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Do multinational firms invest more? On the impact of internal debt financing and transfer pricing on capital accumulation*

Martin Simmler†

Abstract

This study analyzes whether multinational companies (MNC) that are able to reduce their tax burden on capital by shifting profits to low tax jurisdictions invest more than domestic firm. To study the relationship, I exploit a massive corporate tax rate cut of 10%-points in Germany 2008 as a quasi-natural experiment. This reform reduced substantially the incentive of MNC to engage in profit shifting. Using a difference in differences matching strategy (DiD), the results suggest that MNC decreased their fraction of internal borrowing and their capital stock compared to purely domestic firms. Taking the evidence together, the findings suggest that if MNC shift profits abroad, their capital accumulation is less depressed by the national tax rate and, therefore, benefits less from a tax rate reduction. The DiD results are confirmed by a more structural approach, which exploits variation in the tax incentive to shift profits to the headquarter for identification. Further, the results suggest that only internal debt financing but not transfer pricing fosters capital accumulation.

Keywords: internal debt shifting; capital accumulation; corporate income taxation; depreciation allowances.

JEL Classification: H25, F23, G31, G32.

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1 Introduction

A growing body of literature documents that multinational corporations use intra-firm transactions to reduce their tax payments.[1] These activities cause a loss in tax revenue and incentivize governments to engage in tax competition by decreasing their tax rates (e.g. Devereux et al., 2008) and/or to limit profit shifting activities by introducing anti-abuse regulations[2]. Thus, profit shifting activities of multinational firms are mainly associated with welfare losses for countries.

This might, however, not reflect the whole picture as recently pointed out by theoretical studies (e.g. Desai et al., 2006; Hong and Smart, 2010; Schindler and Schjelderup, 2012). A higher tax burden on capital reduces capital accumulation (e.g. Chirinko et al., 1999). Thus, if multinational firms are able to reduce their tax burden by shifting profits to low tax jurisdictions, their capital accumulation should be less depressed by the national tax rate. In other words, multinational firms that shift profits abroad should invest more compared to domestic firms. The aim of this study is to provide clear evidence on the positive impact of profit shifting activities on capital accumulation.[3]

To answer my research question, I rely on a difference in differences design (DiD). The causal impact of profit shifting activities on capital accumulation is identified by comparing the financing and investment behavior of purely domestic and multinational firms in a high tax country in response to a strong tax rate reduction. To account for potential differences between treatment and control group, I follow prior literature (e.g. Egger et al., 2010) and combine the DiD with a propensity score matching approach.

Further, to link the results to the investment literature (e.g. Chirinko et al., 1999; Bond and Xing, 2011) and to allow a comparison with the prior literature on profit shifting activities of multinational companies, a second identification strategy is implemented as well. This exploits the change in the tax incentive to engage in profit shifting to the headquarter for identifica-

[1] e.g. Grubert and Mutti, 1991; Hines and Rise, 1994; Bartelsman and Beetsma, 2003; Clausing 2003; Huizinga and Laeven, 2008, Huizinga et al., 2008; Weichenrieder, 2009; Egger et al., 2010; Buettner and Wamser, 2013.

[2] See Fuest and Hemmelgarn (2005) and Haufler and Runkel (2012) for a theoretical and Buettner et al. (2012), Buslei and Simmler (2013) and Blouin et al. (2014) for an empirical analysis of thin capitalization rules. Peralta et al. (2006) investigate whether countries should limit profit shifting or not.

[3] The paper deals solely with the impact of profit shifting activities on the intensive margin of capital accumulation. For the impact of taxation on the extensive margin, i.e. the location decision of multinational firms, see De Mooij and Ederveen (2003), Devereux and Griffith (2003) or Barrios et al.(2013).

tion. Compared to the first approach, the second approach is sensitive to the modeling of the tax incentive. It allows, however, to link explicitly multinational firms' tax savings to investment spending. Since the studied tax rate reduction came along with the introduction of less generous depreciation allowances, their impact on firms' profit shifting activities and its related impact on capital accumulation is investigated as well. The database for both approaches are financial statements, ownership and subsidiary information for German firms between 2004 and 2010.

Both applied methods provide consistent results and confirm the theoretical predictions. The findings suggest that multinational firms, for which the incentive to shift profits was reduced or even abolished due to the tax rate reduction, decreased their (internal) debt ratio and their capital stock compared to domestic firms. These results are consistent with the presence of a tax-advantage of multinational firms due to their profit shifting activities. The tax advantage allows multinational firms to invest more compared to domestic firms. Moreover, the analysis presents evidence that in particular shifting profits via internal debt financing foster capital accumulation, but not transfer pricing.

The results show further that if governments restrict the generosity of depreciation allowances, the tax advantage of multinational firms increases as the tax burden on capital. Thus, recent tax reforms that followed the principle *tax rate cut cum base broadening* might have decreased the number of firms shifting (simply) profits (to the headquarter) but increased at the same time the tax advantage of firms that still engage in internal debt shifting.

The paper contributes to the prior literature in several ways. Firstly, a new identification strategy is used. So far, most of the empirical literature on profit shifting activities of multinational companies exploit variation in the incentive to engage in profit shifting (e.g. Huizinga and Laeven, 2008; Huizinga et al., 2008; Buettner and Wamser, 2013). Identification relies then on the functional form. By using a difference in differences approach the functional form assumption is relaxed. Moreover, by focusing on the tax rate reduction in the high tax country, I ensure that all subsidiaries had before the tax rate reduction an incentive to shift profits out of the high tax country. This is important as only shifting profits out of the country affects capital accumulation but not if profits are shifted into it. Further, the massive tax rate reduction rules out that adjustment costs refrain firms from reacting.

By studying the tax rate reduction in the subsidiary country I further rule out that complementarity or substitutability of production functions within the multinational group are driving the results. This might, however, occur if variation in the parent tax rate is used for identification as shown by Becker

and Riedel (2012). Overesch (2009) reports that changes in the tax rate of the parent company affect subsidiary's investment spending. He explains his finding by profit shifting activities. In the light of the results by Becker and Riedel (2012) the observed impact could be fully independent of profit shifting activities but simply be related to the interdependence of production functions within multinational groups.

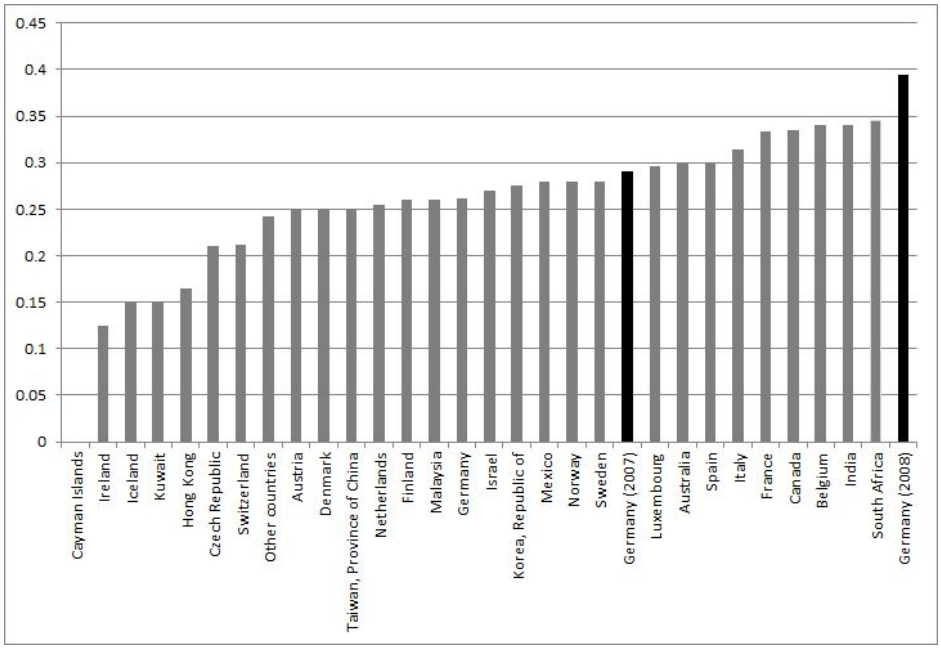
Another contribution to the literature relates to the investigation of the potential different impact of different means of profit shifting on capital accumulation. So far, prior studies did not distinguish between these two different channels (e.g. Mintz and Smart, 2004; Overesch 2009, Egger et al., 2014). As suggested by Schindler and Schjelderup (2013), the two different forms of profit shifting are, however, likely to affect capital accumulation differently. This paper is the first that accounts for the potential different impact and provides empirical evidence on its relevance.

Moreover, I contribute to the literature by explicitly linking the profit shifting to the investment literature. So far, both literature streams have developed more or less separately. Since multinational firms do account for a large share of capital accumulation, it is important to understand how these firms react to tax policy and how the behavioral response is influenced by the presence of profit shifting activities. The results of this paper highlight that tax rate reductions in high tax countries may not spur investment, if multinational firms shift profits via internal debt financing to low tax jurisdiction.

Finally, by estimating both, a difference in differences and a more structural approach, a comparison of the two methods is possible. This allows me to gain insights into the relevance of methodological differences. Further, using two different methods that provide consistent results adds confidence in the empirical results.

The remainder of this paper is as follow. In section two the 2008 corporate tax reform in Germany, the high tax country used in this study, is described. Domestic and multinational firms' expected behavioral responses with respect to internal debt financing and capital accumulation are illustrated in section three. After introducing the data in section four, the methodology and the results of the difference in differences matching strategy are presented in section five, and for the structural approach in section six. In section seven the results of the two methods are compared. Section eight concludes.

Figure 1: Corporate tax rates for selected parent companies of German subsidiaries in 2008



Notes: Corporate income tax rates in 2008 for countries with at least 50 parent firm - year observations in the database are shown. Tax rates are obtained from the Corporate Tax Guide by Ernest & Young 2008.
Source: DAFNE firm data base, 2008.

2 Institutional Background: The German Corporate Tax Reform 2008

The identification strategy employed in this paper compares the behavior of multinational and domestic firms in a high tax country in response to a large tax rate cut. The country that provides almost ideal conditions for this identification strategy is Germany in 2008.

Firstly, prior to 2008, Germany had one of the highest tax rates on corporate profits in Europe and the world. Thus, almost every foreign owned subsidiary in Germany had an incentive to shift part of the profits abroad, e.g. to its headquarter (see Figure 1 for a distribution of the tax rates faced by parent companies owning German firms). Most of the subsidiaries also seemed to follow this incentive as empirical evidence suggests that profit shifting activities came, to a large extent, at Germany's cost (Huizinga and Laeven, 2008).

Secondly, to discourage firms from shifting profits abroad, the German

government implemented with the corporate tax reform 2008 a strong reduction of the tax rate on profits from 40 to 30%.

Further changes due to the corporate tax reform concern the introduction of less generous depreciation allowances, and the introduction of anti-abuse regulations as the new interest barrier (see e.g. Buslei and Simmler, 2013). A minor change that is, however, important in the light of this study relates to the adding back regulations of the local business tax. Certain finance expenses, e.g. interest expenses, have to be partially added back to the tax base of the local business tax. Due to these tax base adjustment the tax rate on profits does not necessarily equal the tax rate to which interest expenses are deductible in Germany.[4] Before 2008, only interest expenses on long term debt (with a maturity exceeding one year) had to be added back to 50% to the local business tax base. In order to treat interest expenses for short and long term debt in the same way, this applies beginning in 2008 to all interest payments but only to 25%. The share of the local business tax of the overall tax rate is around 50%.[5]

3 Theoretical Background

To illustrate the impact of internal debt financing on real investment and how both are affected by the German corporate tax reform 2008, the cost of capital approach (e.g. Jorgenson, 1963; Hall and Jorgenson, 1967) is used and extended by allowing for internal debt financing.[6]

To account for internal debt financing in the multinational context, the starting point of the approach is a shareholder who owns two representative firms in two different countries (G and A). The shareholders' interest is to

[4]The origin of these regulations go back to the 1990s, when the local business taxes, set and collected by German municipalities, were designed to be a tax on infrastructure use.

[5]Before 2008, the local business tax rate was calculated as local business tax multiplier, set by the municipality, times the *Gewerbesteuermesszahl*, which was 5.5% for all municipalities. Further, the local business tax was deductible from its own and from the corporate income tax base. The effective local business tax amounts before the reform to roughly 18% for the average multiplier of 400. Since local business tax payments reduce the corporate income tax base, the average overall tax rate amounts to 39% (18%+(1-18%)*26.38%). Due to the corporate tax reform, the *Gewerbesteuermesszahl* was reduced to 3.5% and the deductibility of the local business tax abolished. The average overall tax rate on profits amounts thus after 2007 to 29% (14% local business tax and 15.8% corporate income tax, including solidarity surcharge). The difference between the tax rate on profits and to which interest payments are deductible decreased. On average, before the reform it amounted to 6%; after to 3.5%.

[6]For an overview and extensions of the approach see Devereux (2004).

maximize the value of the two firms ($V_{G,t}$ and $V_{A,t}$). The value of a firm can be expressed as the present value of its future cash flows (equation (1)), which is the sum of real activity cash flow (π_r) and financial activity cash flow (π_f) (equation (2)). The real activity cash flow in period s for each firm equals sales (price p_s multiplied with output $F(K_{s-1})$) minus investment costs and taxes. Firms' tax payments are determined by the tax rate on profits (u) and depreciation allowances (ϕ) (see equation (3) for the firm in country G).

The financial activity cash flow captures internal debt financing and, thus, borrowing and lending between the two firms of the shareholder. It is determined by three terms and exemplary shown for the firm in country G.[7] The first term in equation (4) reflects that interest payments for internal debt financing, given by the share $\beta_{G,t-1}$ of the capital stock ($K_{G,t-1}$) in country G, can be deducted from the tax base.[8] The tax rate to which interest payments are deductible ($u_{G,mod,t}$) may however differ from the tax rate on profits ($u_{G,t}$) due to, for instance, adding back regulations or thin capitalization rules. Since internal debt financing cannot exceed the amount of the capital stock, it is important to note that β is bounded as it cannot exceed one.[9] The second term determining firms' financial cash flow is the impact of internal debt financing of the capital stock in A on profits in G, thus the opposite case. In this case, the tax base in country G is broadened by the received interest income.

$$
\begin{aligned}
V_t &= V_{G,t} + V_{A,t} && (1)\\
V_{t,G} &= E_t \sum_{s=t} (1+r)^{-s} [\pi_{r,s,G} + \pi_{f,s,G}] && (2)\\
\pi_{r,t,G} &= (1-u_{G,t}) p_{G,t} F(K_{G,t-1}) - q_t I_{G,t} + u_s \phi (q_t I_{G,t} + K^T_{G,t-1}) && (3)\\
\pi_{f,t,G} &= -(1-u_{G,mod,t}) r \beta_{G,t-1} K_{G,t-1} + (1-u_{G,t}) r \beta_{A,t-1} K_{A,t-1} \\
&\quad + c(\beta_{G,t-1}) && (4)\\
c(\beta_{G,t-1}) &= c_{fix} + c_{var}(\beta_{G,t-1}) = c_G \pi^*_{G,t} (u_{G,mod,t} - u_{A,t}) + c_{var}(\beta_{G,t-1}) && (5)\\
K_t &= I_t + (1-\delta) K_{t-1} && (6)\\
K^T_t &= (1-\phi) K^T_{t-1} + (1-\phi) q_{t-1} I_t && (7)
\end{aligned}
$$

If firms use internal debt financing, they face costs ($c(\beta)$) that consist of

[7] In the following I ignore that cash flow changes due to the received respectively paid back, nominal value of debt and focus only on interest payments.

[8] In principle, multinational firms might manipulate interest rates as well. However, this strategy would conflict with the arm's-length principle and is thus not considered in this study.

[9] In principle β might exceed one but in this case capital would earn only the interest rate. Thus, it would be beneficial to receive this income in the low tax country.

a fixed (c_{fix}) and variable part ($c_{var}(\beta)$) (equation (5)). The fixed cost component is assumed to be a fraction (c_G) of firms' maximal tax savings based on firms' maximal taxable profits ($\pi^*_{G,t}(u_{G,mod} - u_A)$).[10] It accounts for the fact that multinational firms have different ways to shift profits abroad, e.g. internal debt financing and transfer pricing. Thus, they use the way that allows them to shift more (which is the way with lower overall costs). The main advantage of using a fixed cost component for internal debt financing is that transfer pricing and its related costs does not have to be explicitly modeled but are still included in the model. There are various ways to model transfer pricing as this depends on the input factors (e.g. royalties or management services) of which prices are manipulated. The variable cost part of internal debt financing is assumed to be convex in the fraction of internal debt financing as standard in the literature.[11] It relates to tax engineering expenses incurred in order to avoid or relax regulations such as thin capitalization rules and/or controlled-foreign-company rules.[12]

The shareholder maximizes the present value of the future cash flows by choosing the state variables for the two firms, firms' capital stock and the fraction of internal borrowing (K and β). The maximization is subject to a capital accumulation constraint (equation (7)) and the valuation of the capital stock for tax purposes (equation (8)).

Optimal Internal Debt Financing: Out of the model, three insights regarding the optimal fraction of internal debt financing (β^*_G) in country G can be derived (equations (8) and (9)). One insight relates to the first order condition for the interior solution, the two other deal with the corner solutions.

One of the two corner solutions is that the firm can shift as much as it wants and thus faces ultimately a zero tax burden in the high tax country G (third line equation (9)). The maximum fraction that has to be shifted is given by equation (8) as for $\beta^{max}_{G,t-1}$ taxable profits in country G are zero

[10] In principle the maximal tax savings could relate to actual production, but this would not change the results qualitatively.

[11] Further, prior literature assumes that the cost of shifting increases in the capital stock (e.g. Schindler and Schjelderup, 2012). The results are not sensitive to this choice. The only difference is that the impact of internal debt financing on capital accumulation would in this case be reduced by the costs of shifting. Since I am not able to account for the cost of internal debt financing in the empirical analysis, I have to leave the question for future research and assume the simpler case in my model. The impact I estimate is the net effect.

[12] It is assumed that the costs of internal debt financing are not tax-deductible. The assumption is not crucial for the results. If the costs are deductible, then the firm has an incentive to deduct them in the high tax country.

in period t.[13] This maximum fraction increases with the ratio of profits before interest payments to the capital stock (first term within the brackets) and decreases with the share of depreciation allowances to the capital stock (second term within the brackets). Since β cannot exceed one, this means that firms with a high ratio of profits before interest to their capital stock and/or low depreciation allowances are not able to reduce their tax payments to a large extent by using internal debt financing. Finally, the maximum share increases with the ratio between the tax rate on profits and the tax rate to which interest payments are deductible.

The other corner solution (first line, equation (9)) and thus the second insight relates to the question whether a firm engages in internal debt financing or not. This depends on the fixed costs. If tax savings exceed the costs, the firm engages in internal debt financing. Since the fixed costs are a fraction of firms' potential overall tax savings, a firm will only engage in internal debt financing if it can substantially reduce its tax payment. Thus, drawing from the insights before, firms with a high ratio of profits to the capital stock are less likely to engage in internal debt financing as these firms are not able to reduce their tax burden to a large extent.

Finally, the last insight relates to the question how much internal financing is used if the firm engages in debt financing and cannot shift as much as it want. It is given by the first order condition for the interior solution (second line, equation (9)) and states that for the optimal amount of internal debt financing the marginal benefit of internal debt financing, expressed by the tax savings, equals the marginal costs, a common result in the literature (e.g. Schindler and Schjelderup, 2012).

$$\begin{aligned} \beta_{G,t-1}^{max} &= \frac{u_{G,t}}{u_{G,mod,t}} \frac{\pi_{r,t,G}^{T}}{rK_{G,t-1}} \\ &= \frac{u_{G,t}}{u_{G,mod,t}} [\frac{p_{G,t}F(.)}{rK_{G,t-1}} - \frac{\phi(q_{G,t}I_{G,t} + K_{G,t-1}^{T})}{rK_{G,t-1}}] \end{aligned} \tag{8}$$

$$\beta_{G,t-1}^{opt} = \begin{cases} 0 & \text{if } a \leq \frac{\pi_{G,t}^{*} c_G}{rK_{G,t-1}} \\ K_{G,t-1} r(u_{G,mod,t} - u_{A,t}) = c_{\beta_{G,t-1}}(\beta_{G,t-1}^{*}) & \text{if } a > \frac{\pi_{G,t}^{*} c_G}{rK_{G,t-1}} \\ & \text{and } \beta_{G,t-1}^{*} \leq \beta_{G,t-1}^{max} \\ min(1, \beta_{G,t-1}^{max}) & \text{if } \beta_{G,t-1}^{*} > \beta_{G,t-1}^{max} \end{cases}$$

[13] One has to derive an expression for firms tax payments in period t, set it to zero and solve it for β.

with

$$a = \frac{\beta^*_{G,t-1} r K_{G,t-1} - \frac{c_{var}(\beta^*_{G,t-1})}{u_{G,mod,t} - u_{A,t}}}{r K_{G,t-1}} \tag{9}$$

Optimal capital stock with debt shifting: The first order condition for the optimal capital stock of the representative firms in county G is given by equation (10).[14] In the optimum the marginal productivity of capital (left hand side) has to equal marginal costs (right hand side). The latter consist for multinational firms of two parts. The first term is the usual expression for the user costs of capital using retained earnings (e.g. Chirinko et al., 1999). It depends on the present value of depreciation allowances $(1 - A)$[15], the finance costs r, the economic depreciation rate δ, and the business tax rate u_t. The second term captures the impact of internal debt financing. It is obvious that if the capital stock of the representative firm in country G is (partly) financed with internal debt ($\beta_G > 0$), the user costs of capital are lower than without shifting (equation (11)). Further, since only $\beta_{G,t}$ affects the return of capital in country G, there will be no difference in the user costs of capital in country G, if profits are shifted from A to G.

$$F_{K_{G,t}} = \frac{(1 - A_{G,t+1})(r + \delta)) - r\beta_{G,t}(u_{G,mod,t+1} - u_{A,t+1})}{p_{G,t+1}(1 - u_{G,t+1})} \tag{10}$$

$$= UCC^{RE}_{G,t} - \frac{r\beta_{G,t}(u_{G,mod,t+1} - u_{A,t+1})}{p_{G,t+1}(1 - u_{G,t+1})} \tag{11}$$

$$A = \frac{u_t \phi (1 + r)}{\phi + r} \tag{12}$$

Before summing up the hypothesis derived from the neoclassical investment model, two simplifying assumption are discussed. The first concerns the fact that only two companies are considered in the analysis, the second the role of external debt financing.

More than two countries: To understand the incentive in a more general setting, the case with three firms is briefly described. The shareholder owns in the following a firm in T as well. Profits from G can now be shifted to A and T. The costs of shifting depend on the overall fraction that is shifted abroad ($\beta_{G,A,t} + \beta_{G,T,t}$). Further, one may assume that the shareholder prefers

[14] The expression is derived by taking the first order condition for the optimal capital stock, then setting inflation and expected real change in the price of capital to zero.

[15] Present value of depreciation allowances is shown for declining-balance method.

(or dislikes) profits to be located in country A (ω). The first order condition for the interior solution for the optimal fraction of internal debt financing are shown in equation (13) and (14).

$$
\begin{aligned}
c_{\beta_{G,A,t}} &= K_{G,t} r(u_{G,mod,t+1} - u_{A,t+1}) + \omega_{\beta_{G,A,t}}(\beta_{G,A,t}) && (13)\\
c_{\beta_{G,T,t}} &= K_{G,t} r(u_{G,mod,t+1} - u_{T,t+1}) && (14)\\
F_{K_{G,t}} &= UCC^{RE}_{G,t} - \frac{r\beta_{G,A,t}(u_{G,mod,t+1} - u_{A,t+1})}{p_{G,t+1}(1 - u_{G,t+1})} && (15)\\
&= -\frac{r\beta_{G,T,t}(u_{G,mod,t+1} - u_{T,t+1})}{p_{G,t+1}(1 - u_{G,t+1})}
\end{aligned}
$$

Depending on the preference parameter (ω) and the tax rates in the two countries, two different cases may arise out of this setting. Firstly, the shareholder shifts all profits to one location, which is then not different from the two country case. Secondly, it may be optimal to shift part of the profits to one place and the rest to the other place. The capital stock in G for the latter case is given by equation (15). It depends now on the tax rates in all three countries, but the implications are the same as in the two country case. If multinational firms shift profits abroad via internal debt financing, they face lower investment costs and thus have a higher capital stock than domestic firms.

External Debt Financing: Compared to retained earnings, internal and external debt financing is tax favored as interest payments are deductible from the tax base. In contrast to internal debt financing, however, both, domestic and multinational firms, are able to use external debt financing. Following the trade-off-theory, the use of external debt financing causes bankruptcy costs (Kraus and Litzenberger, 1973). If in the optimum, bankruptcy costs equal the tax advantage of external debt on the firm level, both type of firms would - if otherwise identical - use the same amount of external debt and thus react to the same extend to a change in the tax advantage. Further, their investment would be equally affected. The implications stated above would thus be the same.

If marginal costs and benefits are not balanced on the firm but rather on the group level, the picture would change. In this case, external and internal debt are to some extend substitutes as multinational firms have an incentive to load firms in high tax countries with a larger amount of debt (see Moen et al., 2011). Multinational firms will then react differently with their external debt ratio to changes in the tax rate. Although this is likely to affect the estimates for the overall debt ratio, I do not expect a bias in

the investment equation. External debt financing does not seem to influence capital accumulation as at the margin marginal costs and marginal benefits of external debt financing equal each other (e.g. Bond and Xing, 2011).

Summing up, the following hypothesis can be derived out of the model.

Hypothesis 1a: If the tax rate on profits in country A is lower than the tax rate to which interest expenses are deductible in country G, then the shareholder of the firms in G and A shift profits from G to A. The larger the difference is, the higher the share of internal debt financing.

Hypothesis 1b: Firms with a high ratio of profits before interest to their capital stock do not engage in internal debt financing due to fixed costs. Further, internal borrowing of firms with generous depreciation allowances depends less on the tax rate difference as these firms are able to shift as much income as they want and are, therefore, not constrained by marginal costs.

For the 2008 corporate tax rate cut, this means that multinational firms will decrease their internal debt financing as the tax advantage to engage in internal debt financing is reduced. Further, I expect due to fixed costs of internal debt financing that firms with a low ratio of profits to their capital stock will decrease their internal debt financing stronger than firms with a high ratio of profits. Since firms benefiting from more generous depreciation allowances have to shift less, their fraction of internal borrowing was lower before the tax rate reduction. Thus, their reduction in the internal debt ratio in response to the tax rate cut should be less strong.

Hypothesis 2a: If profits are shifted from country G to A, the capital stock in G is larger than without internal debt financing shifting.

Hypothesis 2b: The relative advantage of the profit shifting firm with respect to investment increases in the ratio between profits shifted abroad and the overall taxable profits. Thus, the positive impact on investment is larger for firms with a low ratio of profits before interest payments to the capital stock and for firms with less generous depreciation allowances.

If multinational firms shifted profits via internal debt financing to low tax jurisdictions prior to the tax rate reduction, their investment was less affected by the national tax rate. In other words, their capital stock will benefit less from the tax rate reduction, and should, thus, decreases relative to purely domestic firms. Further, I expect that the reduction in the capital stock is larger for firms that were more actively engaged in internal debt

shifting before the reform. These are firms with a low share of profits to the capital stock and firms with less generous depreciation allowances.

4 Data

To test the hypothesis outlined in the previous section, two different methods are used. The first method is a difference in differences propensity score estimation; the second a more structural approach. Since for both methods the same dataset is used, although using different subsample, I start by describing the data and then introduce in the next two sections the methods in detail and present the results.

The database of this study are unconsolidated financial statements, ownership and subsidiary information for German incorporated firms between 2004 and 2010 from the database DAFNE. This data has two main advantages compared to other data sets used to study the behavior of multinational firms. Firstly, beginning in 2006 it covers almost 85% of all German firms with limited liability. Thus, the database allows to compare multinational firms with a broad set of domestic firms instead of exploiting differences between multinational firms. Secondly, at least for a subsample of firms income statements are observed. This allows on the one side to explore firm heterogeneity as suggested by the theoretical model. On the other side it allows to complement the main analysis, which uses only balance sheet information, with additional regression results using interest payments and profits.

Two main selections are made to derive the final samples. Firstly, I require that all firms in the sample are owned by another non-natural person. The main reason is to exclude stand-alone companies from the control group such that only firms belonging to a domestic group are compared with firms belonging to a multinational group. Secondly, I require that the firms included in the final sample are observed before and after the reform as the identification is based on the changed incentive due to the specific reform. A minor selection concerns the exclusion of subsidiaries owned by parent companies located in countries that apply the worldwide principle for corporate taxation (in my sample US, UK, and Japan). Their investment decision depends independently of internal debt financing on the parent tax rate. Further, firms with changes in the ownership structure are excluded as these could be driven by taxes as well.

The data is complemented by a collection of foreign tax rates to capture the tax incentive to engage in internal debt financing to the headquarter.[16] Further, to exploit variation in the tax rate on profits in Germany, which

[16]The data stems from the Ernst & Young tax guides.

varies across the 12,000 municipalities, municipality specific local business tax rates are merged to the data using firms' postal code.[17]

5 Difference-in-Differences Propensity Score Estimation

5.1 Methodology & Descriptive Statistics

The first approach used to provide evidence on the causal impact of internal debt financing on capital accumulation compares the financing and investment behavior of purely domestic to multinational firms, before and after the reform. Thus, I estimate a difference in differences specification of the form given in equation (16). The main advantage of this approach is that I do not have to model the tax incentive to engage in internal debt shifting, which is almost impossible given the complex structures of multinational companies and the missing information on finance flows.

$$Y_{i,t} = \alpha_i + \beta_0 Treatment_i + \beta_1 Treatment_i * Reform + \beta_2 Reform + e_{i,t} \quad (16)$$

Descriptivie statistics, reported in Table 1, suggest that multinational and domestic firms are different with respect to their observable characteristics. Domestic firms are smaller, have a lower debt ratio and a higher capital stock than multinational firms. Further, they operate in different industries. To account for these difference, I combine the difference in differences with a propensity score matching approach. This approach stems from the evaluation literature and can be used to make treatment and control group more comparable (Heckman et al., 1997).[18] It is used in a similar context by Egger et al. (2010). The idea of the approach is to use only treated and control companies that are sufficiently similar to each other for the comparison. Treatment and control group observations are thus matched on a set of variables X such that the conditional mean independence assumption is fulfilled. The assumption states that both group would behave similar in the absence of the treatment.

Crucial assumption for the matching approach is the inclusion of all relevant characteristics X in the analysis. The broadest set of variables, on which I match the two groups are: industry classification, debt ratio 2005,

[17]The local business tax rates are provided by the Federal Statistical Office. Since I have firm level data and not plant level data, I cannot account for the fact that plants of the same firm located in different municipality may face different local business tax rates.

[18]Stuart (2010), Caliendo and Kopeinig (2008) and Caliendo and Kuenn (2011) provide comprehensive overviews and an application of matching methods.

Table 1: Descriptive statistics for treatment and control group up to 2006

	Mean		p-value
	Control Group	Treatment Group	t-test (two-sided)
firm size (log(total assets))	8.29	8.87	0.00
debt ratio	0.45	0.50	0.00
log(capital stock in thd. EURO)	6.14	5.54	0.00
d.debt ratio	-0.01	-0.01	0.57
d.log(capital stock)	0.05	0.02	0.21
Industry dummies			
agriculture, forestry and fishing	0.01	0.00	0.00
mining and quarrying	0.00	0.00	0.56
manufacturing	0.05	0.25	0.00
electricity and gas supply	0.11	0.03	0.00
water supply	0.02	0.03	0.00
construction	0.04	0.23	0.00
wholesale and retail trade	0.01	0.00	0.00
transportation and storage	0.07	0.07	0.81
information and communication	0.01	0.02	0.34
accommodation and food service activities	0.42	0.33	0.00
real estate activities	0.05	0.00	0.00
professional, scientific and technical activities	0.09	0.01	0.00
administrative and support service activities	0.11	0.03	0.00

Notes: Control group consists of purely domestic firms, that are observed between 2005 and 2009. Treatment group includes firms that had before the reform an incentive to engage in debt financing to the headquarter, which was abolished due to the reform.
Source: DAFNE firm data base 2004 - 2006.

firm size 2005 (measured as natural logarithm of total assets), and (natural logarithm of the) capital stock in 2005 as well as the change in the capital stock and the debt ratio between 2005 and 2006.[19] I use the 2005 and 2006 characteristics as the reform was announced in 2007. Although one might argue that matching on capital stock and finance structure does not increase the similarity of treatment and control group since multinational firms that shift profits have a higher debt ratio and invest more, the null hypothesis is that both firms behave in the same way. To check the sensitivity of the results, I exclude these variables in a robustness check.

Since I match on multiple variables, proximity between observations is based on the estimated one-dimensional propensity score, which is the probability of receiving treatment, conditional on the matching variables X. It is estimated by running a logistic regression of the treatment indicator on X.[20] As distance measure, I use the linear propensity score, which improves the balance between treatment and control groups (Rosenbaum and Rubin, 1985). Finally, the observations are matched using kernel and, in a sensitivity

[19] In a robustness specification, I also matched on changes between 2004 and 2005. The results are qualitatively and quantitatively unchanged and are available upon request.

[20] Rosenbaum and Rubin (1985) show that conditioning on X is equivalent to conditioning on the propensity score.

check, 5-to-1 nearest neighbor matching, both with replacement. To evaluate the matching quality I report standardized bias before and after matching.[21] Since the combination of DiD and propensity score estimation requires a balanced sample as otherwise the estimation would suffer from sample attrition, I include only firms in the sample that are observed in every year between 2005 and 2009.

The control group in my setting consists of 6,083 purely domestic firms. These are firms that are ultimately owned by another German corporation, and that do not own foreign subsidiaries, neither directly nor indirectly (via the parent company or subsidiaries). The treatment group in contrast consist of 1,081 foreign owned firms. These multinational firms had before the reform an incentive to engage in internal debt financing to the headquarter that was abolished by the reform. The parent companies of these subsidiaries are, for example, located in France or Sweden (see Table A.1 in the Appendix). I focus on this particular group of multinational firms as, firstly, only 30% of the multinational firms have a subsidiary in a tax haven (Gumpert et al., 2011; Buettner et al., 2013). Moreover, there seems to be a home bias in multinational firms' profit shifting activities (Dischinger et al., 2014). Thus, shifting profits to the parent company is likely to be a very important channel. Secondly, if a multinational subsidiary had before and after the reform an incentive to engage in internal debt shifting, its' reaction is likely to be less strong, which may attenuate the estimated treatment effects. The sensitivity of the exclusion of other multinational firms is assessed in a robustness check.

The two outcome variables of interest are (the natural logarithm of) firms' capital stock and firms' debt ratio (defined as total liabilities to total assets, inluding internal liabilities). The latter is used since internal liabilities are not observed for all firms in the sample. Following the theoretical predictions, firm heterogeneity is assessed by splitting the sample according to firms' ratio of profits before interest payments to total assets and reapply the propensity score matching approach. Since profits are not observed for each company in the data, two-digit industry averages based on all available firms in the database are used. The mean ratio of profits before interest to total assets is around 30%. To uncover the impact of the generosity of depreciation allowances on internal debt financing and firms' capital accumulation, I interact the ratio of depreciation allowances to total assets with the Treatment*After variable. As for profits, two-digit industry averages are used, the mean is around 5.4%.

[21]The standardized bias is calculated as the difference between the mean characteristic of the treated and matched control firms, standardized by the square root of the average of the variances in the two groups.

5.2 Results

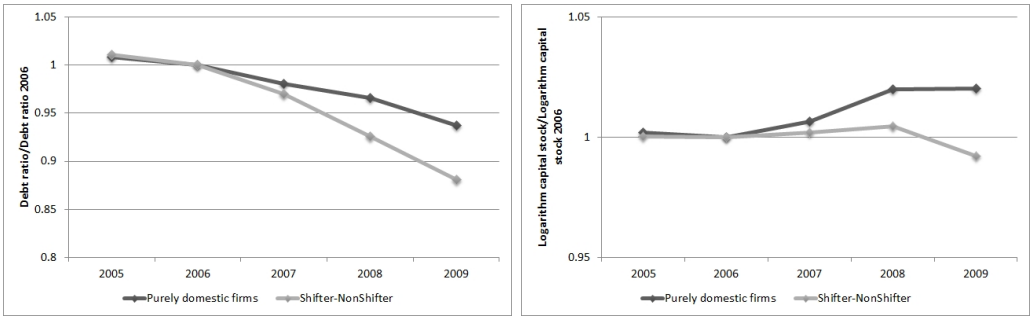
Before presenting the results based on the matched sample, information on the propensity score estimation is provided. The results from the logistic regression used to estimate the propensity score reflect the differences between foreign owned firms and purely domestic firms (Table A.2 in the Appendix). After estimating the propensity score, I apply kernel matching to identify suitable control observations for every firm in the treatment group. The standardized bias indicates a successful matching as for all variables, I match on, the bias is below 5% (Table A.3 in the Appendix).

I begin with providing graphical evidence on the studied relationship. The evolution of the debt ratio for treatment and control group using the matched sample are shown on the left hand side of Figure 2. The debt ratio is normalized by groups' mean debt ratio in 2006. The common trend assumption seems to be fulfilled as between 2005 and 2006 both groups exhibit a similar trend. In line with the theoretical expectations, both the treatment (*Shifter-NonShifter*) and control (purely domestic firms) group decreased their debt ratios after 2007 since the tax rate reduction reduced the tax advantage of debt (e.g. Modigliani and Miller, 1963; Feld et al., 2013). Further, in line with the derived hypothesis in section 3, the debt ratio of the treatment group decreased stronger.

The evolution of the capital stock for both type of firms is shown on the right hand side of Figure 2. Depicted is the natural logarithm of the capital stock, normalized by the groups' mean in 2006. Purely domestic firms increased their capital stock after 2007, which is consistent with the literature on taxes and investment spending (e.g. Chirinko et al., 1999). Firms for which the tax incentive to engage in internal debt financing was abolished (*Shifter-NonShifter*) did not increase their capital stock.

The clear picture of the graphical analysis is confirmed by the results of the difference in differences regression analysis, which accounts for firm specific effects. Column (1) and (2) of Table 2 show the results for the debt ratio and the natural logarithm of the capital stock as dependent variable based on the sample using kernel, and (3) and (4) using 5-to-1 nearest neighbor matching. In all specification, there is a statistically significant, negative impact for the treatment group due to the corporate income tax rate reduction in 2008. The results suggest that on average the treatment group reduced their debt ratio by 2.2 (kernel matching) to 2.3%-points (5-to-1 nearest neighbor) compared to domestic firms. This is in line with the hypothesis that these firms reduced or even stopped using internal debt financing to lower their taxable income. With regard to the capital stock, the results show that firms which stopped shifting profits abroad via internal debt financing decreased

Figure 2: Evolution debt ratio and capital stock for purely domestic firms and Shifter-NonShifter based on the matched sample



Notes: The debt ratio is defined as total liabilities to total assets. Groups and sample as described in the text.
Source: DAFNE firm data base, 2005 - 2009.

their capital stock by around 7 (5-to-1 nearest neighbor) to 11%-points (kernel matching) compared to domestic firms. All presented results are so far in line with the theoretical hypothesis 1a and 2a outlined in Section 3.

Table 2: Results difference in differences (DiD) specification

Matching Method	Kernel		Nearest Neighbor		Kernel	
Matching Variables	with debt variables				without debt variables change capital stock	
Dep. Var	Debt Ratio	Capital Stock	Debt Ratio	Capital Stock	Debt Ratio	Capital Stock
	(1)	(2)	(3)	(4)	(5)	(6)
D(> 2007)	-0.016***	0.120***	-0.019***	0.124***	-0.020***	0.080***
	(0.002)	(0.009)	(0.002)	(0.008)	(0.001)	(0.011)
D(TR)*D(> 2007)	-0.022***	-0.107**	-0.023***	-0.070*	-0.023***	-0.125***
	(0.005)	(0.040)	(0.005)	(0.040)	(0.005)	(0.043)
Observations	35,615	35,615	17,025	17,025	35,615	35,615

Notes: Robust standard errors in parenthesis. Each regression includes a full set of firm and time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2005 to 2009, own calculations.

Before turning to the heterogeneity analysis, the sensitivity of the results is assessed. I start with excluding the finance structure variables as well as the growth rate for the capital stock from the matching variables. The main argument is that due to the fact that multinational firms use internal debt financing and thus have a higher debt ratio than domestic firms, matching treatment and control group on their finance structure does not increase their similarity but rather their dissimilarity. The results are reported in Table 2, column (5) and (6). The result for the debt ratio is almost unchanged, while the impact for the capital stock increases to 12.5%. Overall, however, the results are not statistically different from the baseline specification.

The second sensitivity check concerns the focus on firms that had before the reform an incentive to shift profits to the headquarter, but not after. Table 3 reports the results where all multinational firms, respectively only *Shifter-Shifter* (firms with an incentive before and after the reform to engage in debt financing to the headquarter) and *NonShifter-NonShifter* (firms that had neither before nor after the reform an incentive to engage in debt financing to the headquarter) form the treatment group. Neither for *Shifter-Shifter* nor for *NonShifter-NonShifter* are significant results found. When using all multinationals as treated firms, only the negative impact on investment is significant. These results suggest that it seems to be, in particular, *Shifter-NonShifter* that drive the results, as only these firms had to adjust their debt financing due to the changed tax incentive.

Table 3: Sensitivity analysis: DiD specification

Matching Method			Kernel			
Treatment Group (TR)	All multinational firms		Shifter-Shifter		NonShifter-NonShifter	
Dep. Var	Debt Ratio	Capital Stock	Debt Ratio	Capital Stock	Debt Ratio	Capital Stock
	(1)	(2)	(3)	(4)	(5)	(6)
D(> 2007)	-0.009***	0.102***	-0.015***	0.092***	-0.025***	0.050
	(0.002)	(0.015)	(0.004)	(0.014)	(0.004)	(0.054)
D(TR) * D(> 2007)	-0.009	-0.099***	0.002	-0.060	0.003	-0.117
	(0.006)	(0.030)	(0.011)	(0.045)	(0.006)	(0.100)
Observations	40,455	40,455	33,900	33,900	27,270	27,270

Notes: Robust standard errors in parenthesis. Each regression includes a full set of firm and time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2005 to 2009, own calculations.

Heterogeneity Analysis: The results for firm heterogeneity with firms' debt ratio as dependent variable are presented in Table 4. There is only weak evidence that firms with a low ratio of profits to total assets (Table 4, column (1)) decreased their debt ratio more compared to firms with a high ratio (Table 4, column (3)). Further, the difference is not statistically significant. The main reason is probably that the external debt ratio does change differently for multinational firms, making thus the impact of the overall debt ratio as measured in Table 4 ambiguous. With respect to the role of depreciation allowance, the results are also not fully convincing as the interaction terms are not significant. However, for the group that is likely to engage in internal debt financing the main effect increases in absolute terms and the interaction term is positive, which is in line with a lower reduction in firms' debt ratio the more generous the depreciation allowances are.

The results for the capital stock as dependent variable are in line with the theoretical expectation. They show that firms, which are not active in

Table 4: Heterogeneity debt ratio DiD specification

Dependent variable: Change in liabilities to shareholders				
Sample	$\frac{pF(.)-wL}{K}$ < Mean		$\frac{pF(.)-wL}{K}$ > Mean	
	(1)	(2)	(3)	(4)
D(> 2007)	-0.018***	-0.020***	-0.017***	-0.030***
	(0.006)	(0.007)	(0.003)	(0.003)
D(TR) * D(year > 2007)	-0.024**	-0.068	-0.022***	0.010
	(0.009)	(0.063)	(0.006)	(0.024)
D(> 2007) * $\frac{Depr.A}{K}$		0.072***		0.280***
		(0.008)		(0.000)
D(TR) * D(> 2007) * $\frac{Depr.A}{K}$		1.319		-0.664
		(1.601)		(0.400)
Observations	16,693	16,693	16,917	16,917

Notes: Robust standard errors in parenthesis. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2005 to 2009, own calculations.

internal debt financing (Table 5, column (3)) due to fixed costs, decrease their capital stock less than firms with a low ratio of profits to total assets (Table 5, column (1)) compared to domestic firms. Further, firms likely to engage in internal debt financing that benefit from generous depreciation allowances, experienced a lower reduction in the capital stock. This suggest that internal debt financing fosters their capital accumulation less due to a lower tax burden on capital. In contrast are the results for firms that are less likely to engage in internal debt financing. For these firms depreciation allowances affect capital accumulation only by changing the investment costs. Nevertheless, also for these firms profit shifting activities seem to impact capital accumulation, although to a much smaller extent.

Overall the results are similar to Egger et al. (2014), who find that around 11% of all multinational firms (which are, in particular, the large ones) in their sample are tax avoiders and thus their investment is unaffected by changes in the tax rate. The main difference, however, is that my results suggest that firms that engage in internal debt shifting (which are firms with a low ratio of profits to assets) are, in particular, unaffected by tax rate changes. Thus, if multinational firms use either transfer pricing or internal debt financing to reduce their tax burden, the results suggest that both means of profit shifting have a different impact on capital accumulation.

Table 5: Heterogeneity capital stock DiD specification

Dependent variable: Growth rate of the capital stock				
Sample	$\frac{pF(.)-wL}{K}$ < Mean		$\frac{pF(.)-wL}{K}$ > Mean	
	(1)	(2)	(3)	(4)
D(> 2007)	0.114***	0.080***	0.141***	0.136***
	(0.016)	(0.016)	(0.013)	(0.013)
D(TR) * D(year > 2007)	-0.189**	-0.776***	-0.094**	-0.114**
	(0.086)	(0.235)	(0.043)	(0.041)
D(> 2007) * $\frac{Depr.A}{K}$		1.019***		0.101***
		(0.076)		(0.001)
D(TR) * D(> 2007) * $\frac{Depr.A}{K}$		16.969***		0.412
		(5.584)		(0.669)
Observations	16,693	16,693	16,917	16,917

Notes: Robust standard errors in parenthesis. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2005 to 2009, own calculations.

6 Second Approach: Structural Approach

6.1 Methodology & Descriptive Statistics

To allow to link the results to the investment literature and as an additional test of the hypothesis a second, more structural approach is applied. Compared to the first approach, it has the advantage that the estimated coefficients are related to the potential tax savings of shifting profits abroad. The costs are that the tax incentive of multinational firms must be explicitly modeled.

Since multinational groups are complex and the construction of the relevant tax incentive, therefore, almost impossible, I restrict the analysis to a particular channel, which is the incentive to shift profits to the headquarter. Three arguments support the relevance of this channel for multinational firms' profit shifting activities. Firstly, the results of the difference in differences approach are, only significant for multinational subsidiaries that had an incentive to engage in internal debt shifting to the headquarter before the reform, but not after. Secondly, there seems to be a home bias in internal debt financing (Dischinger et al., 2014). Thirdly, only up to 30% of all multinational firms have subsidiaries in tax havens (Gumpert et al., 2011; Buettner et al., 2013). A further advantage is that liabilities to the parent company are directly observed in the data in contrast to liabilities to other subsidiaries. The latter are only available as the sum of all liabilities to other subsidiaries. Moreover, since the reform abolished the incentive to shift profits to the headquarter completely for some firms, a potential omitted

variables bias is of minor importance.[22]

To test the hypothesis outlined in Section 3, I estimate two equations. The first refers to the optimal amount of internal debt financing to the parent company (equation (17)). Thus, the dependent variable is the share of liabilities against the parent company to total assets ($\frac{LS_{i,t}}{TA_{i,t}}$). The explanatory variable of interest is the tax rate differential (TRD). It captures the incentive to engage in profit shifting via internal debt financing. It is calculated as the difference between the tax rate to which interest payments are deductible, and the tax rate on profits of the parent company. Since the TRD is negative for some firms after the 2008 corporate tax reform, it should not affect the internal debt ratio which includes no receivables from the parent company. To account for the irrelevance of the TRD in this case, I interact the TRD with a dummy that is one if a company has no tax incentive to shift profits to the headquarter (D(NITS)). The coefficient of the TRD (α_1) should be positive since a positive TRD allows firms to save taxes by using internal debt financing. The TRD should, however, not influence the optimal amount of internal liabilities if a company has no tax incentive to shift profits. Thus, the sum of α_1 and α_2 should be zero.

Besides the TRD and the interaction term I control in the regression for the business tax rate in Germany, as well as for firm size (measured as the natural logarithm of total assets) and the business cycle (by including time dummies). The business tax rate in Germany is identified due to the variation in the local business tax rate. All control variables are captured in the matrix $X_{i,t}$. Since the fraction of internal borrowing may depend on a firm specific effect ($\eta_{1,i}$), estimation is done in first differences. Robust standard errors, clustered for the location of the parent company, are reported.

$$\frac{LS_{i,t}}{TA_{i,t}} = \eta_{1,i} + \alpha_1 TRD + \alpha_2 D(NITS) * TRD + \theta_1 X_{i,t} + \epsilon_{i,t} \qquad (17)$$

The impact of internal debt financing on capital accumulation, i.e. the second hypothesis, is tested using a neoclassical investment equation. The estimation equation (equation (19)) is derived by taking the natural logarithm of the first order condition with respect to the capital stock derived in the model (equation (11)) and assuming a simple production function (equation (18)). The equation states that the natural logarithm of the capital

[22]The omitted variable bias depends on the correlation between the omitted variable, which is for example the tax incentive to shift to a tax haven, and the variable of interest, which is the tax rate differential to the headquarter. Since I interact the latter with a dummy that is one if the company has no tax incentive to shift to the headquarter, the bias is reduced as the interaction term between the dummy and the tax rate differential to the headquarter is less correlated with the tax rate differential to the tax haven.

stock depends on the natural logarithm of the user costs of capital using retained earnings less the tax advantage of the multinational firm due to internal debt financing. To identify the impact of the tax advantage (γ), I re-arrange equation (19). Following the argumentation for the internal debt shifting equation, I interact the tax advantage of the multinational firm with a dummy that is one if a firm has no tax incentive to shift profits to the headquarter (equation (20)). I expect that the sum of the coefficient b_2 and b_3 should be zero, since a multinational firm should behave as a domestic firm if it does not engage in internal debt financing to save taxes. If, however, the firm has a tax incentive to shift profits to the headquarter, it should have a higher capital stock. From a theoretical point I expect further that the coefficient for the user costs of capital (b_1) is -1.

$$S_{i,t} = K_{i,t}^{\sigma} \tag{18}$$

$$\begin{aligned} log(K_{i,t}) &= \eta_{2,i} - b_1 * log[UCC_{G,t} - \gamma \frac{(u_{G,mod,t} - u_{A,t})}{(1 - u_{G,t})}] \\ &\quad + \theta_2 log[S_{i,t}] + w_{i,t} \end{aligned} \tag{19}$$

$$\begin{aligned} log(K_{i,t}) &= \eta_{2,i} - b_1 * logUCC_{G,t} + b_2 \frac{(u_{G,mod,t} - u_{A,t})}{(1 - u_{G,t})UCC_{G,t}} \\ &\quad - b_3 \frac{(u_{G,mod,t} - u_{A,t})}{(1 - u_{G,t})UCC_{G,t}} D(NITS) + \theta_2 log[S_{i,t}] + w_{i,t} \end{aligned} \tag{20}$$

The key variable in the neoclassical investment equation (20) is the user cost of capital (UCC). I construct them based upon the work by both Jorgenson (1963) as well as Hall and Jorgenson (1967). For the case without internal debt financing, the $UCC_{i,j,t}$ for firm i in industry j at time t is the weighted average of its asset a specific user costs $UCC_{i,a,j,t}$:

$$UCC_{i,j,t} = \sum_a \kappa_{i,t}^a UCC_{i,a,j,t} = \sum_a \kappa_{i,t}^a \frac{p_t^I}{p_t^S} \frac{((1 - u_{i,t} z_{a,t})(r_t + \delta_{a,j,t})}{1 - u_{i,t}} \tag{21}$$

where $\kappa_{i,t}^a$ is the firm-specific share of asset a to total assets; p_t^I is a price deflater for investment goods and p_t^S the industry j-specific output price at time t[23]; $\delta_{j,a,t}$ is the asset a, industry j-specific economic depreciation rate[24],

[23]The index p_t^I (*Investitionsgueterpreisindex*) is constructed at the country level and the price index p_t^S *(Erzeugerpreisindex)* on a disaggregated level for manufactures by the German Statistical Office. I use this information at the four digit industry level.

[24]The rate of economic depreciation $\delta_{a,j,t}$ can be derived from the national accounts capital stock *(Kapitalstockrechnung)*, provided by the German Statistical Office. The rate is asset (fixed assets and structures), industry (four-digit-level) and time-specific. The rate of economic depreciation is calculated in prices of 2000.

and $z_{a,t}$ are asset a-specific depreciation allowances by the tax system[25], weighted by the tax rate $u_{i,t}$. The financial costs are r_t.[26] Two types of assets are considered, property with buildings and fixed tangible assets.

I estimate the capital stock equation in first differences to account for firm-specific effects ($\eta_{2,i}$). Robust standard errors clustered for the location of the parent company, are reported. Due to the short length of my panel, I am not able to instrument the *UCC* to account for measurement error (Goolsbee, 2000), attenuation bias (Goolsbee, 1998; 2004), and endogeneity due to the asset specific weighting. Since attenuation bias and measurement error bias the coefficient downwards, the coefficient for the *UCC* would present a lower bound. Since this does not hold for the bias in case of endogeneity, the sensitivity of the results is assessed using firms' twice lagged assets structure for the weighting.[27]

Heterogeneity with respect to the use of internal debt financing is again studied by, firstly, spitting the sample according to firm's incentive to engage in internal debt financing and, secondly, interacting the TRD with the share of depreciation allowances to total assets.

In the sample for the second approach 20,993 firms are included. Around 20% of the firms are owned by foreign shareholders. Countries with the largest number of parent companies are France, followed by Switzerland, Sweden and the Netherlands (see Table A.1 in the Appendix). The average firm in the sample has a fraction of internal liabilities to its shareholders of 19%, the median is 9% (see Table 6). The mean of the *UCC* is 13%. The tax rate differential, which is the difference between the tax rate to which interest expenses are deductible (incorporating the adding back regulation of the local business tax) and the tax rate of the parent company, for all foreign owned firms as described above has a mean of 3% and decreases over time due to the corporate tax reform. Further, there is substantial variation in the

[25]In Germany, allowances for fixed assets and structures follow different methods. Structures are depreciated on a straight line basis, whereas fixed assets could also be depreciated according to the declining-balance method until 2007. The rates of depreciation are set by the Federal Ministry of Finance. Due to data restrictions, only regular depreciation allowances are considered. The relevant lifetime of structures for tax purposes is 33 1/3 years. The yearly rate for the declining balance method is 0.2 for fixed assets. Because of missing information about the relevant lifetime for different fixed assets, I assumed a relevant lifetime of 16.9 years based on the investigation of depreciation allowances in Germany from Oestreicher and Spengel (2002).

[26]I used the overall yield on corporate bonds r_t provided by the German Central Bank in its series "Yields on debt securities outstanding issued by residents/corporate bonds/monthly average."

[27]In case the twice lagged asset structure is not observed, lagged and then the current asset structure is used.

Table 6: Descriptive statistics for the second sample

	Obs.	Mean	P50	SD
All firms				
Capital Stock in thd. EURO	20,993	41,963	4,468	912,975
Turnover in thd. EURO	20,993	83,418	17,130	466,342
LS/TA	20,993	0.19	0.09	0.23
Business tax rate	20,993	0.35	0.37	0.05
UCC	20,993	0.13	0.12	0.05
d.log(Capital stock)	15,113	0.03	-0.01	0.68
d.log(Turnover)	15,113	-0.00	0.03	1.13
d.LS/TA	15,113	-0.00	-0.00	0.11
D.Business tax rate	15,113	-0.02	0.00	0.03
d.log(UCC)	15,113	-0.02	0.01	0.15
Only foreign owned firms				
Dummy(No incentive to shift, NITS)	4,719	0.31	0.00	0.46
TRD	4,719	0.03	0.03	0.07
TRD/(1-Business tax rate, BTR)	4,719	0.05	0.04	0.11
d.Dummy(NITS)	3,322	0.09	0.00	0.35
d.TRD	3,322	-0.01	0.00	0.04
d.(TRD/(1-BTR))	3,322	-0.02	0.00	0.06

Source: DAFNE firm data base 2004 - 2010.

tax rate differential. Almost 31% of the foreign owned firms do not have a tax incentive to shift profits to the headquarter. For around 9% of the foreign owned firms, the incentive to shift profits vanished with the reform. The tax advantage of the multinational, given by TRD/(1-Business tax rate), equals 2% or roughly 15% of the *UCC*.

6.2 Results

The results for the change in the ratio of liabilities against shareholders to total assets as dependent variable are reported in Table 7. Column (1) presents the baseline specification with the tax rate differential (TRD) and the interaction term. The results show that the TRD has a significant, positive impact on the ratio of liabilities to shareholders to total assets, if it is positive. Otherwise no impact is found (bottom line of the table, standard errors are calculated using the delta method). This is in line with the hypothesis 1a derived from the model. It adds further evidence to the prior literature on internal debt shifting as a switch in the two regimes (from shifting to non-shifting) is used for the identification. The results also hold if the two tax rates enter separately (column (2)) or, if the TRD is defined as zero if it would be negative (column (3)).

The size of the coefficients, which are statistically not different between the specifications, suggests that an increase in the TRD by 10%-points increases the share of liabilities against shareholders by 2.9%-points. Compared to the prior literature that found an increase of around 1%-points (e.g.

Huizinga et al., 2008; Buettner and Wamser, 2013), the result seems quite large. However, at least three reasons may explain the difference. The first relates to the dependent variable and the used tax differential. In most of the papers on internal debt shifting, the dependent variable is the overall internal debt ratio, which includes all liabilities to other group members (e.g. Buettner and Wamser, 2013), or even the overall debt ratio (e.g. Huizinga et al., 2008). The used tax differential is a (asset-) weighted tax differential. In case the weighting is not appropriate, a measurement error occurs, which biases the estimated coefficient to zero. This study, in contrast, focuses solely on liabilities to the parent company and thus no weighting is necessary to derive the correct tax rate differential. Secondly, I explicitly account for the direction of shifting by including the interaction term with the tax rate differential and the dummy that is one if the firm has no incentive to shift profits abroad. Other papers focus solely on liabilities of companies without accounting whether firms shift in or outwards. To assess whether this argument explains part of the difference, I estimate a specification without controlling for the interaction with the No-Incentive-to-Shift dummy. The result is shown in column (4). The estimated coefficient for the tax rate differential decreases by 0.1 and is now much closer to prior studies. Finally, adjustment costs may play a role as well. Since I focus on a particular strong tax rate reduction, these are likely to be of minor importance for my estimate.

The results for the heterogeneity analysis show that firms within an industry with a low ratio of profits before interest to the capital stock react to tax incentives with their internal debt financing four times as strong than on average (Table 8, column (1)). In contrast, firms that are not likely to engage in internal debt financing due to fixed costs, seem not to react. Further, the results suggest - in line with the hypothesis - that more generous depreciation allowances reduce the tax sensitivity remarkable. The estimated sensitivity of internal debt for firms with no depreciation allowances amounts to 2.3 and is thus more than seven times higher than the one found in the baseline regression.

To assess whether the change in the internal liabilities shows up in interest payments as well, I use the net interest result scaled by total assets as dependent variables (Table A.4 in the Appendix, column (1) and (4)). The results suggest that an increase of 10%-points in the tax rate differential, decrease the net interest results to total assets for firms that are likely to engage in debt financing by around 0.0086. This estimate suggests an interest rate of 6% on liabilities to the parent company, which seems quite plausible.[28] For

[28] A 10%-points increase in the TRD increases the share of internal liabilities by 15%-

Table 7: Results debt ratio

Dep. Var.	Change in liabilities against shareholders			
	(1)	(2)	(3)	(4)
d.Business tax rate [=$u_{G,t}$]	-0.331	-0.047	-0.333	-0.350
	(0.231)	(0.254)	(0.232)	(0.227)
d.TRD [= $u_{mod,G,t} - u_{A,t}$] (1)	0.288***			0.185**
	(0.092)			(0.072)
d.(TRD*D(NITS))(2)	-0.311**			
	(0.148)			
d.$u_{mod,G,t}$*D(NITS)		-0.275		
		(0.172)		
d.$u_{A,t}$ (1)		-0.316***		
		(0.112)		
d.($u_{A,t}$*D(NITS))(2)		0.286*		
		(0.155)		
d.(TRD if $> 0, 0$ else)			0.285***	
			(0.088)	
d.Firmsize	0.035***	0.035***	0.035***	0.035***
	(0.007)	(0.007)	(0.007)	(0.007)
Observations	15,113	15,113	15,113	15,113
Coefficient (1) + (2)	-0.023	-0.031		
SE (Delta method)	0.079	0.140		

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

Table 8: Results heterogeneity debt ratio

Dep. Var.	Change in liabilities against shareholders			
Sample	$\frac{pF(.)}{K}$ < Mean		$\frac{pF(.)}{K}$ > Mean	
	(1)	(2)	(3)	(4)
d.Business tax rate [=$u_{G,t}$]	0.231*	0.224**	-0.600*	-0.601*
	(0.112)	(0.100)	(0.356)	(0.355)
d.(TRD if $> 0, 0$ else)	1.467***	2.287**	0.112	0.118
	(0.506)	(0.830)	(0.093)	(0.110)
d.(TRD if $> 0, 0$ else)* $\frac{Depr.A}{K}$		-14.710*		-0.115
		(8.218)		(0.707)
d.Firmsize	0.026***	0.027***	0.045***	0.045***
	(0.005)	(0.006)	(0.011)	(0.011)
Observations	6,915	6,915	8,198	8,198

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

the other firms the sign is positive, which suggests that firms likely to engage in transfer pricing use less internal debt financing.

To assess whether firms unlikely to engage in internal debt financing use transfer pricing to reduce their tax payments, I estimate the same specification using before interest profits to total assets as the dependent variable (Table A.4 in the Appendix, column (2) and (5)). The coefficient for the TRD is only significant in the sample of firms that are unlikely to engage in internal debt financing. To rule out that measurement error drives the results, I constructed a modified TRD that captures the incentive to engage in transfer pricing, and re-run the regressions. The modified TRD differs from the TRD used so far, as the latter accounts for the adding back regulation of the local business tax. The precision of the estimates increases (decreases) for firms unlikely (likely) to engage in internal debt financing (column (3) and (6)). This suggest that firms that are not likely to engage in internal debt financing do use transfer pricing.

The results of the capital stock equation (Table 9) show that the elasticity of the capital stock with respect to its user costs is not statistically different from -1, which is line with my model and the prior literature (e.g. Dwenger, 2014). The coefficient for sales is, however, as in other studies quite small and suggests decreasing returns to scale. An impact of the tax advantage of the multinational firm on investment spending is only found for firms engaging in tax-motivated internal debt shifting. If firms have no tax incentive to shift profits to the headquarter, the TRD does not affect their investment decision (bottom line of the table, coefficient is statistically not different from zero). This holds again when including the two tax rate separately as well as a modified TRD, which is zero if the TRD is negative.

Regarding firm heterogeneity, the results suggest that capital accumulation of firms with a low ratio of profits before interest to their capital stock depends much more strongly on the TRD (Table 10, column (1) and (3)). The reason is that only these firms are able to use internal debt financing to re-allocate a large share of their profits, which reduces the tax burden on capital and thus fosters investment. The advantage is, however, decreasing in the generosity of the depreciation allowances as they reduce the tax burden on capital as well (column (2) and (4)). In contrast is the impact on profit shifting activities on investment for firms that engage in transfer pricing. For these firms profit shifting activities do only to a small extent affect investment. This suggests in line with the results of the first approach that transfer pricing and internal debt financing affect capital accumulation

points (Table 8, column (1)). This translates for a interest rate of 6% to a change in firms' interest results to total assets of 0.009.

Table 9: Results capital stock

Dep. Var.	Growth rate of the capital stock $B = (1 - BTR) * UCC$		
	(1)	(2)	(3)
d.log(UCC)	-1.259***	-1.139***	-1.260***
	(0.138)	(0.074)	(0.138)
d. $\frac{TRD}{B}$(1)	0.136**		
	(0.052)		
d.($\frac{TRD}{B}$ *D(NITS)) (1)	-0.151*		
	(0.085)		
d. $\frac{u_{G,mod,t}}{B}$		0.163**	
		(0.075)	
d.($\frac{u_{G,mod,t}}{B}$ *D(NITS))		-0.156	
		(0.136)	
d. $\frac{u_{A,t}}{B}$		-0.135**	
		(0.065)	
d.($\frac{u_{A,t}}{B}$ *D(NITS))		0.154	
		(0.114)	
d.($\frac{TRD}{B}$ if $> 0, 0$ else)			0.134**
			(0.051)
d.log(Sales)	0.044***	0.043***	0.044***
	(0.013)	(0.013)	(0.013)
Observations	15,113	15,113	15,113
Coefficient (1) + (2)	-0.016	0.020	
SE (Delta method)	0.052	0.134	

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

in different ways.

Table 10: Results heterogeneity capital stock

Dep. Var.	Growth rate of the capital stock $B = (1 - BTR) * UCC$			
Sample	$\frac{pF(.)}{K}$ < Mean		$\frac{pF(.)}{K}$ > Mean	
	(1)	(2)	(3)	(4)
d.log(UCC)	-1.071***	-1.059***	-1.571***	-1.578***
	(0.123)	(0.110)	(0.147)	(0.148)
d.($\frac{TRD}{B}$ if $> 0, 0$ else)	0.459**	0.923***	0.098**	-0.064
	(0.206)	(0.267)	(0.044)	(0.118)
d.($\frac{TRD}{B}$ if $> 0, 0$ else)* $\frac{Depr.A}{K}$		-9.119***		3.294
		(2.449)		(2.327)
d.log(Sales)	0.055***	0.055***	0.036**	0.035**
	(0.014)	(0.014)	(0.015)	(0.014)
Observations	6,915	6,915	8,198	8,198

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

Sensitivity Analysis

To check the sensitivity of the results, I perform four robustness checks. The first relates to the fact that German owned firms might be differently affected by the business cycle. Thus, I exclude all domestic owned firms from the sample and re-estimate the equation of the heterogeneity analysis. The results for the debt ratio are shown in Table A.5, column (1) and (4), and for the capital stock in Table A.6, column (1) and (4). They are statistically not different from the results for the sample shown above.

The second sensitivity check accounts for the redesigned thin capitalization rule in Germany (see Buslei and Simmler, 2013). The regulation, which was introduced in 2008, restricts the amount of deductible interest expenses to 30% of the tax adjusted EBITDA (earnings before interest, taxes, depreciation and amortization). Since the German government, however, was not interested in harming its own economy, the regulation came with several escapes clauses. The most important one is the exemption limit of 1 million euro. If firms have net interest expenses below the exemption threshold, the regulation is not applied. The exemption limit was raised retroactively in 2009 to 3 million euro due to the impact of the financial crisis. To check the sensitivity of my results, I re-estimate the last specifications using only firms with net interest expenses below 1 million euro. The results for the debt shifting equation are reported in column (2) and (5) of Table A.5 and for the investment equation in column (2) and (5) of Table A.6. Again the

results are not statistically different from the ones using the whole sample, which is due to the fact that only few firms are affected by the regulation.

In the third sensitivity check the internal debt shifting equation is estimated using the overall internal debt ratio as dependent variable. It is defined as the sum of liabilities to the parent company and to all other group members. The main idea is to assess whether the changed incentive to engage in internal debt financing to the headquarter causes an increase in liabilities to other group members. If this is the case, the estimated coefficient for the TRD should shrink sharply. The results suggest, however, that no substitution took place (Table A.5, column (3) and (6)).

Finally, the fourth sensitivity test relates to the potential endogeneity of the *UCC*. To address whether this biases the estimates for the tax advantage of the multinational firm in the capital stock equation, I use the twice-lagged assets structure for weighting the asset-specific *UCC*. The results are shown in Table A.6 in the Appendix. Although the estimated coefficient decreases for the *UCC*, the ones for the tax advantage as well as for the impact of the depreciation allowance remain basically unchanged.

7 Comparing the two Methods

To compare the results of the two different methods, I calculated the expected change in firms' debt ratio and capital stock for the first sample using the structural parameter estimates of the second method. More precisely, I predict firms' behavioral response with respect to the two variables using the change in the TRD and TRD/(1-BTR)*UCC* for *Shifter-NonShifter* for the first sample from 2007 to 2008. Table 11 summarizes the estimated impact for the two methods.

The comparison shows that the ratio between the change in the (internal) debt ratio and in the capital stock are almost identical for the two methods (around 21%). The absolute impact differs however. The impact estimated in the structural approach is only half the size of the estimated impact on the DiD approach. Two reasons may explain the difference and both are related to the used tax rate differential, which is the Achilles' heel of the second approach. The first explanation questions whether the adding back regulation for the local business tax before the reform were binding. According to the regulation, 50% of the interest payments on long term debt had to be added back. Since multinational firms could avoid the regulation by using only short term loans, the used tax rate differential would not been the correct one. To investigate whether this changes the picture, the impact on debt ratio and capital stock is calculated using the modified TRD. The

Table 11: Comparison of the results DiD and structural approach

	DiD	Structural Approach		
	Estimated Coefficient	Estimated Coefficient	TRD resp. $\frac{TRD}{(1-BTR)UCC}$	Estimated Impact
Baseline estimation results				
Change in the debt ratio	-0.022***	0.285***	-0.043	-0.012***
	(0.005)	(0.088)		(0.004)
Change log(capital stock)	-0.107**	0.134**	-0.443	-0.059**
	(0.040)	(0.051)		(0.022)
$\frac{d.Debt}{d.log(capitalstock)}$ in %	21			21
A1: TRD if adding back regulation local business tax before the reform was not binding				
[A2: 30% shift to the headquarter and 70% to other subsidiaries]				
Change in the debt ratio	0.022***	0.285***	-0.073 [-0.075]	-0.021*** [-0.022***]
	(0.005)	(0.088)		(0.006) [(0.007)]
Change log(capital stock)	-0.107**	0.134**	-0.744 [-0.0769]	-0.099** [-0.103**]
	(0.040)	(0.051)		(0.038) [(0.039)]
Firm likely to engage in debt shifting with no depreciation allowances				
Change in the debt ratio	-0.068	2.287***	-0.043	-0.095***
	(0.063)	(0.830)		(0.035)
Change log(capital stock)	-0.776**	0.923***	-0.443	-0.435***
	(0.235)	(0.267)		(0.118)
$\frac{d.Debt}{d.log(capitalstock)}$ in %	9			22
A1: TRD if adding back regulation local business tax before the reform was not binding				
[A2: 30% shift to the headquarter and 70% to other subsidiaries]				
Change in the debt ratio	-0.068	2.287***	-0.073 [-0.075]	-0.161*** [-0.168***]
	(0.063)	(0.830)		(0.061) [(0.062)]
Change log(capital stock)	-0.776**	0.923***	-0.744 [-0.769]	-0.733*** [-0.782***]
	(0.235)	(0.267)		(0.199) [(0.205)]

Notes: The TRD in alternative 1 is calculated as a weighted average. The TRD amounts for the case of shifting to other subsidiaries to 9%. The TRD for alternative 2 is before (after) the reform calculated as the difference between the tax rate on profits (tax rate to which interest expenses are deductible) in Germany and the tax rate on profits abroad before. The TRD/(1-BTR)UCC are adjusted to the changed TRD.

results of the two approaches are now very similar.

Another explanation for the difference between the two approaches could be that part of the subsidiaries do not shift profits to the headquarters but to other subsidiaries in low tax countries. If I assume that only 30% of all multinational firms shift to the headquarters, whereas the rest shift to tax havens, and use a weighted average of the TRD (similar to equation (16)), the results are again very similar. Most likely both explanation are able to explain part of the difference.

Comparing the estimated impact for firms likely to engage in internal debt shifting with no depreciation allowances leads to similar conclusions. Firstly, the ratio of the change in debt financing to the change in capital stock is in the structural approach again around 21%. The ratio for the DiD approach is lower but the coefficient for the debt ratio has not been estimated very precisely. Secondly, the estimated, absolute impact using the structural approach is again much lower. However, as before, both explanations, that the adding back regulations were not binding before the tax rate reduction, and that some firms shift to other subsidiaries, lead to a very similar impact for the change in the capital stock for the structural and the DiD approach.

8 Conclusion

The aim of this paper is to provide evidence on the causal impact of profit shifting activities of multinational firms on their capital accumulation. This is important as profit shifting activities have, so far, been seen as welfare decreasing for countries. If these activities, however, foster capital accumulation, they might at least to some extend be beneficial by reducing the negative impact of taxation on capital accumulation (e.g. Hong and Smart, 2010).

This paper contributes to the existing literature in at least three ways. Firstly, I employ a new identification strategy to uncover the impact of profit shifting activities of multinational companies on their capital accumulation. Secondly, the study attempts to disentangle the potential different impact of different means of profit shifting by focusing on internal debt financing. Finally, two different identification strategies are employed that provide consistent results.

The findings suggest that in particular internal debt financing fosters capital accumulation by decreasing the tax burden on capital, but not transfer pricing. Thus, the tax rate reduction in Germany had only a modest impact on multinational firms' investment spending if these firms used before the reform internal debt financing to shift profits out of Germany. Moreover, the

results show that generous depreciation allowances reduce the tax sensitivity of internal borrowing remarkably. Since depreciation allowances decrease the tax burden on capital as well, they also lower the tax advantage of firms engaging in internal debt shifting with respect to the capital stock.

Altogether the results suggest that internal debt shifting activities of multinational firms are to some extend welfare increasing. The results, however, also speak for tax cuts to increase the competitiveness of domestic firms. These firms face a competitive disadvantage as they are not able to engage in internal debt financing, at least not as long as they remain domestic. Further, the findings highlight the role of recent tax reforms that followed the principle *tax rate cut cum base broadening*. The reduction in the tax rate might have decreased the number of firms shifting profits abroad, but the reduction in the generosity of depreciation allowances increased the tax advantage of firms still shifting profits via internal debt financing. Given these benefits, it is likely that more firms will become multinational (Bucovetsky and Haufler, 2008).

References

Bartelsman, E. J., Beetsma, R.M.W.J. , 2003. Why pay more? Corporate tax avoidance through transfer pricing in OECD countries. Journal of Public Economics 87, 2225-2252.

Barrios, S., Huizinga, H., Laeven, L., Nicodeme, G., 2013. International taxation and multinational firm location decision. Journal of Public Economics 96, 946-958.

Becker, J., Riedel, N., 2012. Cross-border tax effects on affiliate investment: Evidence from European multinationals. European Economic Review 56, 436-450.

Blouin, J., Huizinga, H., Laeven, L., Nicodme, G., 2014. Thin capitalization rules and multinational firm capital structure. European Commission, Taxation Papers, Working Paper 42.

Bond, S., Xing, J., 2011. Corporate taxation and capital accumulation. Discussion Paper, Oxford University Centre for Business Taxation No. 10/15.

Bucovetsky, S., Haufler, A, 2008. Tax competition when firms choose their organizational form: Should tax loopholes for multinationals be closed. Journal of International Economics 74(1), 188-201.

Buettner, T., Holzmann, C., Overesch, M., Schreiber, U., 2013. Anti-tax-avoidance rules and multinationals' tax-haven demand. Mimeo.

Buettner, T., Overesch, M., Schreiber, U., Wamser, G., 2012. The impact of thin capitalization rules on the capital structure of multinationals firms. Journal of Public Economics 96, 930-938.

Buettner, T., Wamser, G., 2013. Internal debt and multinationals' profit shifting - Empirical evidence from firm-level panel data. National Tax Journal 66, 63-95.

Buslei, H., Simmler, M., 2013. Intended and non-intended behavioral responses to the German interest barrier. Mimeo.

Caliendo, M., Kopeinig, S., 2008. Some practical guidance for the implementation of propensity score matching. Journal for Economic Surveys 22: 31-72.

Caliendo, M., Kuenn, S., 2011. Start-up subsidies for the unemployed: Long-term evidence and effect heterogeneity. Journal of Public Economics 95, 311-331.

Clausing, K.A., 2003. Tax-motivated transfer pricing and US intrafirm trade prices. Journal of Public Economics 87, 2207-2223.

Chirinko, R., Fazzari, S.M., Meyer, A.P., 1999. How responsive is business capital formation to its user cost? An exploration with micro data. Journal of Public Economics 74, 53-80.

De Mooij, R., Ederveen, S., 2003. Taxation and foreign direct investment: A synthesis of empirical research. International Tax and Public Finance 10, 673-693.

Devereux M., Griffith, R., 2003. Evaluating tax policy for location decision. International Tax and Public Finance 10, 107-126.

Devereux, M., 2004. Measuring taxes on income from capital. In Sorenson, P.B. (Eds) Measuring the tax burden on capital and labor. MIT Press, Cambridge, chapter 2.

Devereux, M.P., Lockwood, B., Redoano, M., 2008. Do countries compete over corporate tax rates? Journal of Public Economics 92, 1210-1235

Desai, M.A., Foley, C.F., Hines, J.R., 2006. Do tax havens divert economic activity? Economics Letters 90, 219-224

Dischinger, M., Knoll. B., Riedel, N., 2014. The role of headquarters in multinational profit shifting strategies. International Tax and Public Finance 21,248-271.

Dwenger, N., 2014. User cost elasticity of capital revisited. Economica 81, 161-186.

Egger, P., Eggert, W., Keuschnigg, C., Winner, H., 2010. Saving taxes through foreign plant ownership. Journal of International Economics 81: 99-108.

Egger, P., Merlo, V., Wamser, G., 2014. Unobserved tax avoidance and the tax elasticity of FDI. CESifo Working Paper Series 4921, CESifo Group Munich.

Feld, L. P., Heckemeyer,J. H., Overesch, M., 2013. Capital structure choice and company taxation: A meta-study. Journal of Banking and Finance 37, 2850-2866.

Fuest, C., Hemmelgarn, T., 2005. Corporate tax policy, foreign firm ownership and thin capitalization. Regional Science and Urban Economics 35, 508-526.

Goolsbee, A., 1998. Investment tax incentives, prices, and the supply of capital goods. The Quarterly Journal of Economics 113, 121-148.

Goolsbee, A., 2000. The importance of measurement error in the cost of capital. National Tax Journal 53, 215-228.

Goolsbee, A., 2004. The impact of the corporate income tax: Evidence from state organizational form data. Journal of Public Economics 88, 2283-2299.

Grubert, H., Mutti, J., 1991. Taxes, tariffs and transfer pricing in multinational corporate decision making. The Review of Economics and Statistics 80, 365-373.

Gumpert, A., Hines Jr., J.R., Schnitzer, M., 2011. The use of tax havens in exemption regimes, Bundesbank Discussion Paper, Series 1, 30/2011.

Hall, R. E., Jorgenson, D., 1967. Tax policy and investment behavior. American Economic Review 57, 391-414.

Haufler, A., Runkel, M., 2012. Firms' financial choices and thin capitalization rules under corporate tax competition. European Economic Review 56, 1087-1103.

Heckman, J., Ichimura, H., Todd, P. E., 1997. Matching as an econometric evaluation estimator: Evidence from evaluating a job training program, Review of Economic Studies 64, 605-654.

Hines Jr., J.R., Rice, E.M., 1994. Fiscal paradise: foreign tax havens and American business. Quarterly Journal of Economics 109, 149-182.

Huizinga, H., Laeven, L., 2008. International profit shifting within multinationals: A multi-country perspective. Journal of Public Economics 92, 1164-1182.

Huizinga, H., Laeven, L., Nicodeme, G., 2008. Capital structure and internal debt shifting. Journal of Financial Economics 88, 80-118.

Hong, Q., Smart, M., 2010. In praise of tax havens: International tax planning and foreign direct investment. European Economic Review 54, 82-95.

Jorgenson, D., 1963. Capital theory and investment behaviour. American Economic Review 52, 305-360.

Kraus, A. and R.H. Litzenberger, 1973. A State-Preference Model of Optimal Financial Leverage. Journal of Finance 28, 911-922.

Mintz, J., Smart, M., 2004. Income shifting, investment, and tax competition: Theory and evidence from provincial taxation in Canada. Journal of Public Economics 88, 1149-1168.

Modigliani, F., Miller, M. H., 1963. Corporate income taxes and the cost of capital: A correction. The American Economic Review 53, 433-443

Moen, J., Schindler, D., Schjelderup, G. and J. Tropina, 2011. International debt shifting: Do multinationals shift internal or external debt?. CESifo Working Paper Series 3519, CESifo Group Munich.

Overesch, M., 2009. The effects of multinationals' profit shifting activities on real investment. National Tax Journal 62, 5-23.

Peralta, S., Wauthy, X., and T. van Ypersele, 2006. Should counties control international profit shifting? Journal of International Economics 68: 24-37.

Rosenbaum, P. R., Rubin, D. B., 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score, American Statistician 39, 33-38.

Schindler, D., Schjelderup, G., 2012. Debt shifting and ownership structure. European Economic Review 56, 635-647.

Schindler, D., Schjelderup, G., 2013. Transfer pricing and debt shifting in multinationals. CESifo Working Paper Series 4381, CESifo Group Munich.

Stuart, E. A., 2010. Matching methods for causal inference: A review and a look forward. Statistical Science 25, 1-21.

Zodrow, G., Miezkowski, P., 1986. Pigou, Tiebout, property taxation, and the underprovision of local public goods. Journal of Urban Economics 19, 356-370.

Appendix - Additional Descriptive Statistics and Regression Results

Table A.1: Descriptive statistics on the location of the (ultimate) parent company

	All firms	Sample 1	Sample 2
Australia	340	120	53
Austria	1464	140	224
Belgium	878	440	127
Canada	376	75	47
Cayman Islands	125	0	19
Czech Republic	29	0	11
Denmark	1951	190	242
Finland	596	105	138
France	4,919	2,260	1,175
Germany	78,918	30,415	16,274
Hong Kong	67	0	14
Iceland	27	0	10
India	256	110	27
Ireland	374	0	56
Israel	160	30	12
Italy	1816	0	314
Korea, Republic of	256	85	114
Kuwait	83	0	24
Luxembourg	644	150	82
Malaysia	29	5	24
Mexico	85	35	14
Netherlands	2315	210	413
Norway	423	175	87
Other countries	705	40	80
South Africa	95	0	14
Spain	642	250	140
Sweden	2040	760	416
Switzerland	3753	0	800
Taiwan	189	25	42
Total	103,555	35,620	20,993

Notes: Sample 1 includes German owned firms that do not own foreign subsidiaries and foreign owned firms that had before the reform an incentive to shift profits via internal debt financing to the headquarter, which was abolished due to the reform. All firms in sample 1 are required to be observed in every year between 2005 and 2009. Sample 2 includes all firms for which liabilities against the parent company are observed.
Source: DAFNE firm database, own calculations.

Table A.2: Logistic regression of the propensity score

Matching variables	all	without (1), (2), (3)
Log(Total Assets 2006)	0.246***	0.240***
	(0.019)	(0.019)
Debt Ratio 2006 (1)	0.289**	
	(0.127)	
Log(Capital Stock 2006)	-0.125***	-0.116***
	(0.013)	(0.013)
d.Debt Ratio 2006 (2)	1.052***	
	(0.313)	
d.log(capital stock 2006) (3)	-0.125***	
	(0.047)	
Industry dummies		
agriculture	-3.636***	-3.774***
	(1.012)	(1.011)
electricity and gas supply	-2.690***	-2.898***
	(0.196)	(0.194)
water supply	-0.918***	-0.966***
	(0.219)	(0.218)
construction	0.117	0.225*
	(0.125)	(0.124)
wholesale and retail trade	-3.740***	-3.741***
	(1.012)	(1.011)
transportation and storage	-1.446***	-1.568***
	(0.155)	(0.154)
information and communication	-1.555***	-1.259***
	(0.288)	(0.281)
accommodation	-1.934***	-1.759***
	(0.105)	(0.101)
real estate activities	-5.332***	-5.371***
	(1.005)	(1.005)
professional, technical activities	-4.142***	-4.334***
	(0.420)	(0.419)
support service activities	-2.663***	-2.719***
	(0.200)	(0.200)
Observations	7,124	7,124

Notes: The dependent variable is the treatment indicator. It equals one for firms that had before the corporate tax reform an incentive to shift profits via internal debt financing to the headquarter, but not after the reform. It is zero for purely domestic firms. Stars *,**,*** indicate significance at the 1/5/10% level.
Source: DAFNE firm database, 2005, 2006, own calculations.

Table A.3: Standardized bias before and after matching

	Mean		Standardized Bias in %			
	Treatment	Control	Before	After matching		
Matching method				Kernel	NN	Kernel
Matching variables				all		without (1), (2), (3)
firm size (log(total assets) 2005	8.81	8.26	22.89	2.24	0.25	1.39
debt ratio 2005 (1)	0.5	0.45	14.28	-0.08	0.29	6.64
log(capital stock) 2005	5.54	6.12	-16.41	3.10	5.70	2.94
d.debt ratio 2006 (2)	0.00	-0.01	5.5	-0.26	-0.54	10.81
d.log(capital stock) (3) 2006	0.00	0.04	-5.21	1.07	-0.26	-8.38
Industry dummies						
agriculture, forestry and fishing	0.00	0.01	-12.93	-1.31	0.65	-0.92
manufacturing	0.25	0.05	57.57	2.99	0.25	2.63
electricity and gas supply	0.03	0.10	-28.99	-1.04	0.03	-1.05
water supply	0.03	0.01	7.62	2.5	0.03	3.41
construction	0.22	0.04	54.98	1.76	0.22	2.21
wholesale and retail trade	0.00	0.01	-13.3	-1.41	0.00	-1.01
transportation and storage	0.06	0.06	-0.56	0.16	0.06	0.61
information and communication	0.01	0.01	2.22	-0.25	0.01	-0.20
accommodation	0.33	0.41	-18.00	-2.13	0.33	-3.27
real estate activities	0.00	0.05	-31.89	-6.45	0.00	-5.8
professional, technical activities	0.00	0.08	-40.12	-4.88	0.00	-3.76
support service activities	0.03	0.10	-31.34	-1.34	0.03	-1.14

Notes: Control group consists of purely domestic firms, that are observed between 2005 and 2009. Treatment group includes firms that had before the reform an incentive to engage in debt financing, which was abolished due to the reform.
Source: DAFNE firm database, 2005,2006, own calculations.

Table A.4: Results interest result and profits

Dep. Var.	Interest	Profit before		Interest	Profit before	
(scaled by total assets)	Result	Interest		Result	Interest	
Sample	$\frac{pF(.)}{K}$ < Mean			$\frac{pF(.)}{K}$ > Mean		
	(1)	(2)	(3)	(4)	(5)	(6)
d.Business tax rate [$=u_{G,t}$]	-0.076***	-0.598**	-0.600**	-0.076	0.307	0.353
	(0.009)	(0.235)	(0.235)	(0.050)	(0.269)	(0.287)
d.TRD [$= u_{mod,G,t} - u_{A,t}$] (1)	-0.087**	-0.281		0.012**	-0.179**	
	(0.033)	(0.164)		(0.005)	(0.082)	
d.(TRD*D(NITS))(2)	0.106**	0.363*		-0.015	-0.095	
	(0.044)	(0.203)		(0.009)	(0.157)	
d.TRD (modified) (1)			-0.224			-0.187**
			(0.206)			(0.081)
d.TRD (modified)*D(NITS)			0.333			-0.196
			(0.443)			(0.262)
Observations	5,680	5,680	5,680	6,707	6,707	6,707
Coeff. (1)+(2)	0.020	0.082	0.109	-0.003	-0.274	-0.384
SE (Delta method)	0.015	0.087	0.259	0.008	0.144	0.246

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

Table A.5: Sensitivity analysis debt ratio

Dep. Var.	Change in liabilities against shareholders (LS) resp. group members (LGM)					
Sample	$\frac{pF(.)}{K}$ < Mean			$\frac{pF(.)}{K}$ > Mean		
Dep. Var.	LS		LGM	LS		LGM
German owned firms excluded	x			x		
Firms with interest result > 1 million EURO		x			x	
	(1)	(2)	(3)	(4)	(5)	(6)
d.Business tax rate [$=u_{G,t}$]	0.282	0.194*	0.247**	-0.365	-0.617*	-0.346
	(2.360)	(0.106)	(0.117)	(0.866)	(0.366)	(0.456)
d.(TRD if $>0,0$ else)	2.544***	2.299**	2.126***	0.099	0.119	0.120***
	(0.896)	(0.824)	(0.666)	(0.162)	(0.111)	(0.042)
d.(TRD if $>0,0$ else)* $\frac{Depr.A}{K}$	-14.849*	-14.797*	-16.836**	-0.013	-0.205	-0.720**
	(8.487)	(8.161)	(7.773)	(0.731)	(0.671)	(0.325)
d.Firmsize	0.041**	0.026***	0.034***	0.028	0.045***	0.070***
	(0.017)	(0.005)	(0.005)	(0.018)	(0.011)	(0.010)
Observations	429	6,802	6,913	2,893	8,013	8,194

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

Table A.6: Sensitivity analysis capital stock

Dep. Var.	Growth rate of the capital stock $B = (1 - BTR) * UCC$ and $B_mod = (1 - BTR) * UCC_mod$					
Sample	$\frac{pF(.)}{K}$ < Mean			$\frac{pF(.)}{K}$ > Mean		
German owned firms excluded	x			x		
Firms with interest result > 1 million EURO		x			x	
	(1)	(2)	(3)	(4)	(5)	(6)
d.log(UCC)	-2.196**	-1.088***		-1.730***	-1.592***	
	(0.818)	(0.110)		(0.478)	(0.148)	
d.log(UCC_{mod})			-0.252***			-0.317***
			(0.044)			(0.080)
d.($\frac{TRD}{B}$ if $>0,0$ else)	0.806***	0.920***		-0.007	-0.069	
	(0.285)	(0.264)		(0.147)	(0.119)	
d.($\frac{TRD}{B}$ if $>0,0$ else)* $\frac{Depr.A}{K}$	-6.494***	-9.029***		3.183	3.386	
	(1.418)	(2.392)		(2.261)	(2.358)	
d.($\frac{TRD}{B_{mod}}$ if >0, 0 else)			0.860**			-0.054
			(0.335)			(0.104)
d.($\frac{TRD}{B_{mod}}$ if >0, 0 else)* $\frac{Depr.A}{K}$			-8.923**			2.649
			(3.390)			(2.035)
d.log(Sales)	0.167**	0.055***	0.061***	0.074***	0.035**	0.041***
	(0.069)	(0.015)	(0.016)	(0.018)	(0.014)	(0.013)
Observations	429	6,802	6,915	2,893	8,013	8,198

Note: Robust standard errors clustered for the location of the parent in parentheses. Each regression includes a full set of time dummies (not reported). Stars *, **, *** indicate significant at the 10/5/1% level.
Source: DAFNE firm database, 2004 to 2010, own calculations.

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