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Master's Thesis International Economics
Abolishment of Safe-Harbor Rules and the Effect on Multinationals' Capital Structure

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Abstract

Multinational corporations can reduce their groupwide tax liability by shifting internal debt from affiliates in low-tax countries to affiliates in high-tax countries. To counter such tax avoidance schemes many countries have implemented thin-capitalization rules over the past two decades. Contradictory to this trend, the Netherlands abolished its safe-harbor thin-capitalization rules at the start of 2013. This paper analyses the effect of this abolishment on the capital structure of Dutch affiliates of multinational corporations. The empirical analyses find that these affiliates increased their debt-to-equity ratio by 12% to 20% after the abolishment, on average. This paper is, to my knowledge, the first to include headquarters-country gravity variables in thin-capitalization research. The effects are mostly insignificant, except when headquarters located in tax-havens are excluded.

Keywords: Thin-capitalization; Safe-harbor rules, Internal debt shifting

JEL classification: G32, G38, H26

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1. Introduction

Over the past two decades, the thin capitalization of firms, tax sensitivity of debt, and internal debt-shifting by multinational companies (henceforth MNCs), have received massive attention from economic literature as well as from policymakers. The reason for this attention is that the corporate income tax system contains a bias in the favor of debt. The interest expenses paid on debt are tax-deductible for corporations, while dividends are paid out of the net-of-tax corporate income. Thus, the corporate income tax system incentivizes firms to have higher debt ratios (de Mooij, 2011). MNCs can capitalize on the tax benefits of debt more aggressively than domestic firms by shifting both external as well as internal debt to increase their debt tax shield (Møen et al., 2019).

MNCs have two comparative advantages over domestic firms when it comes to debt-shifting. Firstly, by using excessive external debt in affiliates that are located in high-tax countries and less in low-tax country affiliates, the MNC increases the tax benefits of interest payments, while the group-wide amount of external debt stays equal. The second comparative advantage that MNCs have in terms of the debt-tax shield, is the usage of internal debt. By setting up a financial centre in a low-tax country (often a tax haven) and shifting internal debt to affiliates in high-tax countries the MNC creates an internal debt tax shield. The tax benefits of the interest payments on the internal debt in the high tax country are larger than the tax payments on received interest payments in the financial centre (Ruf and Schindler, 2015; Schindler and Schjelderup, 2012), thus creating an internal debt tax shield. These theoretical predictions are supported by many empirical papers (Mintz and Smart, 2004; Büttner et al., 2009; Büttner and Wamser, 2013; Møen et al., 2019). These results suggest that countries with high tax rates attract a reasonable amount of tax-deductible interest costs (Weichenrieder and Windischbauer, 2008).

Excessive amounts of group-wide external debt lead to excessive bankruptcy costs and risks, but internal debt suffers less from such costs. Non-regulated internal debt can therefore create extreme tax benefits as long as there is a positive taxable income (Ruf and Schindler, 2015). Over the past two decades, most countries have implemented thin-capitalization rules to counter excessive tax-driven internal debt financing. The implementation of such thin capitalization rules is encouraged by the OECD (2013) in their Base Erosion and Profit Shifting (BEPS) action plan. Thin-capitalization rules exist in two forms: safe-harbor rules and earnings

stripping rules (Ruf and Schindler, 2015). This paper will focus on the safe-harbor thin capitalization rules. Safe-harbor rules restrict the tax deductibility of excessive (internal) debt. Safe-harbor rules have a certain threshold level of (internal) debt-to-equity after which a higher ratio does not reap more tax deductions from interest paid on debt (binding rules) or after which it is costly to reap those tax deductions. (rules with leeway) (Gresik et al, 2017).

Over the past decades, many countries have felt the need to counter the increasingly aggressive profit shifting by MNCs. As a response, many countries have implemented or tightened their thin-capitalization rules since 2000 (Haufler et al., 2018). Contradictory to these countries, the Netherlands abolished its safe-harbor rules (3:1 internal debt-to-equity ratio) in 2013 (de Brauw Blackstone Westbroek, 2013), which allows for an interesting empirical analysis. This abolishment and its consequences on the debt-to-equity ratio of Dutch affiliates of MNCs are central in this paper.

This paper uses a theoretical model to predict the tax-efficient capital structure of affiliates of MNCs. The model is based on the theoretical model provided by Møen et al. (2019) with some slight simplifications. This paper's model includes the expected effects of the abolishment of the Dutch 3:1 safe-harbor rules with leeway. The most important and new insight provided by the model is the expected increase in the internal debt-to-equity ratio for Dutch affiliates of MNCs after the abolishment. The cost of using internal debt to profit from the internal debt-tax shield above the 3:1 ratio drops significantly after the abolishment. The model, therefore, predicts that MNCs increase the internal debt-to-equity ratio in their Dutch affiliates in/after 2013.

A micro-level data sample from the Orbis database is utilized to put the model and its predictions to the test. The data sample contains information on Dutch affiliates of MNCs and domestic Dutch firms. The dataset only contains information on the total debt and does not show internal or external debt separately. The empirical specification is adjusted to deal with this issue but does not capture the effect on the internal debt-to-equity ratio fully. The main sample includes 687 firms over a six-year period, adding up to 4122 observations. Of the 687 firms, 324 are the Dutch affiliate of an MNC, the remaining 363 firms are domestic Dutch firms. As a robustness test, a smaller sample of the 300 largest firms is used to increase the accuracy of the firm-level data.

The theoretical predictions from the model are supported by the empirical analysis. The identification strategy interacts an MNC dummy with a Post-2012 dummy to examine the

effect of the abolishment on the debt-to-equity ratio of Dutch affiliates of MNCs in a panel dataset. Several variables that are deemed as important capital structure predictors in the finance literature are included to control for cross-firm differences. Headquarter-country variables are included to control for country differences. Lastly, vectors of time and industry fixed effects are embedded in the model to control for unobservable effects. Despite having to use the total debt-to-equity ratio instead of the internal debt-to-equity ratio the result is consistent with the prediction. The effect of the abolishment of the safe-harbor rule on the debt-to-equity ratio of Dutch affiliates of MNCs is significant at the 1% level and has a value of 0.253. This means that the affiliates of the MNCs increased their debt-to-equity ratio by 0.253 after the abolishment of the safe-harbor rules. With a mean debt-to-equity ratio of roughly 1.383, this is an increase of 19.5%.

The result is consistent throughout most of the robustness checks. The model that uses a one-year lagged period to consider capital adjustment time finds an insignificant effect in the large sample, but still a significant effect at the 1% level in the small sample. The model that uses the debt-to-asset ratio as the dependent variable finds insignificant effects as well. All other robustness checks find an effect that is significant at the 1% level and in the range of 0.188 and 0.353 in the small and large samples. This is considered to be a constant result.

An additional contribution of this paper to the research in corporate debt-shifting is the inclusion of headquarters-country (gravity) variables. The inclusion is inspired by the inclusion of gravity variables to predict trade in financial assets (Martin and Rey, 2004; Portes and Rey, 2000; Portes et al, 2001). Orbis provides the location of the headquarters of the MNC of which the Dutch affiliate is a part. The log of the GDP of the country where this headquarters is located is included in the empirical analysis. The log of the distance from the country where the headquarters is located to the Netherlands is included, as well as the log of the import flow from that country to the Netherlands. The logs of GDP and imports are expected to have a positive effect on the debt-to-equity ratio since it should decrease information asymmetries between the two countries. The opposite applies to the log of distance, which also increases travel and communication costs.

The main results regarding the headquarters-country variables are counter-intuitive. Where the logs of distance and imports are insignificant, the log of GDP is significant at the 1% level but has a coefficient of -0.226 which contradicts expectations. A possible explanation for this could be the large number of headquarters located on a tax haven with low imports

and a low GDP. To verify this a robustness check is performed by excluding the Dutch affiliates of MNCs of which the headquarters is located in a tax haven. The logs of distance and imports become significant at the 1% level in both samples and have the expected negative and positive signs, respectively. The log of GDP becomes insignificant in the large sample but stays negative and significant at the 1% level in the small sample. This suggests that the log of GDP of the country where the headquarters is located is negatively correlated with the debt-to-equity ratio of Dutch affiliates of MNCs.

The remainder of this paper is organized as follows: Section 2 presents and summarizes related literature. Section 3 defines and outlines the concept of thin-capitalization rules. The theoretical model is explained in section 4. Section 5 highlights the data that is utilized, as well as descriptive statistics, definitions, and the main variables. The empirical model is explained in section 7. Section 7 presents the main results and section 8 the robustness checks. Section 9 provides a short discussion. Finally, section 10 provides the conclusion.

2. Related literature

There exists a large literature on the tax sensitivity of debt, debt shifting, and thin-capitalization/safe-harbor rules. The tax sensitivity of debt usage has been confirmed by many papers, theoretically as well as empirically. Mills and Newberry (2004) use a sample of U.S. foreign-controlled corporations during 1987-1996. They find that the MNCs with a relatively low average tax rate use more debt in their US foreign-controlled corporation than MNCs with a relatively high average tax rate. This is due to the larger debt tax shield experienced by the MNCs with a lower tax rate and supports their expectations regarding the tax sensitivity of debt.

Desai et al. (2004) look at the effect of local tax rates on the composition and level of borrowing by foreign affiliates of U.S. MNCs. Their dataset differentiates between external borrowing and borrowing by foreign affiliates from the same parent company. By doing so they control for parental fixed effects. As a result, they obtain clean estimates evaluating the impact of tax rate differences on capital structure. Their study finds that a 10% rise in the local tax rates leads to a 2.8% increase in the affiliate's debt-to-asset ratio. Furthermore, they find that affiliates who operate in a country with underdeveloped capital markets borrow more from their parent company. This reduces the overall interest rate faced and provides MNCs with a comparative advantage over domestic firms.

Mintz and Smart (2004) create a model that explains internal debt shifting. Their model suggests that MNCs should use internal debt to profit from the debt-tax shield. Borrowing should be done in the affiliates that operate in high-tax jurisdictions so that the tax-deductibility of interest expenses is the highest. The lending should be done in the affiliate that faces the lowest tax rate so that the tax paid on interest income is the smallest. They use Canadian firm-level data to test the predictions of their model. The firms in their data are all domestic firms that normally are unable to profit from internal debt shifting. However, due to the subnational corporate income system in Canada, there exist provincial differences in the corporate tax rates. This system thus allows for internal debt shifting within a country and provides an interesting study (Mintz and Smart, 2004). They estimate taxable income elasticities with the standard log-linear specification and divide their sample into three groups large corporations who shift income, large corporations who do not shift income, and small corporations. Their study finds that the elasticity of taxable income with respect to tax rates for income-shifting firms is 4.9, while this is 2.3 for non-shifting comparable firms. Büttner et al. (2009) use the MiDi database of the German Bundesbank. Their sample includes foreign affiliates of German MNCs in 26 countries from 1996 until 2003. They use an OLS regression to estimate the impact of local tax rates on external and internal debt. The study's empirical analysis confirms that MNCs use excessive external and internal debt in regions with a high tax burden. Büttner and Wamser (2013) also use the MiDi database but extend the sample. Their data covers foreign affiliates of German MNCs in 174 countries. They look at the role of internal debt in shifting profits from one foreign affiliate of a German MNC to another foreign affiliate of the same MNC. Their dependent variable, thus, is the amount of internal loans received by one foreign affiliate from another foreign affiliate. They look at the effect of the host country tax rate as well as the group-wide lowest available tax rate on the amount of internal loans. Their study finds an implied tax-elasticity of reported profits of only 0.1% due to profit shifting. Previous literature found estimates of 1.3% up to 2%. Büttner and Wamser (2013) find that the small impact in their study is partly due to the German-controlled foreign corporation (CFC) rule.

Møen et al. (2019) use a sample of 33,857 firm-year observations from the MiDi database. Their sample includes 8191 foreign affiliates of 3660 German MNCs from 1996 to 2006. The study makes use of variation in tax rates over time and across countries to identify the tax effect on the capital structure. Their estimation looks at the effect of the host country's

tax rate, the weighted tax difference with the corporate group, and the tax difference between affiliate *i* and the lowest taxed affiliate on the total debt to asset ratio of affiliate *i*. The authors find that MNCs use both internal and external debt to save taxes and that the usage of these two is independent of each other. Most important for this research, they find that MNCs have an advantage over domestic firms by shifting debt across borders to gain additional profits from the debt tax shield.

de Mooij (2011) evaluates 267 estimates from 19 different studies in a meta-study. He finds an average tax elasticity of debt of somewhere between 0.5 and 0.7. Feld et al. (2013) include 1,143 estimates from 46 previous studies in their meta-study. They predict that the marginal tax effect on the debt ratio is 0.30. Hence, if the marginal tax rate is increased by 10 percentage points, the debt-to-asset ratio would rise by 3 percentage points. This is in line with the estimate from de Mooij (2011), who finds that the marginal tax effect on the debt ratio is 0.17 in the narrow measures of debt and 0.28 in the broad measures of financial leverage.

More in line with this paper is research that looks into the effects of thin-capitalization rules on debt-shifting. Weichenrieder and Windischbauer (2008) use a panel from the MiDi database that runs from 1996 to 2004. The sample includes 1699 German affiliates of foreign MNCs. Their study tests the effect of the tightening of the German thin-capitalization rules in 2001 on corporations using a Diff-in-Diff specification. They use branches as a control group since branches are unaffected by the German thin-capitalization rules. Both corporations and branches are split into high- and low-leveraged groups. Lastly, they compare the effects of the tightening on the affected corporations and unaffected branches. Their study finds that high-leveraged corporations decreased their internal debt-to-equity ratio more than similarly leveraged unaffected branches. The difference was significant at the 5% level, which shows that the thin-capitalization rules were only somewhat effective. Weichenrieder and Windischbauer (2008) attribute this to a loophole in the legislation. This loophole allowed foreign MNCs to circumvent the German thin-capitalization rules.

Büttner et al. (2012) also use a panel from the MiDi database. Their sample runs from 1996 to 2004 and includes 42,950 firms. The study estimates the effects of foreign thin-capitalization rules on the foreign affiliates of German MNCs. They estimate the effect of thin-capitalization rules on internal debt by use of a dummy that measures the existence of thin-capitalization rules in a country as well as a variable that measures the safe-harbor threshold

as tightness. The authors make use of the cross-country differences and time variation of the existence/tightness of thin-capitalization rules. Their analysis finds that thin-capitalization rules reduce the tax incentive to use internal debt. When a host country that has a tax rate of 34%, which is the sample average, implements a thin-capitalization rule that denies interest deductions for internal debt exceeding an internal debt-to-equity ratio of 2:1, the ratio of internal debt declines by 12%. If the thin-capitalization rule applies to total debt instead of internal debt, the internal debt ratio is predicted to decline by 24% even.

This master thesis differs from the studies of Weichenrieder and Windischbauer (2008) and Büttner et al. (2012) in multiple directions. First of all, this paper looks at the Dutch affiliates of MNCs which is in line with Weichenrieder and Windischbauer (2008). However, the identification strategy in this research is different. Weichenrieder and Windischbauer (2008) make use of the difference between incorporated firms (affected by the TC rules) and branches (unaffected by the TC rules), as well as the difference between firms above and below the safe-haven threshold to compare the development of the debt-t-equity ratio of corporations and branches. In contrast, this master study estimates the effect of the abolishment of the thin-capitalization rules on the debt-to-equity ratio of Dutch affiliates of MNCs by comparing the development of this ratio to Dutch domestic firms over the same period. A similar identification set-up as in Weichenrieder and Windischbauer (2008) would have been preferred in the research. However, due to data limitations from the Orbis database, this master's thesis has employed a different identification strategy. Furthermore, the research from Weichenrieder and Windischbauer (2008) suffers from the effects of a loophole that biases their results, this loophole should not be present in this paper. Büttner et al. (2012) look into foreign affiliates of German MNCs whereas this research looks into Dutch affiliates of MNCs. Both previous pieces of research use the MiDi database with information on German firms, whereas this research employs the Orbis database and the information on Dutch firms over a more recent period. Moreover, Weichenrieder and Windischbauer (2008) and Büttner et al. (2012) look at tightenings and emplacements of thin-capitalization rules, whereas this study looks at the abolishment of such a rule. Lastly, this paper will look into the effects of gravity measures on the debt-to-equity ratio of Dutch affiliates of foreign MNCs. To the knowledge of the author, gravity variables have not yet been incorporated into similar research before.

3. International tax-system and thin-capitalization rules

The idea behind the usage of debt to save tax payments is well known and stems from the basic principle that interest payments on debt are tax-deductible, whereas costs of equity are not. MNCs, as well as domestic firms, can profit from this by using excessive amounts of external debt to finance investments. However, excessive amounts of debt go hand in hand with excessive costs of debt, think of bankruptcy costs. For this reason, there is a limit to the amount of external debt that a corporation can use effectively (Moen et al, 2019). MNCs profit from the fact that they can use internal debt next to external debt and therefore shift their debt more aggressively. The mechanism for internal debt shifting calls for an affiliate in a low-tax country. This affiliate lends capital to one in a higher tax country. The interest income is thus earned and taxed in a low-tax country while the tax deductions from interest payments are larger in the high-tax country. This leads to an overall tax benefit for the MNC (Schindler and Schjelderup, 2012). In general, governments aim to counter internal debt shifting by imposing thin-capitalization rules that limit the deductibility of internal debt (Ruf and Schindler, 2015).

Thin-capitalization rules exist in two main forms: earning-stripping rules and safe-harbor rules. This paper focuses on the latter. Safe-harbor rules restrict the tax deductibility of excessive debt by setting a certain threshold after which no more tax deductions for interests paid on debt exists. The threshold is defined as a fixed debt-to-equity ratio (3:1 in the Netherlands before 2013). This threshold can either be strictly binding or have leeway. If the safe-harbor rule is strictly binding the tax-deductibility of debt after the threshold is zero. If the safe-harbor rule has leeway to circumvent it, there is a possibility to profit from the tax-deductibility of debt beyond the threshold, but this is costly. If the debt-to-equity ratio is below the threshold, no restrictions on the tax deductibility are present. Hence the name 'safe-harbor rule' (Gresik et al, 2017).

Over the past two decades, governments have been increasing the usage of thin-capitalization rules to counter the increasingly aggressive profit shifting by MNCs (Haufler et al, 2018). This is in line with the OECD's (2013) BEPS plan which aims to counter the exploitation of mismatches in different countries' tax systems by MNCs. Haufler et al. (2018) provide information on the development of the thin-capitalization rules of 34 countries from 2000 (or 2004 if earlier data was unavailable) till 2014. Of those 34 countries, 14 have either

tightened or implemented thin-capitalization rules over that period. In contrast, only one country out of the 34 has abolished its thin-capitalization rules in the same period. The Netherland implemented their thin-capitalization rules in 2004 with a total debt-to-equity threshold of 3:1. The Dutch thin-capitalization rules were aimed at limiting the deductibility of interest on loans from affiliates within the same corporate group, thus internal debt. The taxpayer had the choice to either test the fixed 3:1 debt-to-equity ratio or to test the consolidated group ratio. The amount of non-deductible interest payments due to the safe-harbor rule is capped at the amount of interest paid on loans received from related entities (IFA et al., 2013; Tax Consultants International B.V., 2012).

Against the trend of tightening/implementing the thin-capitalization rules, the Netherlands abolished theirs in 2013 and implemented the arm's-length principle. Under the arm's-length principle, the tax-deductibility of the interest paid on internal debt can be denied if the internal loan could not be provided with similar conditions on the external market. In general, the arm's-length principle is difficult to enforce and has little effect in limiting debt-shifting (Ruf and Schindler, 2015, P.18). The Netherlands implemented earnings stripping rules at the start of 2019 in compliance with the EU Anti-Tax-Avoidance directive. The 2013 abolishment thus provides a natural experiment that allows for an estimation of the effects of safe-harbor rules on the capital structure of MNCs.

4. Model

The model that goes hand in hand with the information from section 3 is provided by Møen et al. (2019), with some slight modifications to incorporate the safe-harbor rule with leeway. An MNC is located in country *p*, is price taking, and has fully owned affiliates in *i = 1, …, n* countries. Each affiliate has fixed assets K_i and for simplicity reasons, this asset is the capital used to produce a homogenous good with the production function $y_i = f(K_i)$ with decreasing marginal productivity. Capital can be financed by equity E_i, third party external debt D_i^E or internal debt from related affiliates D_i^I. The rental costs of capital are exogenous, constant (small country assumption), and equal to *r*. The rental costs of equity are, in contrast to the rental costs of debt, not tax-deductible. This is the case in most OECD countries' tax codes. External leverage is defined as $b_i^E = D_i^E/K_i$ and internal leverage as $b_i^I = D_i^I/K_i$. The total leverage ratio in an affiliate i therefore is: $b_i = b_i^E + b_i^I$

Internal as well as external debt does lead to different types of costs for the affiliate.

The affiliate therefore must find an optimal trade-off between the benefits and costs of using external/internal debt. The use of external debt can incentivize local managers to not overspend on unnecessary perks for themselves to limit the risk of bankruptcy of the affiliate. However, too much external debt could cause managers to disregard beneficial investments to prevent bankruptcy (Huizinga et al., 2008). Furthermore, excessive external debt leads to increased group-wide bankruptcy costs (Huizinga et al., 2008; Møen et al., 2019). The use of excessive internal debt leads to increased tax engineering costs needed to circumvent tax regulation (extra lawyers or accountants) such as thin-capitalization rules or is limited to a fixed amount in the case of strictly binding safe-harbor rules (Overesch and Wamser, 2010; Schindler and Schjelderup, 2012; Overesch and Wamser, 2010). Furthermore, the usage of internal debt does not reduce agency problems between the local managers and the MNC, it does not increase the risk of bankruptcy, and failure to repay the loan does not lead to consequences from the outside. The costs of external debt $C^E = C^E(b_i^E)$ and the cost of internal debt $C^I = C^I(b_i^I, \alpha_i)$ are, therefore, additively separable (Møen et al., 2019, p. 439). α_i defines the tightness of the thin-capitalization rules in country *i*. If the thin-capitalization rules are tighter, α_i increases and the costs needed to circumvent the safe-harbor rule increases. However, if the rules are abolished the costs drop since firms have to follow the arm's-length principle, which is less strict (see section 3). Lastly, the sum of internal loans must be zero (no money creation).

The affiliate's after-tax profits then become:

$$\pi_i = (1 - t_i) * F(K_i) - r * K_i + t_i * r * (D_i^E + D_i^I) - (1 - t_i)(C^E(b_i^E) + C^I(b_i^I)) * K_i \quad (1)$$

Where $(1 - t_i) * F(K_i)$ is the after-tax revenue. $r * K_i$ are the rental costs of capital which are non-tax-deductible and therefore decrease the after-tax profits. $t_i * r * (D_i^E + D_i^I)$ is the total debt tax shield. The taxes paid on the rental costs of debt are tax-deductible and are added to the after-tax profits. Lastly, $(1 - t_i)(C^E(b_i^E) + C^I(b_i^I)) * K_i$ represents the costs of capital and therefore decreases the total revenue. In addition, the MNC faces bankruptcy costs on the parent level, since the MNC (partly) guarantees the debt of its affiliates. These costs depend convexly on the firm-wide external leverage $b_f = \frac{\sum_i D_i^E}{\sum_i K_i}$ and are proportional to the total capital employed (Huizinga et al, 2008, p. 94; Møen et al., 2019, p 440).

$$C_f = C_f(b_f) * \sum_i K_i$$

Worldwide profit of the MNC therefore becomes:

$$\Pi = \sum_i \pi_i - C_f \quad (2)$$

Combining and equations (1), and (2), the maximization problem for the optimal debt levels D_i^E and D_i^I results as:

$$\max \Pi_p = \sum_i [(1 - t_i) * (F(K_i) - r * K_i + t_i * r * (D_i^E + D_i^I) - (1 - t_i)(C^E(b_i^E) + C^I(b_i^I)) * K_i] - C_f(b_f) \sum_i K_i \;\; s.t. \sum_i r * D_i^I = 0 \quad (3)$$

Where the first part is the sum of the after-tax profits of all affiliates. $C_f(b_f) \sum_i K_i$ are the total bankruptcy costs faced by the MNC.

Taking the FOCs with respect to external and internal debt and rearranging them gives equations (4) and (5). See appendix 1 for the derivations:

$$t_i * r = (1 - t_i) * \frac{\partial C^E(b_i^E)}{\partial b_i^E} + \frac{\partial C_f(b_f)}{\partial b_f} > 0 \; \forall i, \quad (4)$$

$$(t_i - \lambda) * r = (1 - t_i) * \frac{\partial C^I(b_i^I, \alpha_i)}{\partial b_i^I} \geq 0 \; \forall i, \quad (5)$$

where the Lagrange parameter λ is the tax payments on the shifted interest.

Equation (5) is our equation of interest. The left-hand side presents the marginal debt tax shield of internal debt, whilst the right-hand side represents the marginal costs of using internal debt (tax planning costs). One can see that the marginal benefits of internal debt are the net tax savings on paying additional interest on internal loans in country *i* and claiming additional interest income in a country with a lower tax rate. The tax benefits are the largest when the difference between the tax rate of the lending country and the tax rate of the lender country is the highest. Therefore, λ should be the lowest statutory tax rate found in the corporate group: t_1 (Schindler and Schjelderup, 2012). The costs of debt shifting depend on

tax engineering costs and on the thin-capitalization rules that are in place in a country. Up till 2013, the Netherlands had thin-capitalization rules with a threshold at the level $\overline{b_i^I}$ (3:1). However, after the abolishment, MNCs had to obey the arm's-length principle instead of the safe-harbor rules. This decreases the tightness parameter α_i. This leads to a reduction in the costs of internal debt shifting $C^I(b_i^I, \alpha_i)$. To highlight the effect of a decrease in parameter α_i equation (6) is derived. Equation (6) is the total differential of equation (5). See appendix 2 for the derivations.

$$\frac{db_i^I}{d\alpha_i} = -\frac{\partial^2 C^I(b_i^I,\alpha_i)/(\partial b_i^I \partial \alpha_i)}{\partial^2 C^I(b_i^I,\alpha_i)/(\partial b_i^I)^2} < 0 \qquad (6)$$

Since $\frac{\partial^2 C^I(b_i^I,\alpha_i)}{(\partial b_i^I \partial \alpha_i)} > 0$ and $\frac{\partial^2 C^I(b_i^I,\alpha_i)}{(\partial b_i^I)^2} > 0$

Equation (6) Highlights how a change in the tightness parameter α_i affects b_i^I. Since both the numerator and the denominator on the right-hand side are positive by definition, the entire division is positive. The negative in front of the division means that the right-hand side of equation (6) is negative. Therefore, an increase in α_i leads to a decrease in b_i^I. In economic terms, this would mean that an increase in the tightness of the thin capitalization rules, would lead to a decrease in the internal leverage of MNCs. In this research, the thin capitalization rules are abolished and the tightness of parameter α_i decreases. According to equation (6), this would lead to an increase in the internal leverage of MNCs. This leads to hypothesis 1.

H1: The abolishment of the safe-harbor rules leads to an increase in the debt-to-equity ratio of Dutch affiliates of MNCs.

5. Data

The most vital part of the data for this research is provided by the Orbis[1] micro-level database from Bureau van Dijk (Bureau van Dijk, 2021). Orbis provides financial information on a total of 287,000,000 active firms all over the world. This study investigates a change in the Dutch tax laws for MNCs. Therefore, only firms located in the Netherlands are of

[1] Bureau van Dijk creates Orbis by combining over 170 separate databases and 100 of their own sources in one set.

importance. Orbis has data on 6,100,000 firms in the Netherlands. Orbis provides financial data and information on ownership for these firms. Both are a necessity for this research. Firms for which Orbis does not provide the necessary financial information are dropped from the sample. Observations that lack the financial data needed to construct the debt-to-equity ratio are excluded. The same applies to firms of which data on the standard capital structure predictors is missing. The standard capital structure predictors included are obtained from Frank and Goyal (2009) and Rajan and Zingales (1995). Lastly, MNCs in databases from Bureau van Dijk often provide consolidated as well as unconsolidated statements (Huizinga et al., 2008). A consolidated statement includes all activities in the parent company as well as in the subsidiaries. In contrast, a non-consolidated statement only consists of the activities within the mother firm or subsidiary. This study, therefore, includes unconsolidated statements only and excludes consolidated statements.

The period utilized to conduct the research runs from 2011 to 2016. With the TC-rule reform being implemented at the start of 2013, optimally the starting year would have been earlier. However, Orbis does not provide data from before 2011. The end year is chosen in a trade-off between the number of years and the number of firms in the sample. A longer period leads to fewer firms. A shorter period leads to less reliable regression results.

Orbis provides the necessary data for 919 firms over the whole period. 195 of these observations show consolidated finances, which are dropped. 724 firms remain in the sample. 37 of these are excluded because of extreme outliers in the debt-to-equity ratio. The final sample includes 687 firms of which 324 are the Dutch affiliate of an MNC. The remaining 363 are domestic firms.

Table 1: Trimming procedures

Selection criteria	Number of firms.
(1) Active firms in country Netherlands	6.113.638
(2) Debt-to-equity ratio 2011-2016	53.965
(3) Standard capital structure predictors 2011-2016	919
(4) Unconsolidated finances	724
(5) Outliers	687
Final sample	687

5.1. Abolishment of TC rules

The main coefficient of interest is the interaction between the post-2012 dummy and the MNC dummy. The theoretical model predicts that, after the abolishment of the TC rules in 2012, MNC should increase their internal debt usage and thus their internal debt-to-equity ratio. This is because the abolishment leads to more leeway and reduces the costs of using internal debt, making internal debt shifting more profitable. Since the costs and benefits of internal and external debt are separable (see section 3), the increase in the usage of internal debt does not lead to a decrease in the usage of external debt. The total debt-to-equity ratio of Dutch affiliates of MNCs is, therefore, expected to increase after the abolishment. This paper thus expects that the coefficient has a positive effect on the debt-to-equity ratio.

5.2. Dependent variable.

The dependent variable in this research is the debt-to-equity ratio. Most literature in corporate capital structure research looks at the debt-to-asset ratio (Huizinga et al., 2008; Møen et al., 2019). However, these studies look at the effect of tax rates and tax-rate differences on the debt-to-asset ratio, in general. This master thesis aims to estimate the effect of the abolishment of safe-harbor rules on the capital structure of MNCs. The Dutch safe-harbor rules were aimed at the debt-to-equity ratio (de Brauw Blackstone Westbroek, 2013), which is why this study looks at the debt-to-equity ratio as a dependent variable. This is in line with similar papers that estimate the effect of thin-capitalization rules. Weichenrieder and Windischbauer (2008) use the internal debt-to-equity ratio in their research on the effect of thin-capitalization rules. Furthermore, Büttner et al. (2012) use the ratio of liabilities from foreign affiliates to total capital to estimate the effectiveness of thin-capitalization rules. However, as a robustness test, this paper will run the main regression with the debt-to-asset ratio as the dependent variable.

The Orbis database does not make a distinction between internal and external debt. The dependent variable in each regression, therefore, is the total debt-to-equity ratio. Total debt should work as a proxy that captures the effect on internal debt for a rather simple reason. This paper investigates Dutch firms and Dutch affiliates of MNCs only. Factors from the external environment that could change the optimal external debt level are therefore similar for both groups. One external factor that possibly confounds results is related to the external debt shifting mechanism. Since my paper only includes the maximum tax difference

within the group and not the weighted tax differentials for all affiliates, a change in the foreign tax rate of an affiliate that is not the lowest is not included in the regression. Such a change would affect the optimal external debt allocation within the MNC group and could thus affect the amount of external debt in the Dutch affiliate (Møen et al., 2019). Since this paper uses the total debt-to-equity ratio as a proxy for the internal ratio, a change in the external debt level of the Dutch affiliate would affect the results. Factors from the internal environment that drive a change in the debt-to-equity ratio should be captured by the control variables. The coefficient of interest will, therefore, provide an approximation of the real effect. Orbis explicitly reports the debt-to-equity ratio for 62 firms in the previously mentioned sample. Hence an alternative debt-to-equity ratio is calculated by use of more prevalent data. Long-term debt and current liabilities are adjoined to form the total debt of the firm. Shareholders' funds are utilized as a proxy for equity. Dividing the first by the latter results in an alternative more prevalent debt-to-equity ratio. Roughly 54.000 firms report the data necessary to construct the alternative.

Table 2: Summary statistics

		Full sample		Small sample	
Variable	Nature	Mean	Std. Dev.	Mean	Std. Dev.
Debt-to-equity ratio	Continuous	2.054	3.366	2.242	3.199
Debt-to-asset ratio	Continuous	0.583	0.247	0.589	0.251
MNC	0/1	0.471	0.499	0.620	0.486
Max tax diff	Continuous	3.147	0.165	3.095	0.211
Expected inflation	Continuous	1.415	1.211	1.415	1.211
Median industry D/E	Continuous	1.556	0.229	1.629	0.419
Tangibility	Continuous	0.495	0.219	0.473	0.201
Sales	(log)	12.10	1.561	13.31	1.504
Net income	(log)	7.153	3.433	8.235	3.689
Population * MNC	(log)	5.228	5.031	6.892	4.788
GDP * MNC	(log)	10.94	10.34	14.33	9.676
GDP/cap*MNC	(log)	5.710	5.378	7.436	4.991
Distance * MNC	(log)	2.882	2.953	3.856	2.927
Imports * MNC	(log)	2.089	2.005	2.666	1.848
Total assets	(log)	11.84	1.649	12.91	1.744
Employees	(log)	6.156	1.599	7.156	1.658
GDP/cap*MNC	(log)	5.710	5.378	7.436	4.991
Population * MNC	(log)	5.228	5.031	6.892	4.788
Profitability	Continuous	0.027	0.193	0.026	0.177
Observations		4.122		1.800	
Firms		687		300	

5.3. Control variables

This study aims to identify the effect of a change in the Dutch tax rules for MNCs on the debt-to-equity ratio of these MNCs. Many other factors drive the optimal capital ratio for firms as well. These factors need to be included as control variables in the regression. The choice of which factors to include in the model is motivated by Frank and Goyal (2009) and Rajan and Zingales (1995). Furthermore, some unconventional MNC specific variables, like the GDP of the country where the headquarters is located, are built into the model. The difference between the lowest statutory tax rate in the group and the Dutch statutory tax rates is included ($t_1 - t_i$). Lastly, industry and time-fixed effects are incorporated.

The standard control variables included will be discussed one by one:

The maximum tax difference ($t_i - t_1$) is calculated as the difference between the Dutch statutory tax rate and the lowest statutory tax rate found in the corporate group, which is defined as affiliate 1. The variable takes on a value of zero if the Dutch statutory tax rate is the lowest in the group. The relation between this variable and the debt-to-equity ratio is expected to be positive. If the difference between these rates is larger, the incentive to borrow from the lowest taxed affiliate becomes bigger (Møen et al., 2019). The variable is included to make sure that potential changes in tax incentives after 2012 do not confound the identification of the TC effect.

Expected inflation consists of only six observations (one for each year) and is gathered from the OECD inflation forecast database. According to Frank and Goyal (2009), expected inflation is positively related to the debt-to-equity ratio. This expectation follows from Taggart (1985) who claims that the real value of the debt-tax shield is higher when expected inflation is high. In contrast, other studies suggest that countries with high inflation also have a higher business risk. This reduces external borrowing (Huizinga et al., 2008). The effect of expected inflation on the capital structure, therefore, is ambiguous.

The median industry debt-to-equity ratio is expected to have a positive effect on the debt-to-equity ratio. Multiple studies have confirmed that inter-industry differences in the leverage ratios exist (Bowen et al., 1982; Scott and Martin, 1975). Two main reasons are provided by Frank and Goyal (2009) to explain the positive effect on leverage. Firstly, Managers could perceive the industry median as a target for their debt-to-equity ratio. Thus, a higher industry median would result in a higher debt-to-equity ratio. Secondly, a higher

industry median could be caused by omitted factors that differ per industry. However, the industry-fixed effects should capture the second effect at least partly.

Tangibility is calculated as the ratio of fixed to total assets (Rajan and Zingales, 1995). Some studies suggest that tangibility has a positive effect on leverage (Frank and Goyal, 2009; Rajan and Zingales, 1995). Creditors can use fixed assets as collateral more easily and decreases the chance of bankruptcy. This should increase the borrowing capacity (Huizinga et al., 2008). This paper, therefore, expects to find a positive relationship between the tangibility coefficient and the debt-to-equity ratio.

Firm size is measured by the log of sales. Empirical literature often uses the log of sales as a proxy for firm size (Frank and Goyal, 2009; Huizinga et al., 2008; Møen et al., 2019). Larger firms can borrow funds easier in general, since they are less prone to go bankrupt and are more diversified (Møen et al., 2019). It is therefore expected that the relation between firm size and the debt-to-equity ratio is positive.

Profitability is proxied by the log of net income. Frank and Goyal (2009) predict that more profitable firms have a higher debt-to-equity ratio since the benefits of a tax shield are more valuable to a firm with higher profitability. However, in their results, they find a negative effect of profitability on leverage. This is in line with the prediction from Titman and Wessels (1988). Following the pecking order theory, they suggest that a firm will prefer raising capital through retained earnings, before turning to debt, and lastly from issuing new equity. This preference follows from the asymmetric information costs and transaction costs (Myers and Majluf, 1984). This paper expects to find a negative correlation between profitability and the debt-to-equity ratio.

5.4 Headquarters-country variables

One of the contributions of this paper is the inclusion of headquarters-country (gravity) variables to the corporate capital structure literature. The headquarters-country variables are included to account for differences between the home countries where the headquarters of MNCs are located.

5.4.1 Standard gravity model

Tinbergen (1962) was the first to present the gravity theory of trade. The model aims to determine variables that impact the trade flow between two countries. The size of the two countries in terms of GDP as well as the geographical distance between them was deemed to

be relevant predictors of the trade flow between the countries (Burger et al., 2009). Tinbergen (1962) used Newton's theory of gravitation to derive the gravity equation.

$$I_{i,j} = K \frac{M_i M_j}{d_{ij}} \tag{9}$$

Where I represents the trade flow between the country i and j. M represents the size of the economy, often measured as the GDP of the country, d represents the distance between the trading countries and K is a constant (Burger et al., 2009). M has a positive effect on the trade flow, a larger economy attracts more trade (Mátyás, 1997). In contrast, the potential trade flow is limited by d, a larger distance between the trading countries decreases the trade flow (Mátyás, 1997). The base model can be expanded by including other variables, such as having common borders or speaking the same language (Feenstra, 2004).

5.4.2 Gravity model in financial markets

Over the past two decades, multiple papers have extended the arguments from the standard gravity model to the financial sector (Martin and Rey, 2004; Portes and Rey, 2000; Portes et al, 2001), who all find that gravity variables also predict trade in financial assets. Martin and Ray (2004) develop a 2-country macroeconomic model where the size of the economy is a predicter of the breadth of the financial markets. This is in line with the results from Portes and Rey (2000) and Portes et al. (2001) who find that size of the economy has a positive effect on the trade in financial assets. This effect is mostly attributed to the fact that larger economies have better working financial markets and easier accessible information. The latter decreases information asymmetries and the cost of information. Portes and Rey (2000) and Portes et al. (2001) also estimate that distance has a negative effect on the trade in financial assets. Both papers attribute this effect to increased informational asymmetries and increased cost of information. Portes and Rey (2000) attribute these increased costs to cultural differences and higher costs of traveling. Egger and Larch (2013) also find that time zone differences act as a trade barrier.

5.4.3 *Gravity model in debt-shifting*

This paper expects the gravity model variables to be a predictor in (internal) debt-shifting. The headquarters-country (gravity) variables included in this model are the log of GDP, which functions as a proxy for the size of the economy, the log of distance between the two countries, and the log of imports from the headquarters-country to the Netherlands.

The log of GDP of the headquarters' country is expected to have a positive effect on the debt lending from the headquarters to the affiliate. This expectation follows from the previously mentioned benefits regarding better working financial markets and easier accessible information leading to increased trade in financial assets (Portes and Rey, 2000; Portes et al., 2001). Furthermore, Schiavo et al. (2010) find that richer countries form tighter financial links in general. This paper expects that these effects apply to internal debt lending as well. Ideally speaking this research would look at the internal debt-to-equity ratio to estimate the effects of the headquarters GDP, but due to data limitations, this is not possible. Self-explanatory the external debt-to-equity ratio is unaffected by the GDP of the headquarters and its inclusion can therefore bias the results. Hypothesis 2.1 is formed to test the expectations of the effect of the headquarters GDP.

H2.1: The GDP of the country where the MNCs headquarters is located has a positive effect on the debt-to-equity ratio of the Dutch affiliate

The next headquarters-country variable to be discussed is the log of distance between the two countries. This paper expects that the log of distance has a negative effect on the debt-to-equity ratio of the Dutch affiliate. Distance increases the differences between two countries in: business culture, administrative work, social behaviour, linguistics, institutions, and economic conditions (Ghemawat, 2001). These differences present the MNC with challenges in multiple activities amongst which, transferring knowledge, integrating foreign acquisitions, and agency problems (Kostova and Hoenen, 2018). Kostova and Hoenen (2018) suggest that increased distance between the two countries leads to increased agency problems between the headquarters and the affiliate. Furthermore, Portes and Rey (2000) suggest that the increased costs of traveling worsen the agency problem. Lastly, Egger and Larch (2013) find that time zone differences act as a trade barrier. For these reasons, this paper expects the distance between the headquarters and the affiliate to have a negative effect on the debt-to-equity ratio of the affiliate. Again, ideally speaking the research would only look at the effect on the internal debt-to-equity ratio. Hypothesis 2.2 is formulated based on the previously mentioned arguments.

H2.2: The distance between the country where the MNCs headquarters is located and the country where the affiliate is located has a negative effect on the debt-to-equity ratio of the affiliate.

The last headquarters-country variable to be discussed in the log of imports from the headquarters country to the Netherlands. The log of imports between the two countries is expected to have a positive effect on the debt-to-equity ratio of the affiliate. As previously mentioned, information asymmetries (Portes and Rey, 2000; Portes et al., 2001), as well as agency costs (Kostova and Hoenen, 2018), are expected to have a negative effect on the debt-to-equity ratio of the affiliate. This paper expects the import flow from the headquarters country to the affiliate's country to represent information flows outside of the GDP/distance factors. Thus, if one out of two countries, who are similar in GDP and distance to the Netherlands, has a larger import flow to the Netherlands, it is expected to have fewer information asymmetries and agency problems. This could be due to, for example, a colonial past or fewer linguistic issues (Feenstra, 2004). This paper, therefore, expects the log of imports to have a positive effect on the debt-to-equity ratio of the affiliate and H2.3 is formulated accordingly.

H2.3: The import flow from the country where the MNCs headquarters is located to the country where the affiliate is located has a positive effect on the debt-to-equity ratio of the affiliate.

6. Identification strategy

The purpose of this study is to estimate the effect of the abolishment of the safe-harbor rules on the debt-to-equity ratio of Dutch affiliates of MNCs. To succeed in this a fixed-effects OLS regression is run on a panel data set. The firm-level control variables, a tax variable, headquarters-destination variables, and year- and industry-fixed effects are added to the empirical model. A dummy interaction term is included to capture the effect of the abolishment after 2012 on Dutch affiliates of MNCs. The dummy interaction term mimics a Diff-in-Diff regression. The first difference should be captured by the Post-2012 dummy, which is the difference between the debt-to-equity ratio before and after the abolishment for all firms. The second difference is captured by the MNC dummy variable, which captures the difference in the debt-to-equity ratio of MNCs and domestic firms. The interaction term combines these differences and should mimic a Diff-in-Diff regression. This approach is used by Davies et al. (2018) to analyze transfer pricing by MNCs and is adopted in this research to analyze the effect of the abolishment on the debt-to-equity ratio of MNCs. The exact empirical model specification is:

$$\frac{D}{E}ratio_{it} = \beta_0 + \beta_1 MNC_i + \beta_2 Post2012_t + \beta_3(MNC_i * Post2012_t) + \beta_4((GDP_{ijt} * MNC_i) * NN_{it}) + \beta_5((Dist_{ijt} * MNC_i) * NN_{it}) + \beta_6((Imp_{ijt} * MNC_i) * NN_{it}) + \beta_7((t_{it} - t_{1t}) * LT_{it}) + \beta_8 X_{ti} + \alpha_i + \gamma_t + \varepsilon_{it}$$

The dependent variable is the debt-to-equity ratio of firm *i* at time *t*. MNC_i is a dummy variable that takes on 1 of the firm is a Dutch affiliate of an MNC. $Post2012_t$ is a dummy variable that takes on 1 if the year is 2013 or later. The $(MNC_i * Post2012_t)$ interaction variable is the variable of interest. It captures the effect of the abolishment of the safe-harbor rules on the debt-to-equity ratio of MNCs. The $(GDP_{ijt} * MNC_i)$ interaction term captures the GDP of the country where the headquarters of the corporate group of affiliate *i* is located. $(Dist_{ijt} * MNC_i)$ is an interaction term that captures the distance between the country where the headquarters is located and the Netherlands. The $(Imp_{ijt} * MNC_i)$ interaction term captures the import flow from the country where the headquarters is located to the Netherlands. The NN_{it} variable is a dummy variable that has a value of 1 if the headquarters is not located in the Netherlands. $(t_{it} - t_{1t})$ is the maximum tax difference between the Dutch statutory tax rate and the lowest statutory tax rate found in the corporate group. LT_{it} is a dummy variable that takes on the value of 1 if the Dutch affiliate does not have the lowest tax rate within the corporate group. X_{ti} is a vector of country and firm-level control variables. α_i is a vector of time dummies and γ_t is a vector of industry dummies. Lastly, ε_{it} is the error term.

7. Results

This section tests the empirical predictions from the model. In this section, the main results will be discussed. Robustness checks will be reviewed in the next section. Table 3 presents the basic regressions.

7.1. Baseline results

As previously mentioned, 687 firms are included in the sample. The data covers six consecutive years which means that there are a total of 4122 observations in the set. The first regression includes no fixed effects. The second regression includes time-fixed effects. The third regression includes time and industry fixed effects. All regressions use robust standard errors. Regression 3 which includes time and industry fixed effects is the main specification and will

be the focus in highlighting the results. However, it should be noted that coefficients and significance are relatively similar across the three regressions apart from some exceptions.

Table 3: Baseline regression, large sample

Dependent variable: Debt-to-equity ratio			
	(1)	(2)	(3)
MNC	-0.447***	-0.446***	-0.468***
	(-4.94)	(-4.94)	(-5.03)
Post-2012	-0.143***	1.250***	1.247***
	(-4.71)	(7.31)	(7.37)
MNC*2012	0.253***	0.254***	0.253***
	(4.52)	(4.52)	(4.46)
Max tax diff	0.000241	0.000270	0.00730
	(0.02)	(0.02)	(0.59)
Expected inflation	-0.00120	0.613***	0.611***
	(-0.09)	(7.88)	(7.96)
Median industry D/E	0.276	0.276	2.267
	(0.75)	(0.75)	(0.71)
Tangibility	-0.283	-0.286	-0.351
	(-1.19)	(-1.20)	(-1.36)
Log sales	0.347***	0.346***	0.353***
	(10.17)	(10.21)	(10.42)
Log net income	-0.124***	-0.124***	-0.124***
	(-3.55)	(-3.55)	(-3.64)
Log GDP MNC	-0.235***	-0.236***	-0.226***
	(-21.50)	(-21.79)	(-19.67)
Log distance MNC	-0.0632	-0.0630	-0.0677*
	(-1.58)	(-1.58)	(-1.74)
Log import MNC	0.0815	0.0810	0.105
	(1.19)	(1.19)	(1.63)
Year FE	No	Yes	Yes
Industry FE	No	No	Yes
R^2	0.0264	0.0265	0.0319
N	4122	4122	4122

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. Regression 1 has no fixed effects included. Regression 2 has year-fixed effects included. Regression 3 is the main specification and has year- and industry-fixed effects included. All regressions use robust standard errors. The sample includes 687 firms. t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Firstly, the coefficients on the MNC and the Post-2012 dummy will be discussed. The coefficient of the MNC dummy has a value of -0.468. This implies that the debt-to-equity ratio of a Dutch affiliate of an MNC is 0.468 lower than that of a Dutch firm, on average. The coefficient is significant at the 1% level and roughly similar in each of the three regressions. The result is in line with many theoretical predictions. For example, Park et al. (2013) suggest that MNCs have more valuable intangible assets (Patents, technology, etc) than domestic firms. This characterization should lead to higher growth potential and profitability, which in

turn should result in a lower leverage level (Park et al., 2013). Furthermore, Rajan and Zingales (1995) suggest that MNCs' assets tangibility is lower on average. This should lead to lower debt-to-equity levels as well. The coefficient on the Post-2012 dummy has a value of -0.143 in the first regression and a value of 1.250 and 1.247 in the second and third regression, respectively. This highlights that excluding the year-fixed effects leads to a wrong approximation of the Post-2012 coefficient. The coefficients are significant at the 1% level in all regressions. Lastly, the coefficient shows that the firms in the sample increased their debt-to-equity ratio by 1.250 after 2012, on average.

The main coefficient of interest is the interaction term of the MNC dummy and the Post-2012 dummy. The interaction term estimates by how much Dutch affiliates of an MNC's changed their debt-to-equity in comparison to domestic Dutch firms after 2012, on average. The coefficient is estimated to be 0.271 and is significant at the 1% level. It suggests that, after the abolishment of the TC rules in 2012, Dutch affiliates of MNCs increased their debt-to-equity ratio by 0.271, on average, compared to domestic firms. The debt-to-equity ratio sample mean for MNCs is 1.383. This suggests that Dutch affiliates of MNCs increased their debt-to-equity ratio by roughly 19.5% after the abolishment of the TC rules. Due to the abolishment, MNCs now have more leeway to use (internal) debt more extensively. This corresponds with the predictions from the theoretical model and the empirical evidence supports H1.

The coefficient on the log of the maximum tax difference is insignificant in all regressions. This is contradictory to expectations from Møen et al. (2019). Their study suggests that a larger tax difference should increase the incentive to borrow from the lowest taxed affiliate. That would result in a higher debt-to-equity ratio.

The coefficient on expected inflation takes on a value of 0.611 and is significant at the 1% level in regressions 2 and 3. It is insignificant in regression 1. The interpretation of this coefficient is as follows. When firms expect inflation to be 1 point higher, they increase their debt-to-equity ratio by 0.611. This is in line with predictions by Frank and Goyal (2009) and Taggart (1985). According to their research, the value of the debt-tax shield is higher when expected inflation is higher. The coefficient is contrary to the findings of Huizinga et al. (2008) and Møen et al. (2019). Their studies find either a negative or a negative/insignificant effect of inflation on the debt-to-equity ratio, respectively. According to Huizinga et al. (2008), this is due to the increased risk premium and business risk caused by higher inflation. Clearly, in

this study, the first effect dominated the latter. This caused a positive correlation between expected inflation and the debt-to-equity ratio.

Contrary to predictions, the median industry debt-to-equity is insignificant in all three regressions. This would suggest that the median industry debt-to-equity ratio does not explain any variation in the firm-specific debt-to-equity ratio. This is in contrast with findings from Frank and Goyal (2009) who find a significant positive effect in all their specifications. This difference could be explained by the inclusion of industry-fixed effects, which Frank and Goyal (2009) do not include. However, regressions 1 and 2 that exclude industry-fixed effects do not find a significant result as well. Two other reasons could explain the difference. Firstly, as previously mentioned the calculated debt-to-equity ratio is not a perfect replacement of the actual value. This applies to the calculated median industry debt-to-equity ratio as well, which might not perfectly match the actual median industry debt-to-equity ratio. secondly, a total of 17 industries are included in the sample of 687 firms. This results in an average of roughly 40 firms per industry and the smallest industry consisting of only 3 firms. These small samples could bias results. To check this more closely, a robustness check will be performed excluding the five smallest industries.

Next, the firm-level control variables will be discussed. Firstly, an eye will be shed on tangibility. This paper expected to find a significant and positive effect of tangibility on the debt-to-equity ratio in line with findings from Frank and Goyal (2009). However, tangibility has a coefficient of -0.351 but is insignificant in all regressions. A possible explanation for this could lay in the average firm size of my sample and the sample from Frank and Goyal (2009). Frank and Goyal (2009) point out that tangibility has a positive effect on the debt-to-equity ratio since it reduces the risk of bankruptcy of the firm, which is favorable for the lender. The average The mean of total assets of the firms in my paper is twice as large as the mean of total assets of the firms in Frank and Goyal (2009). Larger firms are less prone to go bankrupt and tangibility therefore might be an insignificant predictor of the debt-to-equity ratio in my sample.

Secondly, the log of sales will be discussed. The coefficient on the log sales has a value of 0.353 and is significant at the 1% level in all regressions. A 100% increase in sales, all else equal, leads to a 0.353 increase in the debt-to-equity ratio of the firm. This is in line with findings from Huizinga et al. (2008), Møen et al. (2019), and Rajan and Zingales (1995) who all find a positive relationship between the debt-to-equity ratio and log of sales. Huizinga et al.

(2008) and Rajan and Zingales (1995) fail to explain this relationship. Møen et al. (2019) suggest that larger firms have easier access to external debt and are more diversified. To check the robustness of these results the log of sales will be replaced by the log of total assets or the log of the number of employees. Both these variables function as a proxy for firm size, similar to the log of sales.

The last firm-level control variables to be discussed is the log of net income, which acts as a proxy for profitability. The coefficient of the log of net income is -0.124 and significant at the 1% level in all regressions. This means that a 100% increase in net income would lead to a 0.124 decrease in the debt-to-equity ratio. This is in line with findings from Huizinga et al. (2008) and Rajan and Zingales (1995). Both studies find a negative and significant relationship between profitability and the debt-to-equity ratio. A robustness check will be performed replacing the log of net income with the calculated profitability. The profitability is calculated as operating income divided by total assets.

The last variables to be discussed are the headquarters-country variables. The log of GDP is significant at the 1% level in each of the regressions. The log of import is insignificant in all the regressions. The coefficient on the log of GDP has a value of -0.226 and is roughly similar in all three regressions. A Dutch affiliate of an MNC would decrease its debt-to-equity ratio by 0.226 if the GDP of the country where the headquarters is located is increased by 100%. This paper expected GDP to have a positive effect on the debt-to-equity ratio, by decreasing information asymmetries and the costs of information (Portes and Rey, 2000; Portes et al., 2001). The result contradicts this expectation and H2.1 is rejected. A possible explanation for this contradiction could be the large number of headquarters located in tax-havens with a low GDP. A robustness check will be performed excluding headquarters located in tax-havens to see if this biases the results as well as a robustness check using the log of GDP per capita and the log of population. The log of imports is significant at the 10% level in regression 3 and insignificant in regression 1 and 2. H2.2 is therefore rejected. The large number of headquarters located in tax-havens could also be part of the reason why the log of import does not provide significant results. These tax-havens have a small import flow to the Netherlands. The aforementioned robustness check will analyze whether this is the case. Lastly, the coefficient on the log of distance is insignificant and does not seem to be a relevant predictor for the debt-to-equity ratio of MNCs. H2.3 is therefore rejected. The inclusion or exclusion of headquarters located on tax havens should not alter this result.

8. Robustness tests

This section will discuss the robustness tests performed in this paper. Firstly, table 4 performs the three standard regressions on a smaller sample of larger firms. Table 5 until table 11 will present the remaining robustness checks. All robustness checks use regression 3 from table 3 as the starting point and include this regression for comparison reasons. All robustness checks will be performed on the standard and smaller sample. Several of the robustness checks perform the standard regression on slightly adjusted samples and other robustness checks change some of the variables within the samples. Descriptive statistics of the additional variables used in the robustness tests can be found in table 2.

The quality of the firm-level financial data provided by Orbis drops rather quickly. To ensure that the regression results are not influenced by incorrect data a smaller sample is used as a robustness check. Table 4 presents the results of the same regressions as table 3 on the smaller sample. This sample includes the 300 largest firms from the original sample over six years, adding up to 1800 observations. Of those 300 firms, 186 are Dutch affiliates of an MNC. The remaining 114 firms are domestic Dutch firms. What is most important to notice is the coefficient of interest, the interaction term of the MNC, and the Post-2012 dummy. The coefficient is significant at the 1% level in all three of the regressions and has a value of 0.239. That is roughly the same value as in the larger sample. This confirms the robustness of H1. The mean value of the debt-to-equity ratio in the small sample is 1.87. This suggests that Dutch affiliates of MNCs in the small sample increased their debt-to-equity ratio by roughly 12.7% after the abolishment of the TC rules.

Overall, most coefficients and significance stay relatively similar, which is why the major differences will be highlighted. First, the MNC dummy stays significant at the 1% level in all three regressions, but triples in value from roughly -0.46 to roughly -1.34. Secondly, the coefficient on the maximal tax difference becomes significant at the 1% level in each of the three regressions. The coefficient has a positive value which is in line with predictions from the model. If the difference between the Dutch statutory tax rate and the lowest statutory tax rate found in the corporate group is larger, the incentive to shift debt is higher (Møen et al., 2019). The coefficient has a value of 0.0395, which is of a similar magnitude as Møen et al. (2019) who find a value of 0.12. Furthermore, the median industry debt-to-equity ratio is significant at the 1% level in regression 2 and 3 but only at the 5% level in regression 4. The

log of GDP remains significant and negative and H2.1 is rejected. The log of distance from the country where the headquarters is located to the Netherlands becomes significant at the 1% level in all regressions. The coefficient takes on the expected sign and has a value of -0.178. this is in line with the prediction from H2.2. This means that an MNC would experience a decrease of 0.178 in their debt-to-equity ratio if the distance was increased by 100%. Lastly, the log of imports becomes significant at the 5% level in each regression. This is in line with the prediction from H2.3. The coefficient has a value of 0.218 which is the expected sign.

Table 4: Baseline regression, small sample

Dependent variable: Debt-to-equity ratio				
	(1)	(2)	(3)	(4)
MNC	-0.468***	-1.232***	-1.233***	-1.346***
	(-5.03)	(-11.81)	(-11.86)	(-11.37)
Post-2012	1.247***	-0.283***	1.178***	1.151***
	(7.37)	(-8.95)	(7.33)	(6.44)
MNC*2012	0.253***	0.239***	0.239***	0.239***
	(4.46)	(5.44)	(5.43)	(5.33)
Max tax diff	0.00730	0.0411***	0.0412***	0.0395***
	(0.59)	(7.85)	(7.89)	(9.71)
Expected inflation	0.611***	-0.0522*	0.614***	0.603***
	(7.96)	(-1.85)	(8.77)	(7.72)
Median industry D/E	2.267	0.911***	0.912***	7.835***
	(0.71)	(9.70)	(9.71)	(3.14)
Tangibility	-0.351	-0.378	-0.384	-0.556
	(-1.36)	(-1.10)	(-1.12)	(-1.48)
Log sales	0.353***	0.292***	0.292***	0.279***
	(10.42)	(6.35)	(6.30)	(4.43)
Log net income	-0.124***	-0.0656***	-0.0650***	-0.0685***
	(-3.64)	(-3.81)	(-3.86)	(-3.67)
Log GDP MNC	-0.226***	-0.366***	-0.368***	-0.349***
	(-19.67)	(-22.87)	(-23.42)	(-20.32)
Log distance MNC	-0.0677*	-0.163***	-0.163***	-0.178***
	(-1.74)	(-4.47)	(-4.47)	(-4.36)
Log import MNC	0.105	0.171**	0.171**	0.218**
	(1.63)	(2.07)	(2.07)	(2.42)
Year FE	Yes	no	Yes	Yes
Industry FE	Yes	No	No	Yes
R^2	0.0319	0.0654	0.0659	0.0786
N	4122	1800	1800	1800

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. Regression 2 has no fixed effects included. Regression 3 has year-fixed effects included. Regression 4 is the main specification and has year- and industry-fixed effects included. All regressions use robust standard errors. The sample includes 300 firms. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Table 5 presents the robustness tests regarding the firm size proxies. In the original regression, the log of sales acts as a proxy for firm size. In the robustness checks, the firm size will be proxied by the log of total assets or by the log of the total number of employees. Regressions 2 and 3 from table 5 use the log of total assets for the large and small samples, respectively. Regressions 4 and 5 follow the same principle but use the log of the total number of employees as a proxy. It is important to note that the MNC and post-2012 interaction term remains significant at the 1% level in all regressions. Furthermore, the coefficient keeps roughly the same size as in the original regression. This confirms the robustness of the main coefficient of interest. The coefficient on the log of total assets is significant at the 1% level in both regression and keeps the expected positive sign. The log of total assets has a coefficient of 0.202 and 0.183 in the large and small samples, respectively. This is relatively similar to the coefficients from the log of sales and therefore robust. The log of the total amount of employees has a coefficient of roughly 0.05 but is insignificant in both regressions. This suggests that the log of the total amount of employees does not perform well as a proxy for firm size.

Table 5: Firm size proxies

Dependent variable: Debt-to-equity ratio					
	(1)	(2)	(3)	(4)	(5)
MNC	-0.468***	-0.490***	-1.375***	-0.451***	-1.298***
	(-5.03)	(-4.92)	(-10.94)	(-4.59)	(-11.48)
Post-2012	1.247***	1.398***	1.358***	1.503***	1.395***
	(7.37)	(8.12)	(6.51)	(10.10)	(6.61)
MNC*2012	0.253***	0.250***	0.227***	0.265***	0.232***
	(4.46)	(4.74)	(5.35)	(4.79)	(5.41)
Log max tax diff	0.00730	0.0216*	0.0469***	0.0379**	0.0642***
	(0.59)	(1.72)	(6.74)	(2.37)	(10.01)
Expected inflation	0.611***	0.686***	0.696***	0.746***	0.714***
	(7.96)	(8.70)	(7.59)	(11.32)	(7.39)
Median industry D/E	2.267	2.991	8.835***	3.234	9.383***
	(0.71)	(0.93)	(3.81)	(1.02)	(4.10)
Tangibility	-0.351	-0.722***	-0.818**	-0.415*	-0.472
	(-1.36)	(-3.28)	(-2.25)	(-1.72)	(-1.14)
Log sales	0.353***	-	-	-	-
	(10.42)	-	-	-	-
Log total assets	-	0.202***	0.183***	-	-
	-	(4.81)	(6.58)	-	-
Log employees	-	-	-	0.0511	0.0318
	-	-	-	(1.57)	(0.47)
Log net income	-0.124***	-0.103***	-0.0586***	-0.0808***	-0.0412**
	(-3.64)	(-2.87)	(-2.73)	(-2.83)	(-2.07)
Log GDP MNC	-0.226***	-0.213***	-0.347***	-0.187***	-0.331***
	(-19.67)	(-16.02)	(-16.45)	(-15.93)	(-18.07)
Log distance MNC	-0.0677*	-0.0600	-0.182***	-0.0276	-0.157***
	(-1.74)	(-1.39)	(-4.11)	(-0.75)	(-3.65)
Log import MNC	0.105	0.114*	0.224**	0.0861	0.206**
	(1.63)	(1.67)	(2.42)	(1.32)	(2.19)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
R^2	0.0319	0.0215	0.0739	0.0163	0.0699
N	4122	4122	1800	4122	1800

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regressions 2 and 4 include 687 firms in the samples. Regressions 3 and 5 include 300 firms in the samples. Regressions 2 and 3 use the log of total assets as a proxy for firm size. Regressions 4 and 5 use the log of employees as a proxy for firm size. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

One of the contributions of this research is the inclusion of headquarters-country variables. Tables 6 and 7 present the robustness checks regarding these variables. In the original regression, the log of GDP is used as a proxy for country size. The proxy is significant at the 1% level but has an unexpected negative sign. The log of the population, as well as the log of GDP per capita, are therefore included as different proxies for country size in table 6. Regressions 2 and 3 include the log of the population as a proxy for firm size in the large and small samples, respectively. Regressions 4 and 5 use the log of GDP per capita as a proxy for country size. The coefficients on the log of the population stay significant at the 1% level and negative. What is interesting to notice is the coefficient on the log of imports. It was insignificant in all previous regressions but is significant at the 1% level in the regressions of

table 6 and has the expected sign. The coefficients have a value of 0.333 and 0.603 in the large and small samples, respectively. This suggests that a 100% increase in imports from the country where the headquarters is located to the Netherlands, leads to an increase of 0.333 in the debt-to-equity ratio of the Dutch affiliate of the MNC. The coefficient on the log of GDP per capita is significant at the 5% level only in the large sample and will therefore not be discussed. The coefficient is significant at the 1% level in the small sample and has a value of -0.292. This suggests that country size proxies are negatively related to the debt-to-equity ratio of Dutch affiliates of MNCs and that the result is robust.

Table 6: Country size proxies

Dependent variable: Debt-to-equity ratio					
	(1)	(2)	(3)	(4)	(5)
MNC	-0.468***	-0.501***	-1.243***	-0.508***	-1.128***
	(-5.03)	(-5.32)	(-10.97)	(-5.32)	(-12.06)
Post-2012	1.247***	1.235***	0.997***	1.205***	0.905***
	(7.37)	(7.26)	(5.44)	(5.93)	(3.29)
MNC*2012	0.253***	0.246***	0.230***	0.238***	0.209***
	(4.46)	(3.99)	(4.79)	(3.55)	(3.95)
Log max tax diff	0.00730	0.00703	0.0360***	0.00663	0.0341***
	(0.59)	(0.57)	(8.72)	(0.53)	(8.12)
Expected inflation	0.611***	0.593***	0.520***	0.584***	0.489***
	(7.96)	(7.66)	(6.43)	(6.35)	(4.11)
Median industry D/E	2.267	2.002	7.390***	1.778	6.971***
	(0.71)	(0.62)	(2.96)	(0.56)	(2.82)
Tangibility	-0.351	-0.367	-0.606	-0.375	-0.620
	(-1.36)	(-1.42)	(-1.59)	(-1.46)	(-1.59)
Log sales	0.353***	0.352***	0.284***	0.339***	0.252***
	(10.42)	(10.51)	(4.58)	(10.19)	(3.93)
Log net income	-0.124***	-0.123***	-0.0682***	-0.121***	-0.0621***
	(-3.64)	(-3.62)	(-3.59)	(-3.56)	(-3.17)
Log GDP MNC	-0.226***	-	-	-	-
	(-19.67)	-	-	-	-
Log population MNC	-	-0.124***	-0.229***	-	-
	-	(-12.43)	(-16.93)	-	-
Log GDP per capita MNC	-	-	-	-0.128**	-0.292***
	-	-	-	(-2.38)	(-3.38)
Log distance MNC	-0.0677*	-0.00512	-0.0663*	-0.00806	-0.0457**
	(-1.74)	(-0.14)	(-1.78)	(-0.32)	(-2.13)
Log import MNC	0.105	0.333***	0.603***	0.388**	0.789***
	(1.63)	(4.55)	(5.76)	(2.54)	(3.28)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
R^2	0.0319	0.0297	0.0751	0.0278	0.0670
N	4122	4122	1800	4122	1800

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regressions 2 and 4 include 687 firms in the samples. Regressions 3 and 5 include 300 firms in the samples. Regressions 2 and 3 use the log of the population as a proxy for country size. Regressions 4 and 5 use the log of GDP per capita as a proxy for country size. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Table 7 includes another robustness test regarding the headquarters-country variables. The relatively large amount of headquarters located in a tax haven could bias results[2]. To ensure that this is not the case, Dutch affiliates of an MNC that have its headquarters located in a tax haven are excluded from the sample. The list with tax havens is gathered from the Hines and Rice (1994) list. Table 14 in appendix 3 shows the tax havens that are present in the large and small sample and the number of firms per tax haven. Firstly, the large sample will be discussed. The log of GDP becomes insignificant after removing the tax havens. Furthermore, the log of distance and the log of imports become significant at the 1% level and with the expected sign. The coefficients are -0.139 and 0.207, respectively. This shows that excluding the tax havens leads to the expected effects of the headquarters-country variables on the debt-to-equity ratio and the confirmation of H2.2 and H2.3, but the results are not robust.

In the small sample, the coefficients, as well as the significance of the log of distance and the log of imports, stay very similar. I will therefore not discuss them again. The coefficient concerning the log of GDP becomes significant at the 1% level again. It keeps the unexpected negative sign, also once the tax havens are excluded. This confirms the rejection of hypothesis 2.1; the log of GDP does not predict the debt-to-equity ratio in the expected direction. There are two possible reasons for this rejection. Firstly, this study only observes the total debt-to-equity ratio whereas the gravity variables should, self-explanatory, only affect the internal debt-to-equity ratio. Secondly, this research includes Dutch firms only, thus the GDP of the receiving affiliate could not be included. For future research, it would be interesting to look at the GDP of the headquarters as well as the GDP of the receiving affiliates located in different countries.

Lastly, it is important to note the robustness of the coefficient of interest. The MNC post-2012 interaction term stays significant at the 1% level in all regressions of table 6 and table 7. The coefficient always stays in the range of 0.2 – 0.3. This confirms H1 and the effect of the abolishment of the TC rules on the debt-to-equity ratio.

[2] 32 out of the 324 Dutch affiliates of an MNC in the large sample have their headquarters located in a tax haven. This is roughly 10%.

Table 7: Excluding Dutch affiliates of MNCs with their headquarters located in a tax haven from the samples

Dependent variable: Debt-to-equity ratio			
	(1)	(2)	(3)
MNC	-0.468***	-0.590***	-1.607***
	(-5.03)	(-5.59)	(-10.51)
Post-2012	1.247***	1.214***	1.358***
	(7.37)	(5.72)	(7.22)
MNC*2012	0.253***	0.296***	0.264***
	(4.46)	(4.99)	(4.45)
Log max tax diff	0.00730	0.0189	0.0465***
	(0.59)	(1.46)	(10.20)
Expected inflation	0.611***	0.582***	0.694***
	(7.96)	(6.48)	(8.63)
Median industry D/E	2.267	2.321	7.955***
	(0.71)	(0.73)	(3.17)
Tangibility	-0.351	-0.492**	-0.687*
	(-1.36)	(-1.96)	(-1.71)
Log sales	0.353***	0.353***	0.299***
	(10.42)	(11.05)	(4.16)
Log net income	-0.124***	-0.128***	-0.0684***
	(-3.64)	(-3.78)	(-3.73)
Log GDP MNC	-0.226***	-0.0687	-0.345***
	(-19.67)	(-0.77)	(-4.10)
Log distance MNC	-0.0677*	-0.139***	-0.196***
	(-1.74)	(-7.38)	(-7.42)
Log import MNC	0.105	0.207***	0.293***
	(1.63)	(5.67)	(3.67)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.0319	0.0316	0.0818
N	4122	3930	1710

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regression 2 includes 655 firms in the sample. Regression 3 includes 285 firms in the sample. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Table 8 checks the robustness of the profitability proxy. In the original specification, the log of net income is included as a proxy for profitability and was found to be a significant predictor of the debt-to-equity ratio. The coefficient was of similar size and direction as Frank and Goyal (2009) found and thus in line with predictions. In the robustness check, a calculated profitability proxy will be used. The profitability variable is calculated as net income divided by total assets. The coefficient is insignificant in both regressions. The profitability proxy does not seem to be a robust predictor of the debt-to-equity ratio. Frank and Goyal (2009) already stated that, over the past decades, profits have experienced a remarkable decline in their importance when it comes to predicting corporate leverage. This decline could be an explanation of why profitability does not seem to be a robust predictor. Important to note is the robustness of the MNC Post-2012 interaction term.

Table 8: Profitability proxy

Dependent variable: Debt-to-equity ratio			
	(1)	(2)	(3)
MNC	-0.468***	-0.494***	-1.288***
	(-5.03)	(-3.86)	(-6.84)
Post-2012	1.247***	1.624***	1.707***
	(7.37)	(16.87)	(9.80)
MNC*2012	0.253***	0.251***	0.188***
	(4.46)	(3.78)	(2.97)
Log max tax diff	0.00730	-0.00350	0.0309***
	(0.59)	(-0.27)	(6.89)
Expected inflation	0.611***	0.801***	0.854***
	(7.96)	(19.08)	(11.29)
Median industry D/E	2.267	0.869	8.858***
	(0.71)	(0.28)	(4.46)
Tangibility	-0.351	-0.326	-0.621
	(-1.36)	(-1.33)	(-1.58)
Log sales	0.353***	0.247***	0.177***
	(10.42)	(10.10)	(6.68)
Log net income	-0.124***	-	-
	(-3.64)	-	-
Profitability	-	0.413	2.215
	-	(0.42)	(1.56)
Log GDP MNC	-0.226***	-0.206***	-0.326***
	(-19.67)	(-15.38)	(-13.40)
Log distance MNC	-0.0677*	-0.0647*	-0.181***
	(-1.74)	(-1.74)	(-4.65)
Log import MNC	0.105	0.118*	0.231**
	(1.63)	(1.69)	(2.50)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.0319	0.0205	0.0871
N	4122	4122	1800

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regression 2 includes 687 firms in the sample. Regression 3 includes 300 firms in the sample. Regressions 2 and 3 use a calculated profitability proxy. The proxy is calculated as the net income divided by total assets. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Table 9 highlights a rather interesting robustness test. Instead of the MNC Post-2012 interaction term, these regressions include the MNC Post-2013 interaction term as the coefficient of interest. This idea is inspired by Drobetz and Wanzenried (2006), who suggest that firms need time to adjust their optimal capital structure after an exogenous change. The MNC Post-2013 interaction term provides MNCs with a year of capital adjustment time. The coefficient is insignificant in the large sample. A possible explanation could be that such an abolishment never happens overnight. The plans to abolish such a law are public knowledge before the actual abolishment takes place. MNCs thus needed no too little capital adjustment time. In the small sample, the interaction term is significant at the 1% level and has a coefficient of 0.205. This suggests that larger Dutch affiliates of MNCs were adjusting their debt-to-equity for a longer period. I am unaware of why this is the case.

Table 9: Lagged model

Dependent variable: Debt-to-equity ratio			
	(1)	(2)	(3)
MNC	-0.468***	-0.382***	-1.289***
	(-5.03)	(-3.18)	(-14.22)
Post-2012	1.247***	-	-
	(7.37)	-	-
Post-2013	-	1.289***	1.172***
	-	(7.43)	(7.10)
MNC*2012	0.253***	-	-
	(4.46)	-	-
MNC*2013	-	0.164	0.205***
	-	(1.62)	(2.71)
Log max tax diff	0.00730	0.00730	0.0395***
	(0.59)	(0.59)	(9.69)
Expected inflation	0.611***	0.611***	0.603***
	(7.96)	(7.95)	(7.72)
Median industry D/E	2.267	2.254	7.834***
	(0.71)	(0.70)	(3.14)
Tangibility	-0.351	-0.351	-0.557
	(-1.36)	(-1.35)	(-1.48)
Log sales	0.353***	0.354***	0.279***
	(10.42)	(10.44)	(4.43)
Log net income	-0.124***	-0.124***	-0.0687***
	(-3.64)	(-3.64)	(-3.68)
Log GDP MNC	-0.226***	-0.226***	-0.349***
	(-19.67)	(-19.72)	(-20.33)
Log distance MNC	-0.0677*	-0.0679*	-0.178***
	(-1.74)	(-1.74)	(-4.36)
Log import MNC	0.105	0.105	0.218**
	(1.63)	(1.64)	(2.42)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.0319	0.0317	0.0786
N	4122	4122	1800

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regression 2 includes 687 firms in the sample. Regression 3 includes 300 firms in the sample. Regressions 2 and 3 use a one-year lag to take capital adjustment time into account. Regression 1 shows the results from the main specification (table 3 Regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

Table 10 shows the robustness checks concerning the median industry debt-to-equity ratio. As previously mentioned, the samples include some small industries. This could bias the coefficient of the median industry debt-to-equity ratio. This robustness check thus excludes the smaller industries in both samples. In the large sample, industries with fewer than ten firms are excluded, which adds up to six industries. This leaves a total of 659 firms in the sample. In the small sample, industries with fewer than five firms are excluded, which adds up to six industries. This leaves a total of 284 firms in the sample. See table 15 in appendix 3 for more information on the industry sizes in both samples. Table 10 highlights the results from the robustness test. The coefficient of the median industry debt-to-equity ratio stays insignificant in the large sample and drops from the 5% level to the 10% level in the small sample. The median industry debt-to-equity ratio does not seem to be a predictor in the sample of this thesis. This is contradictory to the findings from Frank and Goyal (2009) and Rajan and Zingales (1995). A possible reason for this difference is the imperfectness of the calculated debt-to-equity ratio. It does not perfectly predict the median industry debt-to-equity ratio either.

Table 10: Excluding small industries

Dependent variable: Debt-to-equity ratio			
	(1)	(2)	(3)
MNC	-0.468***	-0.482***	-1.475***
	(-5.03)	(-4.63)	(-10.68)
Post-2012	1.247***	0.818***	0.937***
	(7.37)	(4.27)	(5.09)
MNC*2012	0.253***	0.353***	0.315***
	(4.46)	(5.65)	(5.06)
Log max tax diff	0.00730	-0.00268	0.0413***
	(0.59)	(-0.18)	(11.28)
Expected inflation	0.611***	0.467***	0.523***
	(7.96)	(5.56)	(6.87)
Median industry D/E	2.267	10.55	1.612**
	(0.71)	(1.38)	(2.14)
Tangibility	-0.351	-0.370	-0.392
	(-1.36)	(-1.47)	(-1.04)
Log sales	0.353***	0.361***	0.274***
	(10.42)	(11.18)	(4.46)
Log net income	-0.124***	-0.127***	-0.0735***
	(-3.64)	(-3.77)	(-4.12)
Log GDP MNC	-0.226***	-0.238***	-0.375***
	(-19.67)	(-24.72)	(-21.22)
Log distance MNC	-0.0677*	-0.0648*	-0.196***
	(-1.74)	(-1.76)	(-5.11)
Log import MNC	0.105	0.0964	0.240***
	(1.63)	(1.52)	(2.71)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.0319	0.0308	0.0770
N	4122	3894	1704

Note: The dependent variable is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regression 2 includes 659 firms in the sample. Regression 3 includes 284 firms in the sample. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

For the final robustness check, the dependent variable is altered. Instead of the debt-to-equity ratio, the debt-to-asset ratio is used. The debt-to-asset ratio is more commonly utilized in corporate capital structure literature (Huizinga et al., 2008; Møen et al., 2019) and is therefore included as a robustness test. The debt-to-equity ratio is used by Weichenrieder and Windischbauer (2008) among others and Büttner et al. (2012) have the debt-to-total-capital ratio as their dependent variable. The debt-to-asset ratio has a value between zero and one by construction and values outside this interval are dropped from the dataset (Møen et al., 2019). From the 687 firms in the sample, 27 firms have a debt-to-asset ratio above one in at least one of the years. Thus, a sample of 660 firms remains. From the smaller sample of 300 firms, 8 firms have a debt-to-asset ratio above one. Thus, a sample of 292 firms remains. Table 11 presents the results of this robustness check. What is first to be noticed is the insignificance of the coefficient of interest. The MNC Post-2012 interaction term is insignificant in both regressions and thus disproves H.1 and the robustness of the result of this paper. The debt-to-equity ratio and the debt-to-asset ratio consist of different variables, which obviously can lead to different results. However, an increase in the (internal) leverage should have a similar effect on the debt-to-asset ratio. Similar logic applies to a decrease in equity (to increase the debt-to-equity ratio), which should also have a similar effect on the debt-to-asset ratio. Looking at the relatively large differences between the coefficients in regressions (1) and (2) this could imply a data issue in either one (or both) of the calculated variables. However, this master's thesis remains unaware of why this difference in results is present. The log of GDP remains significant at the 1% level and negative in both samples and thus confirms the rejection of H2.1. The log of distance becomes significant at the 1% level and has the expected sign in both samples, in line with the predictions from H2.2. Lastly, the log of imports becomes significant at the 1% level but with an unexpected negative sign in the large sample and is insignificant in the small sample, thus confirming the rejection of H2.3

Table 11: Debt-to-asset ratio

	Debt-to-equity ratio	Debt-to-asset ratio	
	(1)	(2)	(3)
MNC	-0.468***	0.399***	-0.00284
	(-5.03)	(12.57)	(-0.07)
Post-2012	1.247***	-0.0116*	-0.114***
	(7.37)	(-2.39)	(-13.20)
MNC*2012	0.253***	0.00721	0.00933
	(4.46)	(1.76)	(1.57)
Log max tax diff	0.00730	-0.00216***	-0.00199***
	(0.59)	(-6.61)	(-4.50)
Expected inflation	0.611***	0.00302	-0.0403***
	(7.96)	(1.89)	(-13.00)
Median industry D/E	2.267	-	-
	(0.71)	-	-
Median industry D/A	-	0.896	2.342***
	-	(1.20)	(6.09)
Tangibility	-0.351	0.0262***	0.0209***
	(-1.36)	(13.19)	(15.95)
Log sales	0.353***	-0.0304***	-0.106***
	(10.42)	(-3.61)	(-12.33)
Log net income	-0.124***	-0.0132***	-0.00921***
	(-3.64)	(-18.34)	(-11.40)
Log GDP MNC	-0.226***	-0.0271***	-0.0279***
	(-19.67)	(-22.22)	(-15.06)
Log distance MNC	-0.0677*	-0.0256***	-0.00836***
	(-1.74)	(-11.03)	(-3.92)
Log import MNC	0.105	-0.0744***	-0.00304
	(1.63)	(-13.37	(-0.42)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
R^2	0.0319	0.13	0.21
N	4122	3960	1752

Note: The dependent variable in regression 1 is the debt-to-equity ratio, calculated as (Long term debt + Current liabilities) / Shareholders funds. The dependent variable in regressions 2 and 3 is the debt-to-asset ratio, calculated as (Long term debt + Current liabilities) / Total assets. The regressions are estimated by ordinary least squares. All regressions include year- and industry-fixed effects. All regressions use robust standard errors. Regression 2 includes 660 firms in the sample. Regression 3 includes 292 firms in the sample. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

9. Discussion

What is first to be noted is the low R-squared value of around 3% in table 3, which is the main regression table. This suggests that the predictor variables in the model explain roughly 3% of the variance of the outcome variable (Miles, 2014). This is in line with Huizinga et al. (2008) who find similar R-squared values in most of their regressions[3]. In table 4 the R-squared value increases to almost 8%. This is most likely due to the increased quality of data in the smaller sample that includes only the 300 largest firms. However, to confirm that the predictor values are chosen correctly one is referred to table 12. The standard regressions in this table are performed on the extremely small sample of 62 firms of which Orbis directly reports the debt-to-equity ratio. Since the sample contains only 5 domestic firms and only 62 firms in total most coefficients are insignificant. The coefficient of interest, which is the interaction term between the MNC and Post-2012 dummy stays significant at the 1% level and of similar size as in previous estimations. What is most important to notice is the R-squared value. The value increases to a much more acceptable 23.5%, which is in line with Frank and Goyal (2009), who find that the variation in leverage is for 24% explained by their variables. This indicates that the predictor variables are chosen correctly. However, this also highlights that the calculated debt-to-equity ratio is not perfect.

[3] Huizinga et al. (2008) employ the Amadeus database in their research. Amadeus is provided by Bureau van Dijk as well.

Table 12: R squared check

Dependent variable: Debt-to-equity ratio				
	(1)	(2)	(3)	(4)
MNC	-0.468***	-0.787***	-0.784***	0.354
	(-5.03)	(-3.64)	(-3.63)	(1.53)
Post-2012	1.247***	-0.134**	4.182***	3.953***
	(7.37)	(-1.98)	(10.32)	(9.67)
MNC*2012	0.253***	0.214***	0.214***	0.248***
	(4.46)	(4.20)	(4.18)	(4.80)
Max tax diff	0.00730	0.119***	0.119***	0.102***
	(0.59)	(2.77)	(2.76)	(3.55)
Expected inflation	0.611***	-0.0774***	1.790***	1.702***
	(7.96)	(-4.16)	(11.92)	(11.23)
Median industry D/E	2.267	0.609***	0.609***	0.462
	(0.71)	(9.70)	(9.57)	(1.11)
Tangibility	-0.351	1.087**	1.092**	0.397
	(-1.36)	(2.14)	(2.13)	(0.47)
Log sales	0.353***	0.371***	0.371***	0.470***
	(10.42)	(5.50)	(5.47)	(5.93)
Log net income	-0.124***	-0.0710	-0.0715	-0.0419
	(-3.64)	(-1.52)	(-1.49)	(-0.96)
Log GDP MNC	-0.226***	-0.114***	-0.116***	-0.0240
	(-19.67)	(-4.61)	(-4.53)	(-0.43)
Log distance MNC	-0.0677*	-0.359***	-0.359***	-0.325***
	(-1.74)	(-7.15)	(-7.17)	(-6.21)
Log import MNC	0.105	0.361***	0.360***	-0.00711
	(1.63)	(3.87)	(3.86)	(-0.08)
Year FE	Yes	No	Yes	Yes
Industry FE	Yes	No	No	Yes
R^2	0.0319	0.1439	0.1443	0.2356
N	4122	372	372	372

Note: The dependent variable is the debt-to-equity ratio. The regressions are estimated by ordinary least squares. Regression 2 has no fixed effects included. Regression 3 has year-fixed effects included. Regression 4 is the main specification and has year- and industry-fixed effects included. All regressions use robust standard errors. The sample includes 62 firms. Regression 1 shows the results from the main specification (table 3 regression 3). t statistics in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01

To analyze the difference between the calculated debt-to-equity ratio and the explicitly provided debt-to-equity ratio table 13 is included. Table 13 shows the differences in the mean values of both debt-to-equity ratios for the 62 firms of which Orbis explicitly reports the debt-to-equity ratio over the six years. Noticeable is that the reported value is consistently higher than the calculated value and that the difference grows from 8.6% in 2011 to 22.3% in 2016.

Table 13: Mean reported vs mean calculated debt-to-equity ratio

Debt to equity ratio				
Variable`	Mean reported	Mean calc	Difference	Diff in %
2011	1.64	1.50	0.14	8.6%
2012	1.72	1.43	0.29	16.6%
2013	1.72	1.42	0.30	17.5%
2014	1.89	1.54	0.35	18.5%
2015	1.89	1.54	0.35	18.7%
2016	1.72	1.33	0.38	22.3%
Firms	62	62	62	62

Furthermore, the estimation results by Büttner et al. (2012) and Wamser (2014) highlight that the implementation of thin-capitalization rules encourages MNCs to substitute internal for external debt. While the substitution is limited and the total debt-to-equity ratio still declines after implementation, this does show a bias in the results of this paper. It is reasonable to assume that the reverse substitution occurs after the abolishment of the thin-capitalization rule in the Netherland. Thus, Dutch affiliates of MNCs substituting external for internal debt. Nevertheless, the results show that the debt-to-equity ratio of Dutch affiliates of MNCs after 2012 increased. However, the effect on the internal debt-to-equity ratio is most likely larger than the estimated effect, which faces a downward bias due to the substitution effect.

10. Conclusion

The thin capitalization of MNCs is a central topic in public economics and corporate finance. Both theoretical as well as empirical studies delve into the tax-efficient financing structures of MNCs. It has been established that MNCs use external debt as well as excessive internal debt to profit at most from the debt-tax-shield. Governments can implement thin-capitalization rules to counter this excessive debt usage. Multiple studies have looked at the effects of the implementation/tightening of such rules, yet none have looked at the effect of the abolishment of such a rule.

The theoretical model provided by this study suggests that MNCs will shift more internal debt after the abolishment of the Dutch safe-harbor rule. The costs incurred to circumvent the safe-harbor rule and to use internal debt above the threshold (3:1 internal debt-to-equity ratio) cease to exist and the arm's-length principle, with lower tax engineering

costs, replaces it. Dutch affiliates of MNCs are therefore expected to increase their (internal) debt-to-equity ratio by a larger amount than comparable domestic Dutch firms.

The empirical results from this study confirm the theoretical model. Using the Orbis database, a sample of 687 firms is gathered that contains sufficient information to conduct the analysis. By comparing domestic Dutch firms who are unable to profit from the abolishment with Dutch affiliates of MNCs who can, the effect of the abolishment on thin-capitalization is estimated. The results find that Dutch affiliates of MNCs increased their debt-to-equity ratio by 0.253 in the large sample and by 0.239 in the smaller, more detailed sample, compared to domestic Dutch firms. This accounts for an increase of 19.5% and 12.7% in the mean debt-to-equity ratio, respectively. The result stays of similar size and significance in most robustness checks. In the lagged model robustness check the result in the large sample is insignificant. Furthermore, when using the debt-to-asset ratio instead of the debt-to-equity ratio, the result becomes insignificant as well. This disproves the robustness of the confirmation of hypothesis 1. Since the robustness of hypothesis 1 is disproven, this study will refrain from providing a policy implication. A similar study that observes the internal debt-to-equity ratio should be performed in order to confirm hypothesis 1. Such a study could also delve into why the result on the debt-to-equity and debt-to-asset dependent variable differ.

This study is to my knowledge the first one to include headquarters-country gravity variables in this area of research. The results in the main sample are contradictory to expectations. The log of GDP has a negative effect on the debt-to-equity ratio and the log of distance and import are insignificant. This disproves H2.1, H2.2, and H2.3. The effect of GDP stays similar in the small sample, but distance as well as imports become significant (1% and 5% level, respectively) and have the expected signs. This implies that the log of distance has a negative effect on the debt-to-equity ratio and the log of imports has a positive effect on the debt-to-equity ratio. Thus, as the distance between the country where the headquarters is located and the country where the affiliate is located grows, the debt-to-equity ratio of the affiliate decreases. The reverse holds for the import flow, as the import flow from the headquarters' country to the affiliate's country grows, the debt-to-equity ratio rises as well. As an additional robustness check, Dutch affiliates of MNCs with their headquarters in a tax haven are excluded. The results in the large sample are in line with expectations. The effect of GDP is insignificant, but the effects of distance and imports are significant and have the expected sign.

By excluding headquarters located in tax havens one decreases its sample and the exclusion is not at random. Therefore, this is not a perfect solution to estimate the effect of these variables. Further research should delve into the effects of the headquarter country variables. More specifically, a data set that observes the internal debt-to-equity ratio should be used, as this is affected by the headquarter-country variables the most. Furthermore, a sample with affiliates and headquarters located in different countries should be utilized to better estimate the effects of GDP, distance, and imports on the (internal) debt-to-equity ratio.

Appendix 1: First-order conditions for internal and external debt

In order to derive the FOC for internal and external debt equation (3) is recovered:

$$\max \Pi_p = \sum_i [(1-t_i) * (F(K_i) - r * K_i + t_i * r * (D_i^E + D_i^I) - (1-t_i)(C^E(b_i^E) + C^I(b_i^I)) * K_i] - C_f(b_f) \sum_i K_i \;\; s.t. \sum_i r * D_i^I = 0 \quad (3)$$

First, the FOC for external debt will be derived and provides equation (7):

$$\frac{\partial \Pi_p}{\partial b_i^E} = \sum_i t_i * r - (1-t_i) * \frac{\partial C^E(b_i^E)}{\partial b_i^E} + \frac{\partial C_f(b_f)}{\partial b_f} = 0 \quad (7)$$

After taking $\sum_i (1-t_i) * \frac{\partial C^E(b_i^E)}{\partial b_i^E} + \frac{\partial C_f(b_f)}{\partial b_f}$ to the right-hand side and dividing by $\sum i$, we are left with equation (4). Equation (4) shows the benefits and costs of using external debt.

$$t_i * r = (1-t_i) * \frac{\partial C^E(b_i^E)}{\partial b_i^E} + \frac{\partial C_f(b_f)}{\partial b_f} > 0 \; \forall i, \quad (4)$$

In order to find equation (5), the FOC with respect to internal debt will be derived from equation (3) and provides equation (8):

$$\frac{\partial \Pi_p}{\partial b_i^I} = \sum_i t_i * r - (1-t_i) * \frac{\partial C^I(b_i^I)}{\partial b_i^I} - \lambda * r = 0 \quad (8)$$

After taking $\sum_i (1-t_i) * \frac{\partial C^I(b_i^I)}{\partial b_i^I}$ to the right-hand side and dividing by $\sum i$, we are left with equation (5). Equation (5) shows the benefits and costs of using internal debt.

$$(t_i - \lambda) * r = (1-t_i) * \frac{\partial C^I(b_i^I, \alpha_i)}{\partial b_i^I} \geq 0 \; \forall i, \quad (5)$$

Appendix 2: Effect of abolishing thin-capitalization rules

To find the effect of abolishing the thin-capitalization rules and thus lowering parameter α_i, the total differential of equation (5) is derived.

$$(t_i - \lambda) * r = (1 - t_i) * \frac{\partial C^I(b_i^I, \alpha_i)}{\partial b_i^I} \geq 0 \; \forall i, \tag{5}$$

After replacing λ by t_1, the total differential of equation (5) becomes equation (9):

$$(dt_i - dt_1) * dr = (1 - dt_i) * \frac{\partial C^I(b_i^I, \alpha_i)}{\partial b_i^I} * d\alpha_i + (1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * d\alpha_i + (1 - dt_i) * \frac{\partial C^I(b_i^I, \alpha_i)}{\partial b_i^I} * db_i^I + (1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * db_i^I \tag{9}$$

Since $dt_i = dt_1 = dr = 0$ equation (9) becomes equation (10):

$$0 = (1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * d\alpha_i + (1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * db_i^I \tag{10}$$

Equation (10) can straightforwardly be modified into equation (11):

$$-(1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * db_i^I = (1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * d\alpha_i \tag{11}$$

After dividing both sides by $d\alpha_i$ equation (11) becomes equation (12):

$$-(1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} * \frac{db_i^I}{d\alpha_i} = (1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i} \tag{12}$$

After dividing both sides by $-(1 - t_i) \frac{\partial^2 C^I(b_i^I, \alpha_i)}{\partial b_i^I \partial a_i}$ equation (11) becomes equation (6):

$$\frac{db_i^I}{d\alpha_i} = -\frac{\partial^2 C^I(b_i^I, \alpha_i) / (\partial b_i^I \partial \alpha_i)}{\partial^2 C^I(b_i^I, \alpha_i) / (\partial b_i^I)^2} < 0 \tag{6}$$

Appendix 3: additional tables

Table 14: Tax haven countries

	Number of firms	
Country	Large sample	Small sample
Aruba	1	0
Bahamas	3	1
Belize	1	0
Bermuda	4	4
The British Virgin Islands	1	1
Cayman Islands	2	1
Cyprus	2	0
Gibraltar	1	0
Ireland	4	3
Liechtenstein	1	0
Luxembourg	5	3
Switzerland	7	2
Total	32	15
% Of MNCs	9.9%	8.1%

Table 15: Industry sizes

	Large sample		Small sample	
industry	Number of firms	Percentage	Number of firms	Percentage
1	9	1,3%	4	1,3%
2	8	1,2%	5	1,7%
3	88	12,8%	59	19,7%
4	6	0,9%	2	0,7%
5	12	1,7%	5	1,7%
6	18	2,6%	9	3,0%
7	70	10,2%	44	14,7%
8	25	3,6%	14	4,7%
9	10	1,5%	0	0,0%
10	14	2,0%	7	2,3%
11	321	46,7%	111	37,0%
12	15	2,2%	6	2,0%
13	65	9,5%	24	8,0%
14	11	1,6%	4	1,3%
15	6	0,9%	1	0,3%
16	3	0,4%	1	0,3%
17	6	0,9%	4	1,3%
Total	687	100%	300	100%

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