to MNCs in tax regimes where a rule previously existed.

As known from equation 2, the sum of internal and external debt of the affiliate makes up the total debt of that affiliate. Seeing as only internal debt is affected by the introduction of an ESR, we can conclude that the total effect on total leverage of will equal the effect of internal debt. Hence, as external debt is unaffected and internal debt is reduced, our model states that the introduction of the ESR will lower the total leverage. We can describe the relationship formally as

$$\frac{\partial b_i(b_i^I, b_i^E)}{\partial \sigma_i} < 0 \quad (23)$$

In addition, we assume that the cost of total leverage is a function of internal and external debt levels, and we assume these costs to be separable. This assumption is reasonable as we believe the agency cost to be solely related to the external debt. Similarly, the concealment costs are strictly associated with internal debt. In other words, increasing one type of debt does not indirectly affect the cost associated with the other. This relationship is formally described as

$$C(b_i) = C(b_i^E, b_i^I) = C(b_i^E) + C(b_i^I) \quad (24)$$

4.6 Implication for empirical analysis

Summing up the findings of the theoretical analysis we know that companies benefit from using debt as a source of financing. As internal and external debt carries both benefits and costs, companies will have an optimal debt-level that is neither 0% or 100%. Firms will balance the marginal benefits of debt to marginal cost, to find the optimal debt levels. Only MNCs have tax incentives to use internal debt for tax benefits, contrary to purely domestic firms.

In Norway and Finland, the ESRs' solely target internal debt. Following the theory stated above, we know that the rules will not affect external debt. Firms subject to these ESRs will respond by lowering their level of internal debt. They cannot lower the interest rate and maintain the same level of debt, as the interest rate is assumed to be fixed, in this model. This outcome is independent of whether the tax legislation transitioned from no previous regulation or a different TCR.

In Germany and Spain, the new ESRs target both internal and external debt. Our model does not include external debt. But, for separable agency and concealment cost, such as in our model, the effect of tighter regulation on external debt will be analogous to the effect on internal debt. *Mutatis mutandis*, we can conclude that external debt also should decrease in response to a tighter rule. Hence, our model predicts a decrease in total leverage whenever a rule is tightened.

The theory states that when introducing ESRs the TDAR of affected affiliates in countries with no previous regulation, will fall. However, the theory does not provide an answer to the definite effect of introducing ESRs to a tax regime regulated by SHRs. When moving from a safe harbour rule to an earnings stripping rule, TDAR may both increase or decrease depending on which is deemed tighter. If the previous legislation is deemed tighter, the ESRs will be perceived as a loosening of the rules. Following equation 23 we will then see an increase in TDAR. Conversely, if the ESRs are perceived tighter than the SHRs, we should see a decrease in TDAR. As a result, we could see two different outcomes in our analysis. These outcomes link the theoretical analysis with our research question, and can be formulated through the following hypotheses.

H1: A tax legislation introducing an ESR will trigger a reduction in total leverage of the affected firms

H2a: The ESRs are tighter than the previous legislation, and the multinationals will reduce their TDAR.

H2b: The ESRs are looser than the existing regulation, and the multinationals will increase their TDAR.

The model presented in 4.3 to 4.5 provide the theoretical optimal capital structure of the firms subjected to ESRs. However, the model only depicts a simplified version of the complexity in firm's choice of capital structure. An example of this is the assumption of constant interest rate, which is a rather strong assumption. If they were allowed to adjust interest levels, MNCs could have kept the same leverage ratio, and reduced the interest rate to not exceed the limit of deductibility. Through their influence on internal interest rates, we could see a substitution effect from transfer pricing to debt shifting.

We have chosen two split our second hypothesis to cover both potential outcomes of introducing ESRs to a country with existing regulations. The analysis in section 8 will give us the evidence needed to discard and keep the correct hypothesis based on our results. As explained in section 2.5.3 Germany's SHRs are among the strictest in Europe, hence we believe hypothesis H2b to be the most likely outcome among German affiliates. However, we are unable to produce a similar prediction in the non-EU group in Spain, as their SHRs are less strict, following the insight provided in section 2.5.4.

5 Data

5.1 Presentation and trimming of data

In order to analyse the effects of ESRs in the four countries, we use data we have gathered from the Amadeus database. The database is provided by Warthon research data services (WRDS), and we can access both the financial and ownership data of affiliates through Bureau van Dijk. We have collected data from the years 2005 to 2015 for all the selected sample countries.

The sample period between 2005 and 2015 is carefully selected. Firstly, 2005 is the first year after the Lankhorst-Hohorst ruling in 2004⁴⁶ (Ruf & Schindler, 2015, p. 20). This ruling prevented national thin capitalization regulation to only target affiliates in Germany with foreign parents. After 2004, the regulation would apply to all firms, regardless of where the parent firm is situated. Likewise, Spain chose to remove restriction on EU-based firms, and apply their SHRs solely to the non-EU group. Before 2005, the Lankhorst-Hohorst ruling heavily influenced TCRs, and, in extent, the TDAR of a firm. Therefore, it could be difficult to estimate the causal relationship between the ESRs and TDAR, by including years from before 2005. In conclusion, the year after the Lankhorst-Hohorst ruling is a solid starting point for our sample period. 2015 is the last year of data Amadeus could provide us with complete financial data, and marks the end of the sample period.

Furthermore, we have obtained data solely on the firms that Amadeus characterize as “Very Large”⁴⁷, which are the firms we believe are the most relevant. These companies are the most likely to be affected by the thin capitalization rules. Smaller firms are assumed to have lower interest cost, thus more likely to be exempted from the rule, as the minimum interest cost criterion is not met. Hence, we assume that the exclusion of smaller firms would not reduce the quality of the inference.

⁴⁶ The Lankhorst-Hohorst ruling was a decision by the European Court of Justice (ECJ), making it illegal to only target non-residents of the country with thin capitalization rules. The former German rules were designed in a way that exclusively targeted foreign companies in Germany, and the ECJ stated that this contravened the freedom of establishment. After the ruling, Germany modified their TCRs to also apply to German affiliates.

⁴⁷ “Very large” is defined by Amadeus as an affiliate with at least one of three criteria. Operating Revenue need more than 100 million EUR, total assets must be more than 200 million EUR or each firm must have more than 1,000 employees.

Amadeus provides us with the ownership-status of firms, which enables us to identify which firms have multinational status and which firms that are purely domestic. Amadeus defines subsidiaries as affiliates with a parent company owning a controlling part of the subsidiary⁴⁸. Based on Amadeus' definition, we can assume that the parent companies of these subsidiaries can affect the debt levels of that affiliate, thus exerting influential control. The data contains information on subsidiaries and parent companies located in all sample countries, and subsidiaries located in the sample countries with foreign parents. The data provided by Amadeus only provides ownership status, which is time-invariant. This means that the affiliates that are classified as subsidiaries to a foreign parent company are either considered as multinationals throughout the entire sample period, or not at all. Likewise, affiliates with foreign subsidiaries will be classified as multinationals for the entire time period. Firms that have become multinational during the time-period will also be classified as multinational for the entire period.

5.1.1 Data trimming procedures

The total amount of unique "Very Large" firms is 16,974, which sums up to a total of 191,817 observations before trimming. We start the trimming of the sample by excluding the abnormal values. Firstly, we remove firms with TDAR higher than 1, or lower than 0, firms with age over 268 and firms with negative assets and/or negative tangible fixed assets⁴⁹. We find these companies to represent outliers or firms with incorrect reported financial numbers. These firms will obviously weaken our analysis and inference. Additionally, we remove the firms that have not reported enough data to provide us with TDAR. The total observations removed after these procedures sum up to 8,718 observations.

By accessing the firms' industries, we can trim the dataset of firms that belong to industries that are exempted from the regulation. Financial institutions, insurance, and funds are excluded from the earnings stripping in all the countries, as explained in section 1.5. Firms within the petroleum industry are exempted from the Norwegian ESRs, and are therefore omitted. When removing the firms that belong to these industries we remove 22,251 observations.

⁴⁸Amadeus defines subsidiaries as affiliates where firms own at least 50% of the shares.

⁴⁹ Firms older than 268 years were double-checked and found to have incorrectly reported their age.

Additionally, we remove the affiliates that Amadeus has classified as incomplete. The firms that have either limited reported financials or lack recent accounts, are excluded from the sample. These affiliates have filed for bankruptcy, closed or otherwise provided Amadeus with insufficient data. Amadeus gives us both consolidated and unconsolidated data. The consolidated observations are the parent's and affiliate's total activities, while the unconsolidated numbers show the activities of each affiliate (Huizinga & Laeven, 2006, pp. 1169-1170). As we are investigating the TDAR of the affiliates, we remove the consolidated observations. Removing these observations trim the dataset of 85,409 observations.

Finally, we need to remove duplicates and affiliates that lack observations before and after the treatment. Duplicates would weaken our analysis, as we may risk concluding on false assumptions and observations. By removing the duplicates, we remove 6,389 observations. To ensure that all affiliates could be affected by the reform, we remove all firms that do not have at least one observation prior to and at least one observation after the introduction. By removing the affiliates missing observations on both sides of the treatment, we trim the dataset with 4,616 observations. Our final sample then consist of 64,434 observations, or 33.59% of our initial dataset.

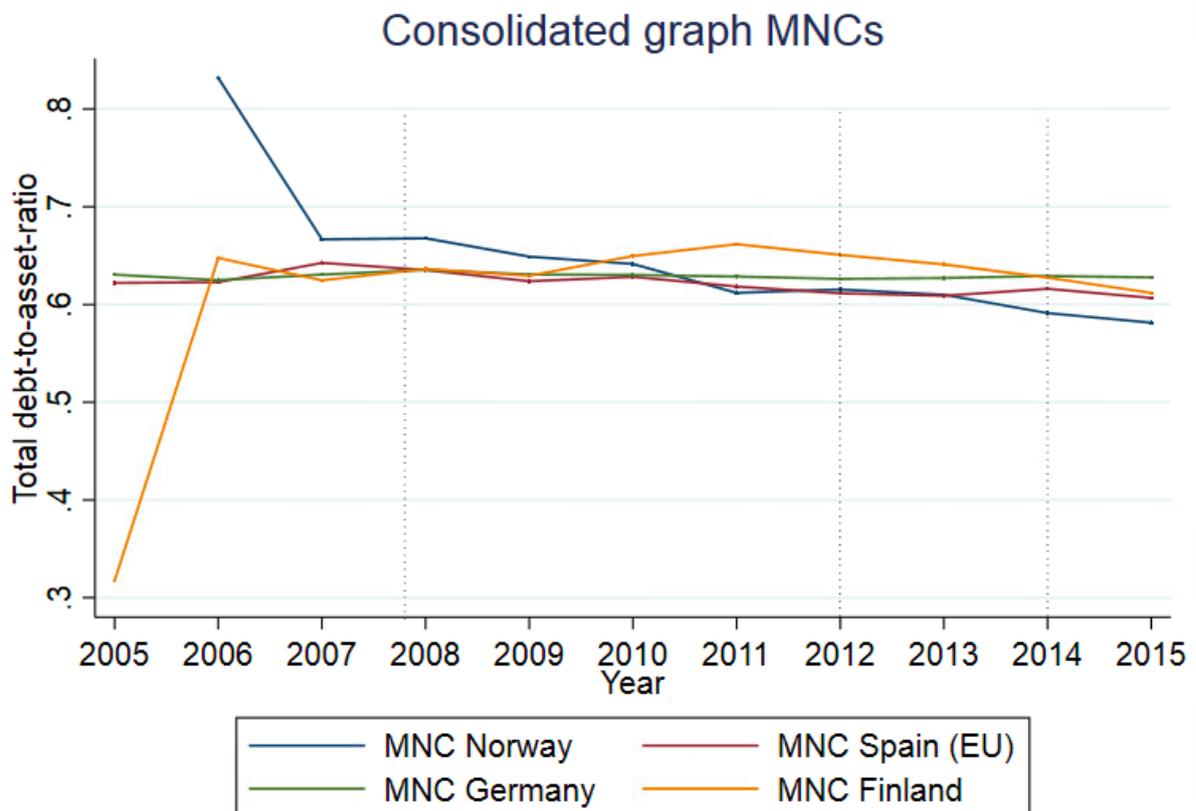
	Number of observations	Percentage of original dataset
(1) All observations from Germany, Norway, Finland and Spain from 2005-2015	191,817	100 %
(2) Drop observations with abnormal and missing values	183,099	95.46 %
(3) Drop industries excluded from the rules	160,848	83.85 %
(4) Drop insufficient data, and consolidated observations	75,439	39.33 %
(5) Drop duplicates	69,050	36.00 %
(6) Drop affiliates without observations on both side of treatment	64,434	33.59 %
Final sample	64,434	33.59 %

Table 3: Data trimming

5.2 Descriptive statistics

5.2.1 All sample countries

In order to visually get an overview of the data after the trimming, we have chosen to present a selected sample of graphs. The following graph shows the average total debt-to-asset ratio among MNCs in the four countries through the period. The dotted lines represent time of treatment of the different countries. The first dotted line is the year of treatment in Germany, the second is the year of treatment in Spain, and the third line is the year of treatment in Norway and Finland, which introduced the tax reform simultaneously.

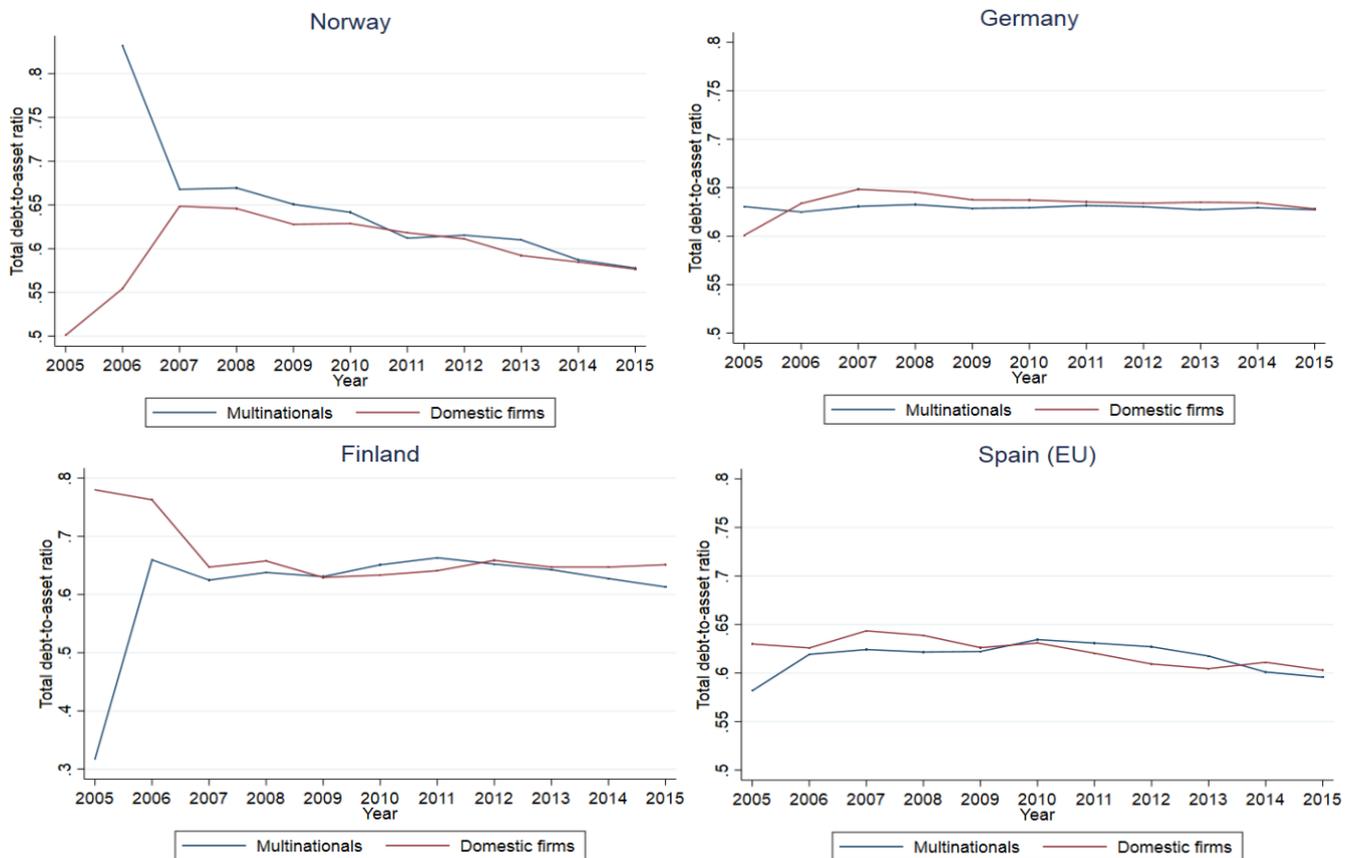


Graph 3: Consolidated graph of the average development of TDAR of MNCs

From graph 3, we see that these markets have quite identical level of TDAR amongst their multinational companies from approximately 2007. In 2005 and 2006, both the Finnish and the Norwegian MNCs seem to have abnormally large fluctuations. Nevertheless, we can see a common downward sloping trend among all MNCs in the later years. Over the next few sections we will look closer at how the development has been in each country, and compare it with the development of the domestic control group. The graphs consist of TDAR-ratios from the two sample groups in our study, namely MNCs and domestic firms. As the ESRs

only affect one of the groups, this visual presentation may indicate how the MNCs are affected by the rules, relative to the domestic firms.

5.2.2 The four countries



Graph 4: Development of average TDAR within the four countries

The four graphs above show the movement in TDAR of the firms within the different countries over time. These graphs alone cannot verify or discard if the rules have had the intended impact on the firms. These can only indicate responses and provide us with a graphic description of the average of the data.

Nevertheless, we can observe if there are indications that firms are adapting to the rule before it is taken into effect (signalling effects), or if the speed of responsiveness of the firms to the ESRs is high or low. However, since the graphs only present the average of all firms in the two groups, individual differences are not taken into account, and the descriptive statistics should not be used as stand-alone evidence in favour of changes in TDAR.

The Norwegian graph shows sign of early adaption. The MNCs seem to experience an average drop in TDAR from 2013 to 2014, the year the tax reform was proposed. There is a

clear downward trend amongst the control group, and there seems to be little to no response to the shock of the new rule. The development corresponds well with the theory that the control group should not be affected.

Much like the Norwegian graph the Finnish graph shows signs indicating a signalling effect before the introduction of the ESR. The Finnish tax reform was first proposed in 2012, two years prior to its introduction in 2014. The MNC-line shows a downward trend from 2012, that may stem from companies starting to adapt to the anticipated change in legislation. As witnessed in graph 3, both the Finnish and Norwegian graphs indicate substantial noise in the period of 2005 to 2007.

As the German sample is the only one that is entirely regulated by strict safe harbour rules before the introduction of the earnings stripping rules, it is natural that the reaction of these MNCs are different to the reactions we see in the other countries. As it seems, the MNCs have a stable development of TDAR without large variations throughout the years. Domestic firms seem to have a stable higher leverage-ratio than multinational firms. This relationship is equal after 2006. It is possible that the firms may still adapt to the Lankhorst-Hohorst ruling in 2005, as we can observe opposite development in this year.

The Spanish graph is the only one that seem to move differently than we would expect⁵⁰. The MNC-line seem to be affected by signalling effects, similar to the effect observed in both Finland and Norway, except it turns positive at the time of treatment. There are numerous reasons to why the line develops as it does, but it seems that the Spanish rules have had a different effect than intended based on the graph above. Spain have, as the only country in our sample had split rules for their market, which may be the reason that we see a result different from what we see in the other countries. This will be further discussed in our analysis in section 8.2 and 8.3. Additionally, there are two countries that became members of the EU in 2011, which may affect the line's trajectory. When joining the EU, the domestic firms will move from being subject to the non-EU regulations to the EU regulations. Hence, they are no longer bound by the safe harbour rules.

⁵⁰ We have chosen to exclude the Non-EU firms from our analysis, as the sample is too small, and the movement of the line is affected too much by the movement of a few firms, further explained in section 8.3.

5.2.3 Descriptive figures

Table 4 and 5, converts the descriptive graphs above to quantitative measures. The tables show the average TDAR of each country, before and after the introduction of the rule, specified for domestic and multinational companies⁵¹. As we know, the domestic companies serve as a control group for the MNCs, but it seems that several firms in this group have also reduced their TDAR in our sample period. German, Spanish and Norwegian firms all have a reduced average in TDAR, ranging between -1% to -1.5%. Finnish domestic firms however, seems to have an upward trend in average TDAR from 2013 to 2015.

Regarding the treated firms, the MNCs, we see a reduction in average TDAR in every country, with different magnitudes. Ranging from 0.2% in Germany to approximately 3% reduction in Norway and Finland, we can point out an average downward trend.

Domestic firms			
	Pre-Treatment	Post-Treatment	Difference
Germany	0.6484	0.6375	-0.0109
Spain	0.6309	0.6175	-0.0134
Norway	0.5922	0.5767	-0.0155
Finland	0.6472	0.6513	0.0041

Table 4: Descriptive statistics of average total debt-to-asset ratio for domestic firms, before and after treatment

⁵¹ As we only require companies to have at least one observation before and after the introduction the rule, we do not have a balanced panel. Therefore, it would make no sense to pool all observations for one country and obtain the average of that. For this reason, we have obtained the average of one country's TDAR one year before and one year after the introduction, consequently assuming these companies to be representative for the entire sample of this country.

Multinational firms			
	Pre-Treatment	Post-Treatment	Difference
Germany	0.6307	0.6287	-0.0020
Spain	0.6204	0.6046	-0.0158
Norway	0.6101	0.5779	-0.0322
Finland	0.6427	0.6130	-0.0296

Table 5: Descriptive statistics of average total debt-to-asset ratio for multinational firms, before and after treatment

We can also state the difference between the size of the control and treatment group, by looking at table 6. This table shows the total number of firms in the year of 2014, specified by country⁵². We can see that the German observations represent the majority of the total dataset. Germany and Norway have an unbalanced proportion of domestic firms, with about 66% and 72% domestic firms, respectively. Conversely, we see that Spanish and Finnish multinationals are about equal to the number of domestic firms.

Country	Domestic	Multinational	Share of domestic firms	Total
GERMANY	2,360	1,253	65%	3,613
SPAIN	916	911	50%	1,827
NORWAY	646	244	72%	901
FINLAND	157	191	45%	348
Total	4,079	2,610	61%	6,689

Table 6: Number of unique firms, domestic and multinational firms, by country, in 2014.

5.2.4 Control variables

So far in this thesis, we have presented the theoretical arguments for how a firm should make capital structure decisions. However, the theory does not always depict the reality. The choice of a firm's capital structure is a complex decision, with many factors to consider. Therefore, we believe that estimating TDAR is a process with many variables, and it's not

⁵² Our data does not require consecutive observations for every year in the sample period. A firm is omitted if does not contain at least one observation before and after the introduction of the ESR in its country. This makes our panel data unbalanced. It makes no sense to look at total observations, as one firm could be counted as much as ten times, and as little as two. Therefore, we have chosen to present the observations from the year of 2014, which is the year with the most observations, making it the best proxy for the number of unique firms we can provide.

solely a question of whether the firm is multinational or not. Only considering the ownership-aspect of the capital structure decision, would induce a problem with omitted variables. To avoid omitted variable bias we have chosen to include three control variables.

We have included a proxy for profitability as one of the control variables. Profitability can provide an indication of the amount of debt a financial institution is willing to lend to an affiliate (Huizinga & Laeven, 2006, p. 106). We have gathered data of the companies' EBIT, as this contains information about the firm's ability to generate cash flows, which we believe to be a good measure for profitability. In our thesis, we have defined profitability as EBIT relative to total assets, as the assets scale EBIT properly, so that it can be used as a comparable measure.

Additionally, we include tangible fixed assets as a control variable. These assets are easily valued, and therefore a strong indicator of a firm's ability to obtain debt (Drobtz & Fix, 2005, p. 88). These assets could also serve as collateral for potential creditors. Therefore, we believe that the amount of tangible fixed assets has a significant explanatory power when regarding TDAR. Scaling tangible fixed assets with the amount of total assets, make up the term "share of tangible fixed assets". In conclusion, not including tangible fixed assets could possibly be a source of omitted variable bias.

Thirdly, we have included assets of the firms, as a proxy of the firms' size. Assuming that large firms are perceived as more solid by credit institutions, large firms will easier be granted loans. Hence, we expect to see a positive relationship between TDAR and assets. These three variables are our control variables. We believe that these add data and depth to our analysis, in addition to prevent our regression to suffer from omitted variable bias.

A quantitative presentation of the control variables is attached in the appendix⁵³. We can see that the average profitability of domestic firms before the treatment ranges between 4.8%-7.3%. Notably, all countries seem to experience a drop in profitability, except Finland, with the Norwegian firms exhibiting negative profits. For the multinationals, all countries experience a marginal drop or no change. As for tangible fixed assets, we can see that multinationals have substantially lower average than the domestic firms, though the

⁵³ An analysis of the control variables is not the focus of this study, thus we put the tables in the appendix (Appendix A) and only present and analyse these briefly.

treatment does not alter the average significantly. Total assets seem to be ambiguously affected by the introduction of the rule. Some countries increase the average amount of assets, while some countries do not. Furthermore, we can see that the average amount of assets is higher for MNCs than domestic firms, in all countries.

6 Empirical approach

In this section, we will explain our method and approach of analysis. Mainly, we will introduce the method, and why this approach enables us to answer our research question. We will explain the effects and prerequisites of a difference-in-difference-model, before we discuss the advantages of using fixed effects for our sample of data.

6.1 Treatment and control group

With the data presented in section 5 as a foundation, we define which firms belong to the treatment group and control group. In our analysis, the treatment group represents the firms that are most likely to be affected by the new law, the multinational companies. Conversely, the control group consists of the firms that we assume to be unaffected by the new tax reform, the domestic firms. Further explanation on how we have divided the sample and which firms we have excluded from the treatment/control groups is explained above in section 5.

6.2 Difference-in-difference (DiD)

To study the effects of introducing an ESR in different tax regimes, we will use a DiD-approach. The DiD compares two groups from the same population which are assumed to be as equal as possible, over a period of time. During that period of time, a treatment is imposed on the sample, to which the affect should only be seen in one group. As the other group is unaffected by the treatment, this group will follow the same trend as before. The difference between the groups after the treatment will thereby reveal the true impact of the treatment. To be sure that the DiD provides the correct result there are certain prerequisites that need to be fulfilled.

Firstly, the method demands that the two groups are unaffected by the treatment before it is put into action (Lechner, 2011, pp. 178-179). Translated to our scenario, this prerequisite requires that none of the firms react to the new tax reform before it is legally binding. If we observe these kinds of signalling effects, the DiD will wrongly calculate the effects into the common trend. As such, the difference measured will not be the true impact of the treatment.

In conclusion, signalling effects will violate this prerequisite, and therefore decrease the validity of the method.

The second prerequisite of the DiD method is the assumption of a common trend for both groups (Lechner, 2011, pp. 179-180). If the treatment was not imposed, the two groups should follow the same trend throughout the period. If the two groups do not share a common trend, the measured effect of the treatment may include other exogenous effects. Therefore, if they do not follow the common trend, the effect measured will still be directly attributed to the treatment effect, even though the difference does not originate fully from it. To exemplify, if the Norwegian MNCs were to decrease their TDAR for other reasons than the introduction of the regulation, we would not be able to separate the treatment effect from that exogenous effect. As examined in section 5.2.2 we assume the prerequisite to be fulfilled⁵⁴. We will further test the robustness of these assumptions in section 8.6.1.

We have data spanning over ten years, providing the DiD with a lot of information regarding the common trend. Including this quantity of data gives us a solid foundation to calculate a common trend. If we only used one observation on either side of the treatment, and assume that the development we observe is the true development of the firms, this could be a source of error. Even when including year-fixed effects, the observed development could be the result of an exogenous shock to the population. Hence, the inclusion of more than one year gives us a more accurate calculation of the common trend. However, there are some implications of including more data. Increasing the number of years, may increase the amount of noise in the dataset. As we observed in section 5.2.2 there are indications of such noise in Norway and Finland. Between 2005 and 2007 we observe variations between our control group and the treatment group. Such variations could indicate the lack of a common trend, and if so invalidate the DiD. We assume the prerequisite to be fulfilled in our main regression, and will further test this assumption in section 8.6.

⁵⁴ As described in section 2.5.3, the German statutory tax rate was cut with ten percentage points in 2008, the year of treatment. As explained in section 2.5.3 this tax rate applied to both groups equally, and we assume that the treatment effect does not contain a tax rate change effect.

6.3 Fixed effects

The use of panel data gives us the opportunity to include several fixed effects in our model. Fixed effects are unobserved latent characteristics of one group or entity within the sample. To exemplify a type of fixed effect, if a firm's debt level follows a different trend than other firms in the sample. Such a trend may indicate that the firm possess individual characteristics, enabling them to attain more debt than comparable firms.

Using a fixed effect model, we can control for these unobserved characteristics. If there exist fixed effects in our data and we do not control for them, variables that explain changes in the TDAR will end up in the error term. This is potentially a source of endogeneity problems, and in extent, we would not be able to see the causal effects of introducing new tax regulations to TDAR. Therefore, including fixed effects is necessary for us to answer our research question, and be certain that our output from the empirical analysis represents the causal relationship between the introduction of tax reforms and multinationals' debt-levels. Hence, we need to control for the fixed effects we believe can cause endogeneity.

We have identified three layers of fixed effects that we need to control for. Firstly, we have included the firm-level fixed effects. We believe that there exist latent characteristics within each firm that somehow determines their debt level. As we know, the debt level of some firms or line of businesses can solely be a product of the firm's individual situation. For instance, one shipping company will attain a high level of debt as their line of business often has substantial investments in tangible assets. Compared to lines of businesses that are not equally capital intense, as audit-companies, we can see large differences in debt levels. The difference between the shipping and the audit company that is solely a product of their individual situation, can be controlled for by including firm-fixed effects.

Secondly, we believe that each country contain certain characteristics that make debt levels among them different, giving rise to country-fixed effects. For example, if accessibility to debt is higher in Germany than in Norway because of German government regulations, German companies are more likely to have higher debt levels than comparable Norwegian firms. This represents one example of unobserved heterogeneity, and we include country-fixed effects to control for this.

Thirdly, we believe that each year has characteristics that affect debt levels. Including year-fixed effects will even out exogenous shocks to debt levels, in different points of time.

We have pooled country- and year-fixed effects, resulting in country-year-fixed effects. Including this fixed effect captures aggregate shocks occurring, in different points of time in different countries.

6.4 Final regression model

To test the hypothesis that TDAR will be reduced as an effect of introducing the ESRs (H1), we have computed the following regression

$$TDAR_{ijt} = \beta_1 \cdot (Treatment \times MNC)_{ijt} + \rho \cdot X_{ijt} + \alpha_i + \gamma_{(j-t)} + \varepsilon_{ijt} \quad (25)$$

$TDAR_{ijt}$ represent the total debt-to-asset ratio for affiliates i in country j at time t . β_1 is the coefficient of the interaction term for MNCs after treatment. MNC is a dummy variable, indicating 1 if a firm is multinational, and zero otherwise. The same goes for Treatment, except 1 indicates an observation of a firm after the treatment, zero otherwise. Hence, β_1 represents the causal relationship between TDAR and the rule's true effect⁵⁵. α_i denotes the firm-fixed effects and $\gamma_{(j-t)}$ represents the country-time-fixed effects, while ε_{ijt} represent the idiosyncratic error term. Additionally, we define the control variables' coefficient as ρ . X_{ijt} symbolise the three control variables we have in our regression:

$$X_{ijt} = Profit_{ijt} + Share\ of\ TFA_{ijt} + Assets_{ijt} \quad (26)$$

As mentioned in section 5.2.4, these control variables are included as they significantly affect a firm's ability to obtain debt, and are chosen based on the studies by Huizinga & Laeven (2006) and Drobetz & Fix (2005). As a measure of profitability, we use the firm's earnings before interest and taxes relative to total assets. Secondly, we use the share of tangible fixed assets relative to total assets, here called "Share of TFA". Finally, we use total assets as proxy for firms' size, which is measured in 100 million.

⁵⁵ Normally, the standard DiD-model includes the terms that the interaction term consists of. In our scenario, these are the dummy variable to indicate which firms are multinational (MNC), and a treatment dummy to indicate the treated years of all firms (Treatment). When using fixed effects, any variable that is constant within the panel will be collinear with the fixed effect and will thereby be omitted. As the MNC-dummy is constant over time and the Treatment-dummy is the same for all firms, these are omitted. These are always zero and does not explain further variations in TDAR, hence they are not included in the presentation of the model.

6.5 Cluster in the regression

Cameron & Miller (2014, p. 7) describe that the DiD-method often has highly serial correlated regressors, even when including fixed effects. They claim that this serial correlation will potentially cause severe differences between the default standard errors and cluster-robust errors. This means that the standard ordinary least squares (OLS) assumption regarding zero conditional mean is likely to be violated when using the DiD without cluster-robust errors.

It is logical to assume that our observations are not completely independent from one another, possibly violating the zero conditional mean assumption. For instance, debt levels of one Norwegian firm in one particular line of business is likely to be highly correlated with a Norwegian firm in the same line of business. In extent, the errors for the same observation pair are also likely to be correlated. Inspired by Buettner et al. (2012) we perform the regression analysis using cluster robust-estimators, in order to relax the zero-conditional mean assumption. Cluster-robust standard errors allow for correlation of residuals within the clusters specified (Angrist & Pischke, 2008, p. 15). Since we cluster on country-year, the only assumption we need to be true is that the observations in one cluster are independent from the observations in the other clusters. Relating to our scenario, observations of firms in Norway in 2010 can correlate with observations from the same country in the same year, but not with a Finnish firm in 2010.

7 Empirical results

In this section, we will present the findings from our empirical study. We have two regressions we use as the basis to analyse and explain the development of firms' total debt-to-asset ratio in our selected countries. The point of departure for the analysis is to present our findings, and thereafter discuss and interpret the findings in section 8. In extent, we examine if the results are in line with the theory previously presented, and whether or not they support our hypotheses.

In both regressions in table 7, we define the dependent variable as the total debt-to-asset ratio, and the independent variables are either interaction terms or control variables. Each country has a single interaction term, except for Spain which is split into two sub-samples. Along with the interaction terms, we have control variables in each regression. In column (1) we have clustered at country-year level, and in column (2) we have excluded Norwegian and Finnish firms for 2005 and 2006. As a result, we are able to test if these years are invalidating the prerequisite of a common trend in the two countries.

Table 7 Main regression

	(1)	(2)
	TDAR	TDAR
Interaction Finland	-0.019** (0.007)	-0.019** (0.007)
Interaction Germany	0.006** (0.003)	0.006** (0.003)
Interaction Norway	-0.009** (0.003)	-0.008** (0.003)
Interaction Spain, EU	-0.007 (0.007)	-0.007 (0.007)
Interaction Spain, non-EU	-0.004 (0.009)	-0.004 (0.009)
Profitability	-0.012 (0.018)	-0.012 (0.018)
Tangible Fixed Assets	0.043*** (0.014)	0.044*** (0.014)
Assets	0.002*** (0.000)	0.002*** (0.000)
R^2	0.822	0.823
Observations	59657	59581
Country-year-fixed effects	Yes	Yes
Firm-fixed effects	Yes	Yes
Clustered at country-year level	Yes	Yes

Cluster-robust standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As we see in column (1), there is a clear and significant reaction in all of Norway, Germany and Finland. All three find their MNCs to significantly adapt their capital structure as a response to the ESRs. In Norway and Finland, the MNCs reduce their TDAR with 0.9 and 1.9 percentage points, respectively. The German MNCs respond by increasing their TDAR with 0.6 percentage points. All of these results are significant at a 5%-level. Additionally, we find the reaction of Spanish affiliates to be insignificant. We observe a negative coefficient for both sub-samples, but they are not significant, making us incapable of concluding on the Spanish affiliates' reaction.

As we can see from column (2), removing the first two years in Norway and Finland does not alter the regression severely. The difference in column (2) is that the Norwegian interaction term is decreased by 0.1 percentage point, relative to column (1). As the results have only marginally changed in column (2), we will continue our analysis with column (1) as our focus.

7.1 Control variables

We argued in section 5.2.4 that the profitability of each MNC would affect the corresponding debt-levels. Recalling, increased profitability is associated with creditors increasing their willingness to lend capital. However, looking at our results, we find that increased profitability is negatively related with debt-ratio. Although counter-intuitive and opposite of our main assumptions, other studies show similar results⁵⁶. This is in line with the modified pecking order theory proposed by Myers & Majluf (1984). The theory states that firms might prefer to finance new investments by internal financing (i.e. profits), not debt. However, profitability remains insignificant in both columns.

Moreover, the tangible asset ratio has a positive effect on total debt-to-asset ratio, and is statistically significant. We assumed that the amount of easily valued assets can be held as collateral, and is proportional with creditworthiness, and in extent, debt levels. The regression output tells us that our predictions align with the results. An increase in “Share of TFA” will significantly and positively affect TDAR.

Finally, the variable of total assets is also statistical significant and has a positive sign. Recalling that this variable is measured in hundred million, making an increase of one hundred million in assets increase TDAR with 0.2 percentage points. Notably, the sign is positive, in line with our assumptions in section 5.2.4.

As these control variables do not directly answer our research question, we will not analyse them further.

⁵⁶Both Huizinga et al. (2008) Frank & Goyal (2003) and Buettner et al. (2012) show the same results, where Frank & Goyal use EBITDA/assets as indicator of cash flows in the subsidiary, and Buettner et al. use the log of sales.

8 Discussion of results

8.1 Norway & Finland

As we can see from section 5.2.2 the development in TDAR in the average multinationals and average domestic firms is to some degree similar in Norway and Finland. The regression output in section 7 shows that the development is to some extent equal. We find statistical evidence supporting the theory that an introduction of ESRs in a country with no former rule will in fact lower the total-debt-to asset ratio of firms bound by the rule.

The objective of the ESRs is to curb tax avoidance. With significant negative coefficients for the TDAR amongst MNCs in Norway and Finland, we can conclude that multinationals are reducing their debt levels. Specifically, Norwegian and Finnish MNCs have reduced TDAR with 0.9% and 1.9%, relative to domestic firms. The reduction of debt will in turn reduce the amount of deductible interest costs, hence the ESRs have been able to limit the amount of tax avoidance performed by the MNCs.

However, we are only able to observe if the total debt-to-asset ratio has been affected, thus we are unable to identify an affiliate's change in the level of internal and external debt. We cannot investigate the potential effects of MNCs replacing non-deductible internal debt with deductible external debt. As our dataset limit our analysis to total debt, such a substitution effect would reduce the measured impact of the ESRs.

8.2 Spain (EU)

The Spanish laws differ from those in the other countries, as explained in section 2.5.4. As a result of the different restrictions among Spanish affiliates we will analyse Spain in two parts. This section will be dedicated to analysing the firms that were not previously regulated by the country's SHRs. The scenario for these firms is analogous with the scenario in Finland and Norway, as MNCs in these countries are not previously regulated when subjected to an ESR. The key exception here being that the Spanish rules target total debt, not only internal debt.

The Spanish MNCs have reduced their debt ratio relatively to the domestic firms by 0.7%. This is in line with the results from Finland and Norway. However, the reduction is not

significant, invalidating the magnitude and sign of the coefficient representing the changes in the total debt-to-asset ratio. Consequently, we have not found evidence in Spain supporting the hypothesis H1 that the new ESRs will lead to a statistical significant reduction in TDAR.

We have identified three possible explanations to why the change is insignificant. Firstly, the Spanish firms may have found a way to circumvent the rules. Secondly, our dataset may suffer from not being generalizable for all businesses in Spain. Finally, the results could suffer from firms either responding earlier or later than the year of introduction, invalidating the DiD.

Our study does not point out whether firms are successful in circumventing the regulation. However, if some firms are successful in circumventing the regulation, these could distort the effect of the ESRs, resulting in insignificant results. A supporting argument for possible circumvention is that there are clauses that exempts businesses from being bound by the rules. We are unable to investigate, or conclude on, this possibility with the data at hand.

Another plausible explanation is that our dataset is not generalizable for all businesses in Spain. For instance, if the sample is too small, meaning too few companies are observed, our regression would estimate coefficients which does not represent the true population parameter. As we know, different lines of businesses are subject to exogenous shocks which affects each company differently. One of these shocks can be new tax regulations, but the existence of shocks with opposite effect is possible as well. The sum of these shocks' effect on the TDAR can override the total response to the ESR making the net change insignificant. If the sample size is small, the dissimilarities between the corporations within the sample may cause the inference to be subjected to this problem. As we have 17,367 observations, we believe that this is not the reason for why we have obtained insignificant results.

If Spanish firms react slower or quicker than first anticipated, we will not see the significant reduction we expect. Spain introduced the ESRs to full effect from the beginning of 2012, and we should be able to see a reduction immediately after that⁵⁷. Nonetheless, a plausible explanation is that firms have already reduced their TDAR, prior to the introduction. As new laws need to be proposed and voted over before their introduction, Spanish firms might have anticipated the regulation. If this is the case it would violate the first prerequisite of the DiD,

⁵⁷ As seen in the studies by Blouin et al. (2014), we know that MNCs react quickly to new legislation.

that firms should not react to the treatment before its introduction. We will further analyse this in the lag/lead-analysis in section 8.6.1.

8.3 Spain (Non-EU)

As mentioned earlier in section 5, our dataset consists of European data. The resulting observations in the group of non-EU affiliates sum up to 158. With such a small sample, we are unable to provide proper statistical inference, and as presented in table 7, the coefficient is far from significant. We will not analyse the results further as the group is considered too small, as the regression would not provide solid statistical inference.

8.4 Germany

In Germany, we find a clearly significant reaction to the ESRs, with a positive coefficient. This result is analogous with claiming that German MNCs increase their total debt-to-asset ratio when moving from safe harbour to earnings stripping rules. The coefficient shows a positive response on a 5%-level. Germany operated with a safe harbour rule that we believe were strict compared to the rules we found elsewhere in Europe⁵⁸. The strictness and tightness of these laws may explain our results from Germany. When subjected to such strict regulations on the level of internal debt, our regression indicates that the introduction of ESRs has a different effect than in the other countries. The new legislation only restricts the total interest costs, and as a result the cost of debt shifting can decrease. As explained in section 4.5.1.2, the reaction among German affiliates can be explained through the argument that the SHRs are perceived as a tighter regulation than the new ESRs. Our regression indicates that the resulting actions of multinationals are to increase their level of debt, and reduce the internal interest costs, supporting this theory.

Our intuitive theory behind such actions can be explained through an analysis of the costs. We know that multinationals increase their level of debt until the marginal cost of an incremental increase of debt equal the marginal gain. When subject to SHRs the marginal cost of one unit of internal debt increase, and MNCs reduce their level of internal debt.

⁵⁸ Germany had a 1.5:1 ratio, compared to Belgium's ratio of 7:1 (Buettner et al., 2012, p. 932). For instance, German affiliates would be allowed only 150,000 EUR of deductible internal debt, compared to 700,000 EUR in Belgium, for the same amount of equity.

However, ALP is the only restriction on transfer pricing, and MNCs respond by increasing their internal interest rate. When governments then change legislation from SHRs to ESRs these costs change. The cost of concealment will decrease, and the cost of transfer pricing will increase⁵⁹. As a result, the MNCs adapt their level of debt until the new marginal cost equals the marginal gain of increasing debt. The affiliates will reduce their internal interest rate, and increase their level of debt. The new solution gives leaner, less equity-based affiliates.

This intuition is only valid when moving from strict safe harbour rules to earnings stripping rules. Otherwise, as explained in section 2.4.2, the introduction of ESRs will increase costs connected to both debt shifting and transfer pricing. When operating in a market with strict SHRs, affiliates increase their transfer price (interest rate) as the cost of increasing their level of debt is too high. Hence, ESRs represent an opportunity to increase debt, and reduce their interest costs without negative consequences. This increase in debt indicates that the ESRs are perceived as a loosening of the previous rules, in regard to internal debt.

As we do not have access to the internal and external debt in the different firms, we cannot give a definite answer if the new rules have given the intended result in Germany. The German government intended to curb the tax exploitations of MNCs, and we are unable to conclude on the outcome with our results. We still believe, as explained in the analysis, that the German regulation has succeeded in curbing tax avoidance. While the SHRs curbed the source of deductible interest (debt levels), the new ESRs curb the interest cost directly. By targeting interest cost directly, and not indirectly, we believe the new regulation to be an improvement on the former. We believe further analysis would need to use another dependent variable, as TDAR may not give the proper results when analysing the German market's transition. The ESRs focus on a result-indicator and the use of a balance-indicator, such as TDAR, does not provide an absolute estimate of the impact. We analyse the capital structure of the MNCs, hence TDAR is the most correct dependent variable. To analyse the absolute effect of the ESRs we believe that using a result based-indicator, like net interest costs, would be more precise.

⁵⁹ The mechanism behind the development in these costs are explained in section 2.4.1 and 2.4.2.

8.5 Differences depending on legislation

Based on the analysis above, we have found that the results differ depending on the previous situation in the countries. Norway, Spain and Finland were the countries without a clear regulation applicable to all firms pre-treatment, and they do not react similarly. Only Norway and Finland reduce TDAR, while we are unable to conclude in the case of Spain. As these findings are unequal, we cannot generalize and claim that a transition from no prior regulation to ESRs will reduce debt levels. When introducing the ESRs in a market with previous regulations, we found a different result than in the other countries. As analysed above, we believe the tightness of previous legislation to be a significant factor. The non-regulated markets have all experienced effects in line with their original purpose⁶⁰, while we are unable to conclude on the definite reaction in Germany due to lack of data. As mentioned, the number of Spanish firms with non-EU/EEA-based parent companies in our dataset is limited, and we will not include the group in our analysis of the hypotheses⁶¹.

We are now able to analyse our first hypothesis H1, that MNCs' TDAR is reduced by the introduction of ESRs. The ESRs are meant to increase both the cost of debt shifting and transfer pricing, as such we originally assumed the rules to cause a reduction in MNCs' level of debt in all countries. However, we found both significant reductions and significant increase in the TDAR depending on the country to which the rules were introduced.

Following the analysis and observations above, we believe our findings to indicate that our hypothesis is incorrect. The ESRs are significantly affecting multinationals' level of debt, and tax legislators have managed to obtain a reaction among the MNCs. However, the reduction of TDAR is not universally generalizable for all countries. This comes from the fact that Germany increase their TDAR, while Finland and Norway decrease their TDAR. Hence, we can reject H1 that the ESRs will trigger a reduction in multinationals' debt levels.

Additionally, we are able to conclude on our differentiated second hypothesis H2a and H2b. H2a states that the ESRs are tighter than the previous legislation, and we should observe a reduction in multinationals' TDAR. Conversely, H2b states that the ESRs are less stringent

⁶⁰ Though not significant in Spain, the coefficient is still negative, in line with the expected result.

⁶¹ We do believe that the results in Spain could differ from the German results as the existing SHRs were less tight compared to the German SHRs. The differences are explained in section 2.4.1, 2.5.3, 2.5.4, and mentioned again in 8.4.

than the previous legislation, and the multinationals will increase their TDAR. Only Germany and the Non-EU affiliates are subject to this transition, but we will solely focus on the German results. The results in table 7 present a significant increase in TDAR among affected firms. The reaction is supported by the theory stated in section 4.5.1.2 and equation 23. The introduction of ESRs is deemed as a reduction of tightness, and the TDAR increase. With ESRs targeting the net interest costs, the previous tighter rules on internal debt are replaced with a less stringent rule⁶². As explained in section 8.4, following the introduction of a less stringent rule, MNCs respond by substituting transfer pricing with debt shifting. Following these arguments, we discard H2a as the German MNCs' TDAR has increased. To conclude, we believe that the German ESRs are less tight than the previous SHRs, in regard to MNCs' internal debt, and that H2a is valid. This conclusion is not automatically universal for all countries moving from SHRs to ESRs. As mentioned, we believe these results to differ depending on the tightness of the previous legislation. We could experience a different result if we had a sufficiently large group from the non-EU group in Spain, as their rules were less tight.

8.6 Robustness tests

To test the solidity of the main regression, we perform robustness tests. Specifically, we will verify the regression with a designated lag/lead-analysis. The lag/lead-analysis gives an indicator on how the groups behaved in the period prior to, during the year of introduction and after treatment. There are three reasons to why we conduct a lag/lead-analysis. Firstly, we want to test whether signalling effects impose a threat to the common trend assumption, explained in section 6.2. This is tested through the analysis of the lead-indicators. By isolating the difference from the years prior to the treatment, we can investigate whether the firms respond before the introduction of the rule, and thereby show evidence of signalling effects. Secondly, as we are interested in examining how firms react to new tax legislations, we want to test the speed of responsiveness. This is shown by the Treatment- and Lag-indicators. By isolating the difference after treatment, we can see directly the degree of corporation's responsiveness to the tax reform. Thirdly, we want to test the long-term effect of the rules. This is done through the use of a continuous indicator.

⁶² The rules are most likely an improvement on the previous legislation, but with focus on interest cost over internal debt the new ESRs are deemed as a loosening of the restrictions connected to internal debt.

We have chosen to include two leads, as we assume that the firms do not anticipate the tax reforms earlier than two years prior to its introduction. Given that assumption, we find that the isolation of both two and one year prior to the introduction can give us information to whether the firms adapted significantly to the proposed law before its introduction. These leads are measured in differences, meaning that lead 2 is the effect from two to one years prior to the introduction. Likewise, Lead 1 gives the difference from one year before the treatment to the year of introduction.

The lag-indicators are also measured in differences, meaning that the lags are the difference between two specified years after the introduction. The first lag is called “Lag 1”, as it shows the effect of the introduction as a difference between the first and second year after the introduction. This also known as the second-year effect. As the indicators are measured in differences, adding a third lag for Norway and Finland would not yield any results as we do not have observations from 2016.

Furthermore, we have the variable called “Treatment”. This is the difference between the first year after the introduction and the year of introduction. This is named Treatment as it shows the impact of the rule in the year of introduction.

Finally, we include a continuous indicator. This variable will indicate the tax reform’s long-term effect on the treatment group’s TDAR. The continuous effect is not measured in difference, but reflect the total effect of the reform, taking all coming years after the second year of introduction into account. This means that the continuous indicator uses all observations from two years after the treatment and on. Therefore, Norway and Finland have no continuous indicator, as they have no more than two years of observations after the rule is implemented. We believe that a continuous indicator from two years and on gives us a clear understanding of the new sustainable level of TDAR amongst the treated firms.

8.6.1 Lag/lead-analysis

	(1) Germany TDAR	(2) Spain TDAR	(3) Norway TDAR	(4) Finland TDAR
Lead 2	-0.038 (0.030)	-0.005 (0.006)	-0.001 (0.011)	-0.003 (0.015)
Lead 1	-0.020 (0.019)	-0.015** (0.007)	0.010 (0.016)	-0.014 (0.019)
Treatment	-0.018 (0.019)	-0.021*** (0.008)	-0.000 (0.018)	-0.024 (0.021)
Lag 1	-0.010 (0.019)	-0.015* (0.009)	0.006 (0.018)	-0.039* (0.022)
Continuous indicator	-0.006 (0.018)	-0.000 (0.009)	0.000 (.)	0.000 (.)
R^2	0.840	0.840	0.840	0.840
Observations	56529	56529	56529	56529
Country-year-fixed effects	Yes	Yes	Yes	Yes
Firm-fixed effects	Yes	Yes	Yes	Yes
Clustered at firm level	Yes	Yes	Yes	Yes

Cluster-robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Lag/lead-analysis. Lead 1, Lead 2, Treatment and Lag 1 is measured in differences.

The table present the regression of TDAR on the treatment group in one country on two lead variables, a treatment variable, a lag variable and a continuous indicator. This analysis will map out at what time the MNCs react to new regulation. As we can see the lags are mostly insignificant, as are the leads. The four figures presented below depict the lag- and lead-coefficients in all four countries. The dotted lines are the 95%-confidence interval of the coefficients.

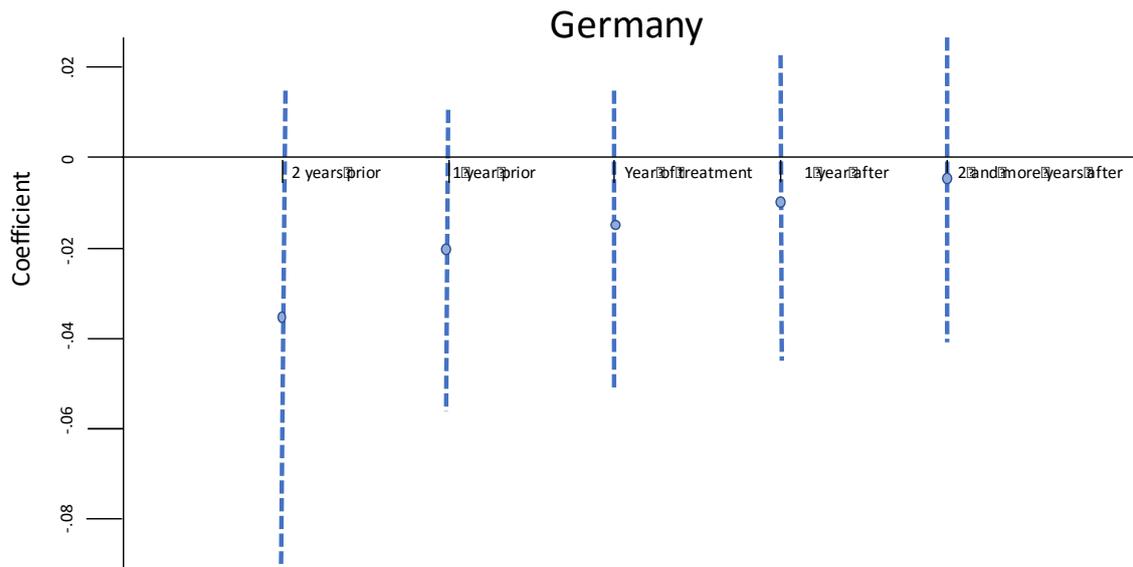


Figure 2: Graphical depiction of the German coefficients

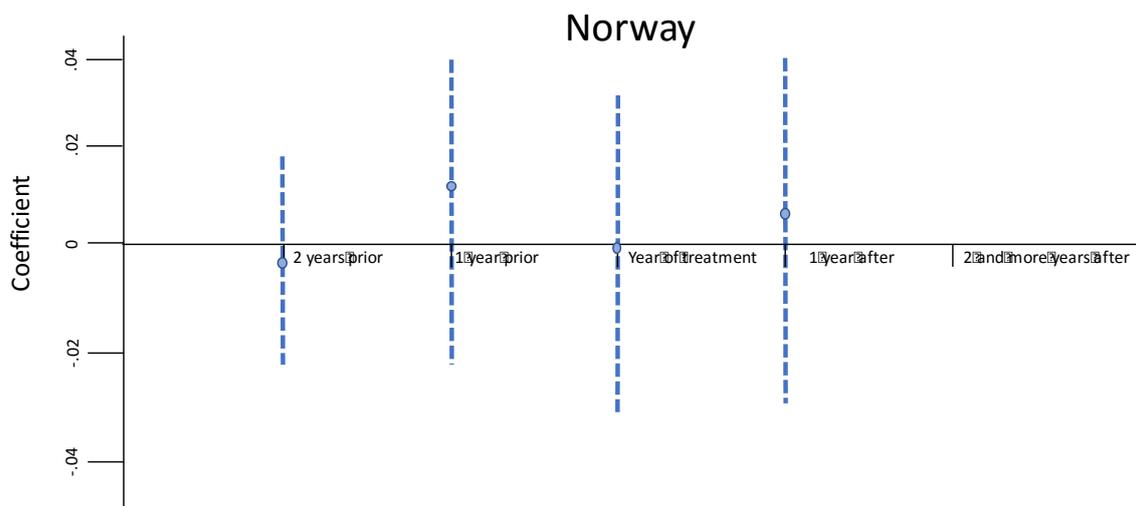


Figure 3: Graphical depiction of the Norwegian coefficients

From figure 2 and table 8 we can see that the German coefficients of all lags, leads and the continuous indicator have a negative sign. In general, this means that German firms are reducing total leverage in all years we test. However, none of the coefficients are significantly different from zero, as the confidence intervals span over zero. Hence, we should not expect that any of these indicators are explaining the true variation in TDAR. The same argument can be made in the case of Norway. From figure 3 we find that none of the indicators are significantly different from zero.

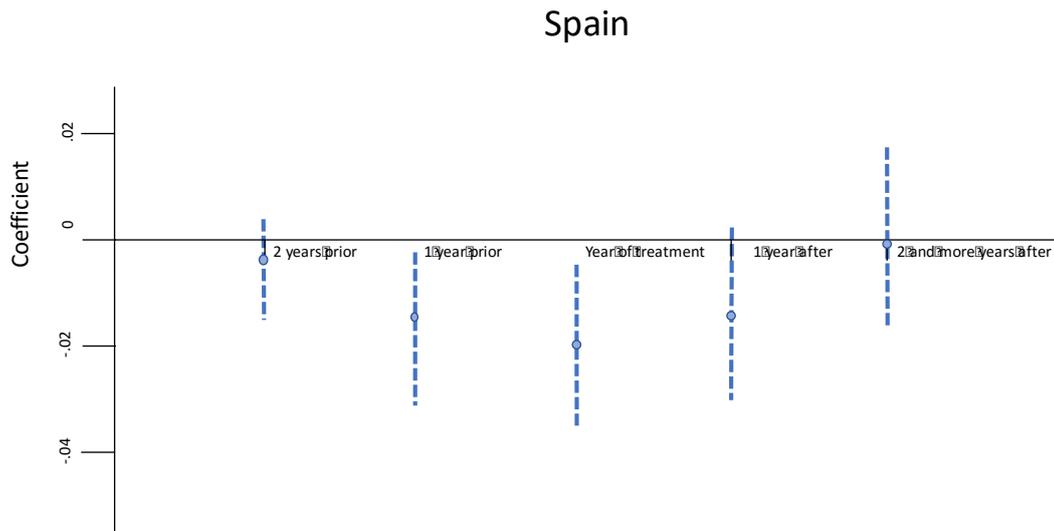


Figure 4: Graphical depiction of the Spanish (EU) coefficients

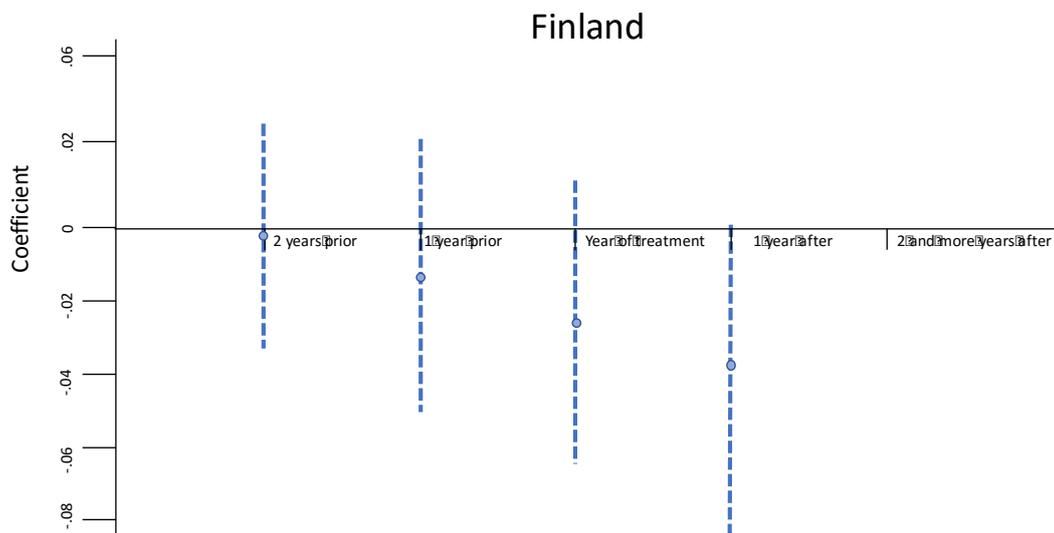


Figure 5: Graphical depiction of the Finnish coefficients

Among the Spanish firms with parent companies from within EU/EEA we see a negative trend two years prior to treatment. From Figure 4, we can see that Lead 1, Lead 2 and Treatment have negative coefficients. In addition, Lead 1 and Treatment are significant. The continuous indicator for Spain is insignificant and is situated approximately at zero. Seen in figure 5, the Finnish coefficients are almost completely insignificant as well, except from the Lag 1-indicator. This coefficient is significant at a 10%-level, and has a negative coefficient.

8.6.2 Implications for firms' responsiveness and long run effect

Our research question states that we are examining at how firms react to new regulation. This can be answered through the analysis and comparison of the lag/lead-analysis and our main regression. As the Treatment, the lags and the continuous indicator describes how firms react during and after the introduction, these are the variables we will be reviewing in this section⁶³.

From our main regression, we recall that the Finnish firms significantly reacted to the ESRs, by reducing TDAR. From the lag/lead-analysis we can observe at what time this reaction was significant. As the Lag 1-variable is significant at a 10%-level and negative, we can conclude that Finnish firms reacted most significantly in the second year after introduction. As the introduction of the ESR was in 2014 we can conclude that the largest effect was seen in 2015, indicating slow responsiveness among Finnish affiliates. This may indicate that the DiD may be invalidated, as the impact of the treatment is one year later than what we expected. As the results remain significant and with the same sign as in the main regression, we still believe that the assumptions of the DiD holds.

Similar to Finland, Norway does not have a continuous indicator, as explained in section 8.6.1. We see that the Treatment-coefficient and the Lag 1-coefficient are insignificant. The propensity of the coefficients is also small. As we found significant results in our main regression, we can conclude that the lag/lead-regression does not override the conclusion we made when discussing the main results.

The German continuous indicator in table 8 is insignificant. However, the long-run effect is slightly negative with a coefficient of -0.006. This effect for Germany is the impact from two years after the introduction of the rule and the following years, from 2010 to 2015. Finding the continuous effect to be negative seems peculiar as the main regression suggests that firms in Germany increased their leverage ratio after the introduction. A possible explanation for this is that the total leverage level is increased by the time of impact, and is consequently lowered. Seeing as the continuous indicator's coefficient is not significant, and the

⁶³ We have chosen to only include two lags as our dataset do not have more report 2016-data and we believe that the firms will adapt quickly, in line with what Blouin et al. (2014) found when investigating the time of response by firms when subjected to SHRs.

coefficient in the main regression is positive and significant, we will put more emphasis on the main regression, and claim that total leverage has increased in Germany. The German Treatment- and Lag 1-indicator are insignificant in the lag/lead analysis. As it provides no added insight, we will not analysis these further.

In Spain, we can see that the Treatment indicator is significant at a 5% level, with a negative coefficient of 0.021. The significant findings are contrary to what we found in the main regression, where the coefficient was insignificant. Reviewing the lag/lead in isolation, we conclude that Spanish firms do react to the new ESR, by reducing their total debt-to-asset levels, at the year of introduction. Furthermore, in Spain we can see that the Lag 1-indicator is negative with a propensity of 0.015. More importantly, the coefficient is significant at a 10% level. This means that Spanish firms react to new regulation in the second year after the introduction. Summarized, Spanish multinational firms reduced their debt levels significantly in 2012 and 2013. The same problem as seen in Finland arises here, as the DiD might not hold when Lag 1 is significant. We will come back to this in section 8.6.3

The long-run effect in Spain is zero. Seeing as we have observed a reduction in two consecutive years after introduction, we can state that in the years after 2013 the Spanish firms rebalance total debt. However, this coefficient is not significant, meaning we cannot conclude with safety that Spanish firms increase debt after 2013. Nevertheless, our findings from the main regression show that Spanish firms do not react significantly to the new introduction. This is consistent with Spanish firms increasing debt after 2013, making the net reaction zero, or at least insignificant.

8.6.3 Implications for common trend

Recalling from section 6.2, we stated that a prerequisite for the DiD is that the two groups' TDAR follow a common trend before the introduction of the treatment. We have ensured this by including several years before the introduction of the ESRs in the respective countries. Nevertheless, looking at the graphs and the discussion from section 5.2.2 we get the idea that for some countries, this prerequisite is not satisfied. Especially, Norwegian and Finnish domestic firms seem to correlate negatively with multinationals in the period between 2005 and 2006. A similar trend can be seen amongst the Spanish and German firms in the earliest years, but with less variation than the Finnish and Norwegian firms. To test

whether MNCs and domestic firms in fact follow a common trend we can look at the lead-indicators of the lag/lead-analysis, which are the focus in this section.

In Germany, Norway and Finland the coefficients of both leads are insignificant. In Norway and Finland, this means that there exists no signalling effects in 2012 and 2013⁶⁴, while the same is true for Germany in 2006 and 2007. As discussed in section 5.2.2 the Norwegian and Finnish firms showed signs of early adaption, however through the Lag/Lead-analysis we reject this theory. This concludes that there exists a common trend in at least these years. In extent, we can trust the DiD to estimate the causal relationship between firms change in TDAR and the new regulation.

Furthermore, returning to the Spanish firms with parents situated within the EU/EEA, we see a negative trend two years prior to treatment. Both Lead 1 and 2 have negative coefficients, while Lead 1 is clearly significant. The results may indicate signalling effects amongst the MNCs, as they reduce debt levels before the introduction. However, this poses as a serious threat to the common trend assumption. We can now say that the Spanish treatment and control group does not follow a trend the year prior to the introduction. As the DiD-assumption now is violated, we should not trust the main regression uncritically. The main regression showed an insignificant coefficient, and we concluded that the Spanish firms most likely did not reduce TDAR in response to the introduction of the rule. Now however, we know that we should not trust the DiD in the Spanish case, but probably rely more on the lag/lead. The lag/lead shows that the Treatment-indicator and Lag 1-indicator is negative and significant. In conclusion, when looking at the Spanish firms, we should use the lag/lead-analysis to answer our research question. This tells us that Spanish firms reduce their debt levels significantly, in two consecutive years after the introduction. This is also in line with Clemente-Almendros & Sogorb-Mira's (2016) findings.

8.6.4 Differences depending on legislation after robustness

Seen from the section above, we can now discard the findings in the main regression regarding Spain, and use the lag/lead-analysis as the correct foundation for comparison. In

⁶⁴ The reason for why we are not including more leads to Norway and Finland is simple. The Norwegian rules was proposed in 2013 and the Finnish in 2012. It is unreasonable to believe that firms would adapt to a rule that is not yet proposed. If we included more leads, and the leads became significant, we cannot argue for a causal relationship between the firms' reaction to a new law and the forthcoming tax-reform. Significant reduction in TDAR could in these cases be caused by exogenous factors, such as the financial crisis.

chapter 8.5, we concluded that the reaction of firms transitioning from no prior regulation to an ESR, is ambiguous as the results from Spain were different than the results from Norway and Finland. However, as we now can conclude that the reaction of Spain is equal to the reaction of Finnish and Norwegian firms, we can conclude unambiguously. A tax regime with no prior restrictions to thin capitalization will experience a drop in TDAR when subjected to an ESR.

8.7 Weaknesses

In the next paragraphs, we will summarize the potential weaknesses in our analysis, and how they may have affected our results.

The fact that Amadeus does not provide changes in ownership-status over time, may give rise to classification errors. To exemplify, this may cause for some companies being classified as MNCs for all the years, when they became part of an international group halfway through our observation period. Though there is a possibility that some firms are wrongly classified, we believe the problem to be minimal. We have a dataset consisting of purely “very large” firms, and the number of these firms that change classification during our period is deemed small enough to not significantly affect our analysis.

Another weakness is the fact that we can’t isolate internal and external debt, which in turn only enables us to examine total debt. As a result, we are unable to see if firms substitute internal debt to external debt as a response to the ESRs. The substitutability of debt is only valid in Norway and Finland, as Germany and Spain target total debt. However, if internal debt is substituted with external debt, our results only show a conservative estimation of the actual effect, and our conclusion would still remain solid.

Additionally, we are unable to see the effect of the tax reform in Finland and Norway in years after 2015. We only have data from 2014 and 2015, which are the only years available after the introduction of the rule. The risk is that the firms within these groups are still adapting to the new law, hence our predicted new level of debt may be different from the level observed in two or three years. We still believe our predictions to be valid, as we have seen research pointing to the firms’ quick reaction to changes in thin capitalization rules (Blouin et al. 2014). The research points to how MNCs rapidly adapt their level of internal debt in order to oblige to the new restrictions. Additionally, we found the MNCs in both Germany and Spain to react quickly, and their results do not change after the first two years. Nevertheless, the

lag/lead analysis shows that Finnish firms are adapting to the new tax reform in 2015, while the Norwegian firms are not. Therefore, this might only be a problem in Finland.

In Germany, the problem rests in data leading up to the treatment, as we only have three years of observations prior to the tax reform in 2008. Because of the Lankhorst-Hohorst ruling in 2004, debt levels for foreign companies in Germany compared to German companies would diverge too substantially before 2005, as regulation favoured German domestic companies. As it is reasonable to believe that the regulation is not anticipated two years in advance, we believe the dataset to be sufficient and this potential weakness to be minimal. If the assumptions do not hold, then we may violate the common trend assumption of the DiD. Moreover, as shown in section 8.6.1, the leads for Germany are not significant, meaning that we can conclude that the German firms follow a common trend, and the lack of data does not pose a threat to the analysis.

As mentioned earlier, we have split the Spanish firms into two groups, the EU firms and the non-EU firms. This is done because the former Spanish thin capitalization rules, which were active from 2005 to 2012, does not apply to firms that are situated within the EU/EEA. Firms originating from outside the EU/EEA with Spanish affiliates, would be the only firms bound by these rules. As Amadeus only provides information about European firms, the affected group solely consist of 158 observations. This amount of observations is probably too small for the inference to represent the true population parameter. This is the reason for why we do not put too much emphasize on the analysis of these. We still chose to include these observations in our main regression because of two reasons. Firstly, if we pooled these with the other Spanish firms, the assumption of equal groups of the DiD is likely to be violated. Secondly, these are the only Spanish firms to experience the transition from a SHR to an ESR. We believe that the small number of observations is inadequate to obtain some sort of statistical significance. Therefore, we have chosen to drop the non-EU firms from our robustness test.

9 Conclusion

We have in our thesis studied multinational and domestic firms from Norway, Finland, Spain and Germany. All four of these countries introduced ESRs limiting interest cost deductibility dependent on EBITDA. Through data collected from the Amadeus database, we were able to investigate how multinational companies reacted to the introduction and change of laws concerning thin capitalization and tax deductibility. To our knowledge, we are the first to investigate the difference between adapting to ESRs with no prior regulations, and adapting to ESRs from SHRs. The theory we have presented enabled us to construct hypotheses, which were tested and analysed through a regression analysis. For this matter, we have used the DiD-method with multiple fixed effects and clustering to causally estimate the relationship between TDAR of multinationals and the ESRs. Additionally, we have conducted a lag/lead-analysis to further investigate the robustness of our results.

Our thesis set out to test and investigate the effect of the new earnings stripping rules. We believe this study to be important as we know that thin capitalization and tax avoidance are worldwide problems, recently emphasized further by the Paradise Papers scandal. We analyse whether there exist significant evidence to support the reason for implementing ESRs, and whether the effect aligns with the purpose of the new tax reforms. Over the next paragraphs, we will summarize our findings, and conclude on the questions we set out to answer:

How has the introduction of earnings stripping rules affected the capital structure of multinational companies in Germany, Spain, Norway and Finland, and does the transition from safe harbour rules, or no previous regulation, to earnings stripping rules affect the impact?

To answer this question, we put forward three hypotheses. Firstly, we predicted that TDAR would be reduced as a response to an ESR (H1). In our analysis, we have presented negative and significant coefficients in every country transitioning from no regulations to earnings stripping rules. The main regression in table 7 showed a significant reduction in TDAR in Norway and Finland, while the Spanish results are not far from significant. However, we argued in section 8.6.3 that the DiD is invalidated by the lack of a common trend in Spain. As a result, we concluded that the output of the lag/lead analysis represent the causal relationship, rather than the output of the DiD. The lag/lead-analysis puts forward evidence

for a significant reduction in debt levels as a response of the new tax reform in Spain. Additionally, we found a positive and significant response among German MNCs regarding the switch from SHRs to ESRs.

Based on the results summarized above, we are able to conclude on the outcome of the transition to earnings stripping rules. The rules have had a significant effect on the total debt-to-asset ratio amongst the multinational companies in all four countries. The total debt-to-asset ratio has decreased in Finland, Spain and Norway. These results align with the purpose of the law, and we conclude that the law has significantly changed TDAR among MNCs. However, we found a significant increase among German MNCs. Correspondingly, we can conclude that our predictions in H1 were incorrect. Although, significant reductions were observed in three out of four countries, the German results rejects the prediction.

The second and third hypothesis, predicts that MNCs will reduce (H2a) or increase (H2b) TDAR depending on the relative tightness of the ESRs compared to the previous regulations. From our analysis in section 8.5 and the results presented in table 7, we believe we can discard H2a. The German affiliates display significant increase in TDAR when subject to the new earnings stripping rules. We believe the actions to be intuitive, as explained in section 8.4. Based on this intuition we are able to conclude on H2b. We conclude that the German results verify H2b, that the new ESRs in Germany are less tight than the previous regulations, in regard to internal debt. We still believe the new rules to be an improvement on the SHRs, as they target the interest costs directly.

Finally, we are able to answer our research question. The ESRs have had a significant impact on the total debt-to-asset ratios of the MNCs in all four countries we have analysed. In Norway, Finland and Spain we found a significant reduction in TDAR among affected firms. Conversely, we found German MNCs to increase their level of debt after the introduction of ESRs. Our findings indicate that the magnitude of the impact is clearly affected by the previous regulations, and the impact is dependent on the ESRs relative tightness compared to these regulations.

9.1 Suggestions and discussion

As mentioned in the analysis we believe that the use of a different dependent variable could give more conclusive results. As we wanted to examine the changes in the capital structure

of firms when subjected to an ESR, we necessarily needed a dependent variable that is directly linked with capital structure. However, as ESRs limit interest cost, which is a result-based measure, a result-based measure should be used if the intention of the study is to examine the direct effect of the ESR. Using TDAR, a balance-indicator, is probably not optimal when testing the effect of changing from a balance based- to a result based-rule. This theory supports the findings of Harju, Kauppinen and Ropponen (2017), as they found significant reductions in financial expenses.

Furthermore, when implementing ESRs in a strictly SHR-regulated tax regime, our results indicate that MNCs will adapt by increasing their internal debt and decreasing their internal interest rate. Our analysis in section 8.4 presents our intuitive interpretation of such actions. To our knowledge, our thesis is the first quantitative analysis to indicate such a development in TDAR after a switch from SHRs to ESRs. As a result, one would need data from more countries experiencing the same transition from SHRs to ESRs to be able to generalize the interpretation of this increase in debt shifting, and decrease in transfer pricing.

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Appendix A

All control variables below are measured in means.

Table 8 descriptive statistics of control variables, sorted by pre- and post-treatment and by national/multinational status

Profitability	Domestic		
	Pre Treatment	Post Treatment	Difference
Germany	0.0578	0.0402	-0.0176
Spain	0.0480	0.0363	-0.0117
Norway	0.0605	-0.0188	-0.0793
Finland	0.0735	0.0829	0.0093

Profitability	Multinational		
	Pre Treatment	Post Treatment	Difference
Germany	0.0578	0.0402	-0.0176
Spain	0.0480	0.0363	-0.0117
Norway	0.0605	-0.0188	-0.0793
Finland	0.0735	0.0829	0.0093

Total assets, in millions	Domestic		
	Pre Treatment	Post Treatment	Difference
Germany	205	254	49
Spain	289	323	34
Norway	323	315	-17
Finland	219	252	33

Total assets, in millions	Multinational		
	Pre Treatment	Post Treatment	Difference
Germany	382	419	37
Spain	500	513	13
Norway	392	409	17
Finland	332	364	32

Share of tangible fixed assets	Domestic		
	Pre Treatment	Post Treatment	Difference
Germany	0.2859	0.2963	0.0104
Spain	0.2236	0.2120	-0.0116

Norway	0.2120	0.2402	0.0282
Finland	0.2760	0.2414	-0.0346

	Share of tangible fixed assets		Multinational
	Pre Treatment	Post Treatment	Difference
Germany	0.1538	0.1623	0.0086
Spain	0.1660	0.1608	-0.0052
Norway	0.1463	0.1474	0.0012
Finland	0.1461	0.1459	-0.0002

Table 9: number of observations for domestic and multinational firms, by country

Country	Domestic	Multinational	Total
GERMANY	24,177	12,730	36,907
SPAIN	8,668	8,699	17,367
NORWAY	5,268	1,975	7,243
FINLAND	1,289	1,628	2,917
Total	39,402	25,032	64,434

Appendix B

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***Managing dataset

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**Generating financial measures

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gen tfa=Tangiblefixedassets*exrate
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gen eq=Shareholdersfunds*exrate
```

```
gen EBIT=EBIT_localcurrency*exrate
```

*Renaming certain variables for simplicity

```
rename YearpartofCLOSDATE year
```

```
rename multi MNC
```

```
rename NACERev2primarycodes industry
```

```
rename id idstring
```

```
rename Consolidationcode cc
```

```
rename Country country
```

```
rename EU eu_spain
```

* Cleaning data (some company-IDs contain some of the following non-numerical letters, which must be removed to avoid string variables)

```
replace id = substr(id, "A", "",.)
```

```
replace id = subinstr(id, "B", "",.)
replace id = subinstr(id, "C", "",.)
replace id = subinstr(id, "D", "",.)
replace id = subinstr(id, "E", "",.)
replace id = subinstr(id, "F", "",.)
replace id = subinstr(id, "G", "",.)
replace id = subinstr(id, "H", "",.)
replace id = subinstr(id, "I", "",.)
replace id = subinstr(id, "J", "",.)
```

```
*Generating financial measures for inference
```

```
gen debt= assets-eq
gen tdar=debt/assets
egen id=group(idstring)
gen profit= EBIT/assets
gen shareoftfa=tfa/assets
gen age=year-YearpartofDATEINC
rename assets hunmassets
gen assets=hunmassets/10000000
```

```
*Labeling control variables
```

```
label var shareoftfa "Tangible Fixed Assets"
label var assets "Total Assets"
label var profit "Profitability"
```

```
** Grouping relevant variables
```

```
egen countrycode=group(country)
egen country_year=group(countrycode year)
```

```
gen finland=1 if countrycode==1
gen germany=1 if countrycode==2
```

gen norway=1 if countrycode==3

gen spain=1 if countrycode==4

replace finland=0 if missing(finland)

replace germany=0 if missing(germany)

replace norway=0 if missing(norway)

replace spain=0 if missing(spain)

***Trimming of sample

*Dropping observations with abnormal or missing values

drop if tdar>1

drop if tdar<0

drop if missing(tdar)

drop if assets<0

drop if shareoftfa<0

drop if age>268

*Dropping industries excluded from rules

gen banking=1 if industry>6410 & industry<6631

drop if banking==1

gen petroleum=1 if industry>609 & industry<631

gen petroleum_no=1 if petroleum==1 & norway==1

replace petroleum_no=0 if missing(petroleum_no)

drop if petroleum_no==1

*Dropping insufficient data, and consolidated observations

drop if cc=="LF" | cc=="NRF" | cc=="C2" | cc=="C1"

***Duplicates removed

egen sortedidyear=group(id year)

duplicates drop sortedidyear, force

*Dropping affiliates without observations at least one observation before and one observation after introduction of rule

egen npreno = total(year <= 2013 & norway==1), by(id)

egen npostno = total(year > 2013 & norway==1), by(id)

gen npreno1=1 if npreno>0

gen npostno1=1 if npostno>0

replace npreno1=0 if missing(npreno1)

replace npostno1=0 if missing(npostno1)

gen minimumno=1 if npreno1+npostno1>1

replace minimumno=0 if missing(minimumno)

egen nprefi = total(year <= 2013 & finland==1), by(id)

egen npostfi = total(year > 2013 & finland==1), by(id)

gen nprefi1=1 if nprefi>0

gen npostfi1=1 if npostfi>0

replace nprefi1=0 if missing(nprefi1)

replace npostfi1=0 if missing(npostfi1)

gen minimumfi=1 if nprefi1+npostfi1>1

replace minimumfi=0 if missing(minimumfi)

egen nprege = total(year <= 2007 & germany==1), by(id)

egen npostge = total(year > 2007 & germany==1), by(id)

gen nprege1=1 if nprege>0

gen npostge1=1 if npostge>0

replace nprege1=0 if missing(nprege1)

replace npostge1=0 if missing(npostge1)

gen minimumge=1 if nprege1+npostge1>1

replace minimumge=0 if missing(minimumge)

egen nresp = total(year <= 2011 & spain==1), by(id)

```
egen npostsp = total(year > 2011 & spain==1 ), by(id)

gen npresp1=1 if npresp>0

gen npostsp1=1 if npostsp>0

replace npresp1=0 if missing(npresp1)

replace npostsp1=0 if missing(npostsp1)

gen minimumsp=1 if npresp1+npostsp1>1

replace minimumsp=0 if missing(minimumsp)

drop if minimumno==0 & norway==1

drop if minimumfi==0 & finland==1

drop if minimumge==0 & germany==1

drop if minimumsp==0 & spain==1

***Preparing data for regressions

xtset id year

*generating variables from before introduction of rule, specified by country

gen postfi=1 if year>2013

gen postge=1 if year>2007

gen postno=1 if year>2013

gen postsp=1 if year>2011

replace postfi=0 if missing(postfi)

replace postge=0 if missing(postge)

replace postno=0 if missing(postno)

replace postsp=0 if missing(postsp)

gen MNCfi=1 if MNC==1 & finland==1

gen MNCge=1 if MNC==1 & germany==1

gen MNCno=1 if MNC==1 & norway==1

gen MNCsp_EU=1 if MNC==1 & spain==1

gen MNCsp_nonEU=1 if MNC==1 & eu_spain==1
```

```

replace MNCfi=0 if missing(MNCfi)

replace MNCge=0 if missing(MNCge)

replace MNCno=0 if missing(MNCno)

replace MNCsp_EU=0 if missing(MNCsp_EU)

replace MNCsp_nonEU=0 if missing(MNCsp_nonEU)

**generating interaction terms

gen intfi=MNCfi*postfi

gen intge=MNCge*postge

gen intno=MNCno*postno

gen intsp_EU=MNCsp_EU*postsp

gen intsp_nonEU=MNCsp_nonEU*postsp

replace intfi=0 if missing(intfi)

replace intge=0 if missing(intge)

replace intno=0 if missing(intno)

replace intsp_EU=0 if missing(intsp_EU)

replace intsp_nonEU=0 if missing(intsp_nonEU)

compress

label var intge "Interaction Germany"

label var intsp_EU "Interaction Spain"

label var intno "Interaction Norway"

label var intfi "Interaction Finland"

***Main regressions

*Column 1

reghdfe tdar intfi intge intno intsp_EU intsp_nonEU profit shareoftfa assets, abs(id country_year) vce(cluster country_year)

estimate store reg1

esttab reg1 using mainregression.rtf, b(3) se(3) r2 replace label star(* 0.10 ** 0.05 *** 0.01) obslast

*NB! Column 2 is generated by using all line of codes above, only including the following, before the trimming

gen fi05=1 if countrycode==1 & year==2005

gen fi06=1 if countrycode==1 & year==2006

```

```

gen no05=1 if countrycode==3 & year==2005

gen no06=1 if countrycode==3 & year==2006

drop if fi05==1

drop if fi06==1

drop if no05==1

drop if no06==1

*Secondly, running this regression

reghdfe tdar intfi intge intno intsp_EU intsp_nonEU profit shareoftfa assets, abs(id country_year) vce(cluster country_year)
estimate store reg2

*Thirdly
esttab reg1 reg2 using mainregressionmodified.rtf, b(3) se(3) r2 replace label star(* 0.10 ** 0.05 *** 0.01) obblast

***Robustness test
*Lag/lead-analysis

foreach var of varlist int* {
    forval i=1/2 {
        * Generate differences of lags and leads

        gen `var'L`i'=L`i`.var'

        gen `var'DL`i'=D.`var'L`i'

        replace `var'DL`i'=0 if `var'DL`i'==.

        gen `var'F`i'=F`i`.var'

        gen `var'DF`i'=D.`var'F`i'

        replace `var'DF`i'=0 if `var'DF`i'==.

    }

    * Generate unlagged difference

    gen `var'D=D.`var'

    * Drop all undifferenced forwards

    drop `var'F*

    forval i=1/1 {
        * Drop all undifferenced lags except the final one which needs to be included

        drop `var'L`i'

    }

    drop `var'DL2

    replace `var'L2=0 if `var'L2'==.

```

}

drop intge intno intsp_EU intsp_nonEU intfi

***Regression output

reghdfe tdar intgeDF2 intgeDF1 intgeD intgeDL1 intgeL2 , abs(country_year id) vce(cluster id)

estimate store reg3

reghdfe tdar intsp_EUDF2 intsp_EUDF1 intsp_EUD intsp_EUDL1 intsp_EUL2 , abs(country_year id) vce(cluster id)

estimate store reg4

reghdfe tdar intnoDF2 intnoDF1 intnoD intnoDL1 intnoL2 , abs(country_year id) vce(cluster id)

estimate store reg5

reghdfe tdar intfiDF2 intfiDF1 intfiD intfiDL1 intfiL2 , abs(country_year id) vce(cluster id)

estimate store reg6

*Outreg

esttab reg3 reg4 reg5 reg6 using laglead.rtf, b(3) se(3) r2 replace label star(* 0.10 ** 0.05 *** 0.01) obslast

***Descriptive statistics

*Create mean of variable tdar, for every country, for the graphs

egen tdarMNCno=mean(tdar) if country=="NORWAY" & MNCno==1, by(year)

egen tdarcontrolno=mean(tdar) if country=="NORWAY" & MNCno==0, by(year)

egen tdarcontrolsp=mean(tdar) if country=="SPAIN" & MNCsp_EU==0, by(year)

egen tdarMNCsp=mean(tdar) if country=="SPAIN" & MNCsp_EU==1, by(year)

egen tdarMNCge=mean(tdar) if country=="GERMANY" & MNCge==1, by(year)

egen tdarcontrol=mean(tdar) if country=="GERMANY" & MNCge==0, by(year)

egen tdarMNCfi=mean(tdar) if country=="FINLAND" & MNCfi==1, by(year)

egen tdarcontrolfi=mean(tdar) if country=="FINLAND" & MNCfi==0, by(year)

*Graphing development in TDAR, by country

twoway (tsline tdarMNCno) (tsline tdarcontrolno)

twoway (tsline tdarcontrolsp) (tsline tdarMNCsp)

twoway (tsline tdarMNCge) (tsline tdarcontrol)

twoway (tsline tdarMNCfi) (tsline tdarcontrolfi)

twoway (tsline tdarMNCnonEU) (tsline tdarcontrolsp)

*All countries' development in one graph

twoway (tsline tdarMNCno) (tsline tdarMNCsp) (tsline tdarMNCge) (tsline tdarMNCfi)

*Descriptive statistics

tabstat tdar profit shareofffa assets if year==2007 & country=="GERMANY" & MNCge==0, by(MNCge) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2007 & country=="GERMANY" & MNCge==1, by(MNCge) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2009 & country=="GERMANY" & MNCge==0, by(MNCge) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2009 & country=="GERMANY" & MNCge==1, by(MNCge) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2011 & country=="SPAIN" & MNCsp_EU==0, by(MNCsp_EU) stat(mean
count) col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2011 & country=="SPAIN" & MNCsp_EU==1, by(MNCsp_EU) stat(mean
count) col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2013 & country=="SPAIN" & MNCsp_EU==0, by(MNCsp_EU) stat(mean
count) col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2013 & country=="SPAIN" & MNCsp_EU==1, by(MNCsp_EU) stat(mean
count) col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2013 & country=="NORWAY" & MNCno==0, by(MNCno) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2013 & country=="NORWAY" & MNCno==1, by(MNCno) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareofffa assets if year==2015 & country=="NORWAY" & MNCno==0, by(MNCno) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareoftfa assets if year==2015 & country=="NORWAY" & MNCno==1, by(MNCno) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareoftfa assets if year==2013 & country=="FINLAND" & MNCfi==0, by(MNCfi) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareoftfa assets if year==2013 & country=="FINLAND" & MNCfi==1, by(MNCfi) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareoftfa assets if year==2015 & country=="FINLAND" & MNCfi==0, by(MNCfi) stat(mean count)
col(stat) long nototal

tabstat tdar profit shareoftfa assets if year==2015 & country=="FINLAND" & MNCfi==1, by(MNCfi) stat(mean count)
col(stat) long nototal

*Further descriptive statistics

tab country MNC if year==2014

tab country MNC