Internal Debt and Multinationals' Profit Shifting – Empirical Evidence from Firm-Level Panel Data

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Abstract: This paper explores the extent to which multinational firms use internal debt as a vehicle to shift taxable profits from high-tax to low-tax countries. While previous research has shown that multinationals tend to favor debt financing in high-tax countries, the paper argues that the profit-shifting incentive depends on the tax conditions not only in the host country of a subsidiary but also in the other countries where the multinational holds affiliates. Empirical evidence is provided using a micro-level panel dataset that includes virtually all German multinational firms. This dataset allows us to explore differences in tax conditions faced by foreign affiliates in more than 100 countries over a period of ten years. The empirical results confirm that internal debt is used more heavily by multinationals with affiliates in low-tax countries and that the use of internal debt increases with the spread between the host-country tax rate and the lowest tax rate among all affiliates in the multinational group. However, the tax effects are small, suggesting that internal debt is a rather unimportant vehicle for German firms in shifting profits. Further testing indicates that this result can partly be explained by the German CFC rule.

Keywords: Capital Structure; Multinational Corporations; Internal Debt; Corporate Taxation; Tax Planning; Profit Shifting

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1 Introduction

Due to the rising importance of foreign direct investment (FDI) and multinational firms, international tax issues are of increasing importance for tax policy. As noted in the literature (*e.g.*, Gresik, 2001), a multinational corporation has several ways to structure its activities in order to minimize the burden of taxation. This tax planning partly involves conventional decisions to set up firms in a tax-efficient way, such as, for instance, using debt rather than equity finance. Yet multinational tax planning also involves less conventional practices that exploit the specific characteristics of multinationals. In particular, tax planning employs profit-shifting techniques that only require the adjustment of the internal structure of the multinational firm. While there are several possible routes, a prominent strategy involves internal loans: borrowing from affiliates located in low-tax countries and lending to affiliates located in high-tax countries will allow the latter to reduce profits by deducting interest payments, which might then be taxed as earnings in the low-tax country.[1] While several papers document that tax-planning activities have significant effects on the distribution of taxable profits of multinationals (*e.g.*, Grubert and Mutti, 1991; Hines and Rice, 1994; Huizinga and Laeven, 2008), so far, the empirical literature has not provided direct evidence about the extent to which internal debt is used for profit-shifting purposes.

The extent to which the different ways of profit shifting are used by multinational firms has important implications for business tax reforms. In particular, high-tax countries, which suffer from adverse revenue effects and from a discrimination against domestic firms that do not have access to international income shifting strategies, need to know about the importance of the different channels of profit shifting when they consider designing measures against it. Anti-tax-avoidance

[1]There are other strategies to shift taxable profits to low-tax countries such as, for instance, transfer pricing (*e.g.*, Haufler and Schjelderup, 2000; Swenson, 2001; Clausing, 2003).

measures, such as transfer pricing regulations or measures that restrict interest deductibility for internal debt, imply not only a higher tax burden for foreign firms, but might cause substantial compliance costs as well as distortions of the firms' decisions. Whether there is a net benefit associated with such measures depends crucially on the importance of the specific channel of profit shifting addressed by these measures.

Clarifying how important profit shifting by means of internal debt might be will also improve our understanding of the existing empirical evidence on the tax-sensitivity of the capital structure. A number of papers show that the capital structure of multinationals' affiliates is sensitive to the tax rate in the host country of an affiliate (*e.g.*, Jog and Tang, 2001; Mills and Newberry, 2004; Huizinga *et al.*, 2008; Egger *et al.*, 2010; Møen *et al.*, 2010; DeMooij, 2011). Whereas most of the literature has focused on the total debt-to-asset ratio, Altshuler and Grubert (2003), Desai *et al.* (2004a), Mintz and Weichenrieder (2005) as well as Ramb and Weichenrieder (2005) find effects of the host-country tax rate on internal debt. Concerned with flows rather than stocks, Collins and Shackelford (1998) find that interest payments from foreign affiliates respond to taxes. While this empirical literature supports the view that internal debt is sensitive to taxes, the findings do not allow us to draw conclusions on whether and to what extent internal debt is really used for profit shifting or whether these effects reflect the conventional tax shelter of debt finance. Although the interest deduction results in revenue losses in both cases, this distinction has implications for tax policy. If the conventional tax shelter is the primary motivating factor, restrictions on interest deductibility for related party debt are a potential countermeasure. If profit shifting drives internal debt finance, those restrictions might cause a shift towards other forms of profit shifting, and lowering or eliminating effective tax-rate differentials *vis à vis* other countries is the ultimate remedy.

Against this background, this paper investigates whether and to what extent internal debt is used by multinational firms for profit-shifting purposes. As has been emphasized in the theoretical literature on profit shifting, the extent to which a multinational engages in profit shifting depends not only on the tax burden faced in the host country. It also depends on the tax conditions faced by the other entities of the multinational group. More specifically, as emphasized by Graham (2003) and Mintz and Smart (2004), a foreign affiliate of a multinational can be expected to use more internal debt if the multinational holds some other corporate entity in a low-tax country and if the spread between the host-country tax rate and the lowest tax rate within the multinational group is large.

To test these predictions we use a micro-level panel database of virtually all German multinationals made available for research by the Deutsche Bundesbank (the German Central Bank). A distinguishing characteristic of this dataset is that it reports the actual amount of internal debt from related parties that is used by foreign affiliates. The data allows us to restrict the focus of the empirical analysis on internal loans from non-German affiliates and to exclude loans granted by the German parent. This focus on interaffiliate borrowing is important, since, under standard conditions and given the relatively high German tax rates – at least in the period before the 2008 tax reform, there is little reason to expect that German parents use internal loans to foreign affiliates to shift foreign profits into Germany. Because the data reports the location of all foreign affiliates of each multinational including corporate entities in tax havens, we can measure precisely the tax incentive for profit shifting faced by the individual affiliate. This enables us to distinguish multinationals' profit shifting from the conventional tax-advantage of debt finance. While the dataset has been used previously to test whether foreign subsidiaries rely more on debt finance in host countries where tax rates are high (Mintz and Weichenrieder, 2005, Buettner *et al.*, 2009), none of these papers has tested whether the usage of internal debt can be explained by profit shifting.

Our empirical results confirm that internal debt is used more heavily by multinationals that hold some affiliates in low-tax countries. Moreover, we find a robust and significant impact of both the host-country tax rate as well as the lowest tax rate within the multinational group on the use of internal debt, indicating that an increase of the spread between the host-country tax rate and the lowest tax rate within the multinational group results in an increase of internal debt. However, even if we focus on majority-owned subsidiaries, the implied tax effects are rather small. Compared with existing empirical evidence on the tax-sensitivity of taxable profits, our findings suggest that, on average, internal debt is a rather unimportant vehicle of profit shifting. One possible explanation is that anti-tax-avoidance provisions curb profit shifting by internal debt. In accordance with this view, we find that the tax conditions faced by subsidiaries that are subject to the German CFC rule – as, for example, subsidiaries in tax havens – have no significant predictive power for the multinationals' use of internal debt.

The paper is organized as follows. In Section 2 we discuss the theoretical background as well as its empirical implications concerning internal debt financing. Section 3 gives a short description of the dataset and discusses the investigation approach. Section 4 provides descriptive statistics. The basic results are presented in Section 5. Section 6 extends the analysis and explores the robustness of the findings against alternative specifications of the profit-shifting incentive. We also take account of some specific institutions concerning the taxation of the parent including CFC rules and double taxation treaties. Section 7 provides a summary and concludes.

2 Theoretical Issues and Empirical Implications

One general benefit of debt finance is that associated interest expenses are deductible from corporate profits, while returns to equity are not. As a result, the value of a firm depends on its leverage (see Myers, 2001; Auerbach, 2002; Graham, 2003). However, firms trade off the benefits from using debt against its costs. The literature suggests that such costs are related to potential problems of financial distress (Kraus and Litzenberger, 1973), personal taxes (Miller, 1977), or agency cost of debt, reflecting the inability to solve the potential conflict between equity and debt claimants by means of contracts (Jensen and Meckling, 1976; Myers, 1977). Moreover, in a setting with asymmetric information between managers and shareholders, heavy reliance on debt finance might lead to inefficiently low investment (Stulz, 1990).

Due to these costs, we would expect that firms do not exclusively rely on debt finance. Nevertheless, these considerations are consistent with the view that higher taxes imply, ceteris paribus, higher debt-to-asset ratios. This positive relationship is confirmed empirically not only for multinationals, as noted in the introduction, but also for domestic firms (*e.g.*, Gordon and Lee, 2001). The existence of financial relations between the different firms within a multinational group, however, requires some further considerations.

A first point is that financing decisions of the various firms in a multinational group become interdependent if the parent company provides implicit or explicit guarantees for the debt of its affiliates. As Huizinga *et al.* (2008) show, this introduces a substitutive relationship among the affiliates such that the leverage of an affiliate becomes a function not only of the host-country tax rate but also of the tax rates of all other countries where the multinational holds affiliates. This interdependence of financing decisions between affiliates arises even without explicit borrowing relations within the multinational group.

Taking account of internal debt raises further issues. In fact, the existence of internal credit markets is a distinct feature of multinationals that offers several advantages against purely domestic firms since multinationals can substitute external with internal debt (Desai *et al.*, 2004a). The multinational may, for instance, issue external debt in some favorable credit market and subsequently allocate the funds by way of internal lending to other foreign affiliates. Moreover, if there are specific risks faced by an affiliate that make it difficult to get access to external debt at favorable conditions, the multinational firm might resort to using internal debt (see also Gopalan *et al.*, 2007). Further explanations arise from the role of debt in mitigating managerial incentive problems (*e.g.*, Hart, 1988; Aghion and Bolton, 1989). In any case, one determinant of all such uses of internal debt is the after-tax cost of the internal loan, which is affected by the local tax rate in the host country. Therefore, similar to the case of a domestic firm, we should expect that the local tax rate exerts a positive impact on internal debt.

These motives to optimize the capital structure of the individual affiliate have to be distinguished, however, from tax arbitrage or profit shifting. When loans are used for profit shifting, affiliates borrow and lend among each other without increasing outside debt, because internal loans are financed out of retained earnings or parent equity. For instance, an affiliate located in a low-tax country might provide a loan to another affiliate located in a high-tax country. The interest would then be deducted from the tax base in the high-tax country, transferred to the low-tax country, and taxed there. A multinational aiming at minimizing overall tax payments will borrow in high-tax countries and declare the interest income in the country that levies the lowest tax rate. This strategy obviously makes use of internal debt to shift profits from high- to low-tax jurisdictions. And since this involves higher debt in high-tax countries, it supports a positive effect of the host-country tax rate on leverage.

The theoretical literature has further explored the determinants of profit shifting by means of

internal debt. Accordingly, the optimal amount of internal debt is obtained if the marginal tax savings from internal debt are equal to the marginal cost of profit shifting. Mintz and Smart (2004) assume that this marginal cost is increasing in the amount of internal funds used by the borrowing affiliate. This ensures the existence of an interior solution where firms are not exclusively relying on internal debt. Moreover, in this model, internal debt is inversely related to the lowest tax rate among all affiliates of a multinational group. More precisely, the marginal tax incentive to use internal debt is captured by the difference between the host-country tax rate and the lowest tax rate in the group.[2] Thus, the testable hypothesis of the theoretical literature is that, in the presence of profit shifting, a foreign affiliate will use more internal debt if the spread between the host-country tax rate and the lowest tax rate within the group is larger.

The assumption that the borrowing affiliate faces increasing marginal cost of profit shifting is plausible for several reasons. First, the theoretical literature emphasizes that debt finance plays a role in mitigating managerial incentive problems (*e.g.*, Aghion and Bolton, 1989). If more debt is used for tax reasons, a distortion of managerial incentives arises. As noted by Huizinga *et al.* (2008), the tax incentive to use more debt would, therefore, distort the capital structure of the foreign subsidiary of a multinational corporation. As a result, the borrowing affiliate faces increasing marginal cost of profit shifting. Moreover, some part of the literature on profit shifting introduces increasing concealment costs in order to capture an increasing risk of conflict with tax authorities and increasing efforts to conceal tax-evasion activities (Haufler and Schjelderup, 2000). These costs are also incurred by the borrowing affiliate, since it is the corresponding host country that loses tax revenues. On the part of the lending affiliate, which often is a holding company placed in a country that offers favorable tax conditions, these problems do not arise.

[2]Egger *et al.* (2010), and Møen *et al.* (2010) come to the same result.

By investigating internal borrowing of foreign affiliates, the subsequent analysis aims at testing empirically how important profit shifting is as a determinant of internal debt finance. Basically, we examine whether and to what extent internal debt usage is driven by the local tax rate and the lowest tax rate among all affiliates of a multinational. Of course, the complexity of international taxation makes it difficult to measure the profit-shifting incentives precisely. This not only relates to the problem of capturing the tax conditions in several countries including locations where direct investment associated with production takes place and locations for financial centers such as tax havens. It is also important to capture specific features of international taxation that will affect the profit-shifting incentives. This includes questions concerning double-taxation treaties and whether or not the foreign affiliate is subject to Controlled Foreign Corporation rules. We will come back to these issues below.

3 Data and Investigation Approach

A basic problem in the empirical analysis of the tax effects on the capital structure is to find a setting with sufficient empirical variation in the incentives generated by the tax system. In the current study we utilize a micro-level panel dataset of multinationals that offers substantial variation in three dimensions:

1. The first dimension relates to the international perspective as the dataset reports the capital structure of foreign affiliates of multinational firms operating in various countries. Since the data considers multinationals' activities globally, the empirical analysis is based on a sample of 145 countries where some affiliates are observed and where reliable information with regard to corporate income taxation is available.

2. Another dimension that offers variation in the tax conditions is the time dimension. The panel data covers the multinationals' activities as well as the tax conditions on an annual basis from 1996 until 2005. The tax data displays substantial variation over time. During the investigated period, among the 145 countries included, we count 203 instances where tax rates were lowered and 24 cases where tax rates were raised.

3. The third dimension is related to the heterogeneity of the location patterns of multinational groups. Since multinationals operate in different countries, the profit-shifting opportunities of an affiliate depend on the set of countries where the respective multinational group holds affiliates. As a consequence, the profit-shifting incentive varies among affiliates in the same host country, depending on the characteristics of the respective group.

While the first two sources of variation originate in the tax policies of the countries, the third source of variation stems from location decisions of firms. Since production technologies available to firms as well as the market structures for their products differ, the incentives for vertical and horizontal FDI differ between firms. To the extent that the different location patterns of the multinationals reflect these differences, the differing options for tax planning emerge as a side effect and can safely be used to identify tax incentives for profit shifting. If, however, the variation in the incentive for profit shifting emerges from tax-planning strategies that involve the location in low-tax countries, the variation might become endogenous. We will return to this issue below when we discuss the specification of the empirical model.

In order to test the empirical implications as outlined in the previous section, we employ a micro-level dataset for German multinationals that is taken from a comprehensive annual database of foreign direct investment positions of German enterprises (MiDi) provided by the Bundesbank. The data provide information about each foreign affiliate's balance sheet and some further information

about the ownership and about the German investor. Each German multinational has to report its foreign assets above some lower threshold level, including both directly and indirectly held FDI.[3] Basically, the data provides balance-sheet information of virtually all German outbound investments from 1996 to 2005, regardless of the degree of ownership.

With respect to the lending entity of internal loans, the dataset distinguishes between internal debt received from the parent and internal debt received from other foreign affiliates.[4] This allows us to restrict the focus of the empirical analysis on internal loans granted as well as received by foreign affiliates and to exclude loans granted by the German parent. This is important, since, under standard conditions and given the relatively high German tax rates – at least in the period before the 2008 tax reform, there is little reason to expect that German parents use internal loans to foreign affiliates to shift foreign profits into Germany. Note, though, that internal parent debt might well be explained by reasons other than profit shifting (see Section 2).

Since we focus on internal loans granted and received by foreign affiliates, we implicitly assume that the tax conditions in the host countries of these foreign affiliates are decisive for the multinational firm. This might be questioned in a context where the parent company would have to pay taxes on worldwide profits, as in a foreign tax credit system. However, note that for German multinationals usually the exemption principle applies. Hence, the German case might be much more straightforward in comparison to the U.S. case, where taxes on foreign earnings are subject to a foreign tax credit and, furthermore, interest allocation rules apply (Altshuler and Mintz, 1995). Yet the exemption principle might not be fully effective in the German case, for instance, due to Controlled

[3]Data collection is enforced by German law, which determines reporting mandates for international transactions as part of the Foreign Trade and Payments Regulation. Since 2002 FDI has to be reported if the participation is 10% or more and the balance-sheet total of the foreign object is above 3 million euro. For details see Lipponer (2007). Though previous years showed lower threshold levels, we apply this threshold uniformly for all years.

[4]The corresponding position is "...liabilities to affiliated enterprises ... outside of Germany" (see Lipponer, 2007).

Foreign Corporation (CFC) rules or if no double taxation treaty exists between Germany and the low-tax country. We will come back to these issues below.

Since tax conditions vary in more than one dimension, we can further exploit the micro-level information of the dataset and explore the capital structure of multinationals using panel data techniques. Following our discussion of the empirical implications, the analysis is based on regressions of the following type

$$ID_{i,k,t} = a_1\tau_{i,t} + a_2\tau_{k,t}^{low} + a_3 x_{i,k,t} + \varphi_t + \gamma_k + \varepsilon_{i,k,t}, \tag{1}$$

where the dependent variable ($ID_{i,k,t}$) is defined as the amount of internal loans received by a foreign affiliate i from other foreign affiliates within the multinational group k divided by total capital. $\tau_{i,t}$ is the host-country tax rate applicable to affiliate i and captures the conventional tax shelter of debt finance. $\tau_{k,t}^{low}$ denotes the tax rate of the entity facing the lowest corporate tax rate within the group, which identifies the tax savings from profit shifting together with the host-country tax rate. It is defined by

$$\tau_{k,t}^{low} \equiv \min\left[\left(\tau_{1,t}\alpha_{1,k,t}\right), ..., \left(\tau_{j,t}\alpha_{j,k,t}\right), ..., \left(\tau_{n,t}\alpha_{n,k,t}\right)\right],$$

where $\alpha_{j,k,t} = 1$ if the company group k holds an affiliate in country j and zero otherwise. Note that the basic specification includes time effects (φ_t) to capture differences in the treatment of foreign earnings in the home country of the multinational (Germany) and other aggregate shocks. We also employ affiliate-specific control variables ($x_{i,k,t}$) which capture some heterogeneity in the borrowing costs across affiliates. Since borrowing costs may vary across industries, we also provide results of specifications that employ industry-specific effects.

Moreover, in our basic specification, we condition on a fixed effect for each multinational group (γ_k), since group-specific risk would affect the lending rate and the cost of borrowing (Desai *et al.*, 2004a). Using group-specific fixed effects also allows us to condition on the international structure of each group. This is important, because the choice of the group structure is not modeled and the existence of an affiliate in a low-tax country may be part of a specific tax-planning strategy. As a consequence, the variation in the lowest tax rate could be endogenous. For instance, one might be concerned that firms, which are more active in profit shifting, are more likely to locate in low-tax countries. A low figure for the lowest tax rate would then capture not only the incentive for profit shifting but also the firm's predisposition to profit shifting. The implication for the empirical results can be characterized as a selection bias since the group of firms with a low $\tau_{k,t}^{low}$ might differ systematically from other firms. Yet by conditioning on group effects, we tend to avoid this bias because all cross-sectional variation between multinationals is removed.

If the location pattern of the multinational is constant over time, the group effect is sufficient to control for selection effects.[5] This is also true if the location pattern changes for reasons entirely unrelated to changes in tax policy. But, if the change of the location pattern is associated with changes in tax policy, one might be concerned that the change in the incentive for profit shifting (captured by $\tau_{k,t}^{low}$) is endogenous. Consider, for example, the case where country j initially has a tax rate above the lowest tax rate within the group $\tau_{j,t-1} > \tau_{k,t-1}^{low}$ and is not hosting an affiliate. In this case, the weight attached to the tax rate in country j is equal to zero ($\alpha_{j,k,t-1} = 0$), since the multinational does not have an affiliate in j in $t-1$. Now assume that country j lowers its tax rate such that in the next period $\tau_{j,t} < \tau_{k,t-1}^{low}$. Company k might respond and restructure its location pattern such that $\alpha_{j,k,t} = 1$ and $\tau_{k,t}^{low} = \tau_{j,t} < \tau_{k,t-1}^{low}$. As a consequence, the incentive to engage in profit shifting increases. In this case, the incentive to use internal debt results partly

[5] See Verbeek and Nijman (1992) for a discussion of selection effects in a panel data context.

from the firm's response to the tax-rate change. Indeed, without restructuring the location pattern, the tax-rate change would not show up in the measure of the profit-shifting incentive in this case.

In order to test whether this kind of effect matters in our setup, we alter the definition of the lowest tax rate and assign a weight of zero to cases where a location decision is associated with a tax decrease. Similarly, we assign a zero weight to cases where a location is abandoned upon a tax increase. Formally, we introduce an alternative indicator for $\tau_{k,t}^{low}$ that is based on a different definition of the lowest tax rate within the multinational group

$$\begin{aligned}\overline{\tau_{k,t}^{low}} \equiv \min \quad & [\tau_{1,t} \,|\alpha_{1,k,t} = 1 \wedge (\alpha_{1,k,t} - \alpha_{1,k,t-1})(\tau_{1,t} - \tau_{1,t-1}) \geq 0 \,, ..., \\ & \tau_{j,t} \,|\alpha_{j,k,t} = 1 \wedge (\alpha_{j,k,t} - \alpha_{j,k,t-1})(\tau_{j,t} - \tau_{j,t-1}) \geq 0 \,, ..., \\ & \tau_{n,t} \,|\alpha_{n,k,t} = 1 \wedge (\alpha_{n,k,t} - \alpha_{n,k,t-1})(\tau_{n,t} - \tau_{n,t-1}) \geq 0 \,].\end{aligned}$$

By using this definition, we ignore that part of the variation in the location pattern which is associated with tax-policy changes.[6]

4 Descriptive Statistics

Table 1 provides some information about the sample of multinationals. The basic sample includes FDI by German multinationals in 145 countries, excluding all *binational* corporations with only one foreign affiliate because no internal loans from non-German affiliates can be observed in this case. Nevertheless, this sample covers more than 80% of the total FDI of Germany as the MiDi data covers virtually all German outbound investments. Note that this basic sample is used to describe

[6]Note that we ignore adjustment cost in the location decision since, if these costs are substantial, the current variation in profit-shifting incentives that arises from a change in the tax rate will not suffer from the above mentioned endogeneity problem.

Table 1: Sample Characteristics

Sample	Number of Observations	Firms	Countries
All available observations	*196,111*	*7,594*	*160*
(1) Basic sample excl. *binational* corp.	157,155	6,086	145
(2) Reduced sample excl. zero sales	128,892	4,479	140

Sample 1 excludes *binational* corporations and comprises all foreign direct investment observations (outbound investment) where corporate tax rate information is available; Sample 2 further excludes all observations reporting no sales. The number of countries refers to countries in the sample where at least one German investment is reported at some point of time.

the profit-shifting incentives for the foreign subsidiaries. The distribution of internal debt which is investigated empirically, however, is taken from a reduced sample excluding affiliates with zero sales. While this restriction implies a reduction in the number of observations, the idea is to focus on the capital structure of productive affiliates where operating profits – which are eventually shifted – originate. Since the lowest tax rate observed among all foreign affiliates is determined using the basic sample, which includes also non-productive affiliates, the tax incentive to use internal debt is taken into account in a comprehensive way. In other words, entities of the multinational that are rather likely to provide loans under profit shifting are included in the computation of the tax incentive.

As has been discussed above, we employ affiliate- and group-specific indicators of the tax incentives for profit shifting. More specifically, we determine for each multinational the lowest corporate income tax rate observed among all of its foreign affiliates (for ease of exposition, we will refer to the corresponding tax rate as the *lowest tax rate* and to the affiliate as the *lowest-tax affiliate*). We use this group-specific lowest tax rate as the benchmark for the group and include also the host-country tax rate as shown in Equation (1).

Table 2: Descriptive Statistics for Foreign Affiliates

Variable	Mean	Std. Dev.	Min.	Max.
Total leverage	.586	.274	0	1
Internal debt				
– all	.241	.260	0	1
– excluding loans from German parent (ID)	.106	.196	0	1
Host-country tax rate	.330	.073	0	.600
Lowest tax rate	.208	.090	0	.510
Tax-rate difference	.121	.102	0	.550
Lowest tax rate (altern.) [a])	.210	.091	0	.532
Lowest tax rate (CFC) [b])	.298	.038	.250	.532
Lowest tax rate (CFC-DTT) [c])	.301	.038	.250	.540
Loss carry-forward	.309	.462	0	1
Tangibility	.261	.254	0	1
(ln) Sales	9.82	1.43	[d])	[d])

Panel comprises 10 years, 128,892 ([a]) 124,255; [b]) 94,314; [c]) 84,672) observations. The tax-rate difference is the difference between the statutory tax rate at the affiliate's location and the lowest tax rate within the multinational group. Lowest tax rate (altern.): alternative computation of the lowest tax rate ($\tau_{k,t}^{low}$, see Section 3); Lowest tax rate (CFC): additionally takes into account the German CFC legislation (see Section 6.4); Lowest tax rate (CFC-DTT): additionally takes the German CFC rules and double taxation treaties (DTTs) into account. [d]) confidential data.

Table A.1 in the appendix provides a list of the 145 countries for which tax information is available and where a positive number of affiliates are observed. Apart from the number of affiliates observed for each country, the table also shows which countries typically host the lowest-tax affiliates. Most affiliates are reported in the U.S., in the U.K., in France, and in the Netherlands, which reflects the importance of these countries' markets for the German multinationals. The table also shows that low-tax locations that are frequently mentioned in debates about tax evasion, like Ireland and Switzerland, are often hosting the lowest-tax affiliate.

Table 2 displays descriptive statistics for the variables used in the empirical analysis (a correlation matrix for the right-hand side variables used in the regression analysis is provided in the appendix).

A first impression of the potential importance of internal debt as a means of shifting taxable profits, as compared to the conventional tax shelter of debt finance, is given by the three different debt variables. While, on average, the total debt-to-asset ratio is almost 60%, the internal debt-to-asset ratio is only 24.1%. This figure still includes internal loans from the German parent to foreign affiliates. Given Germany's high tax rate, it is quite unlikely that these loans are related to profit shifting. Their presence, instead, is more likely to be attributed to multinationals' attempts to circumvent adverse credit market conditions or to provide the management of the affiliate with appropriate incentives (see Section 2). Internal loans received from other foreign affiliates, which are the focus of the subsequent empirical analysis, amount only to an average internal-debt-to-asset ratio of 10.6%.

5 Basic Results

Table 3 provides some first descriptive evidence on the impact of taxes on internal debt. It displays the share of capital financed with different kinds of debt for the reduced sample as well as for various subsamples. For ease of comparison, Column (1) repeats the mean figures reported in Table 2. Columns (2) and (3) report the share of internal debt observed among the affiliates of those multinational corporations that hold at least one affiliate in a low-tax country. Column (2) defines the low-tax country as a country with a tax rate below the 10th percentile of the (unweighted) tax-rate distribution among the countries. Column (3) uses a stricter definition based on the 5th percentile of the tax-rate distribution. If corporations use internal debt for profit shifting, we should expect the mean to be higher for the affiliates of these multinational corporations. Indeed, the share of internal debt (excluding loans obtained from the German parent) is higher by a factor of approximately 1.5, indicating that the use of internal debt from other affiliates is much

Table 3: Leverage and Internal Debt of Foreign Affiliates

Variable	reduced sample (1)	multinational groups with an affiliate in a low-tax country: 10th percentile (2)	multinational groups with an affiliate in a low-tax country: 5th percentile (3)	lowest-tax affiliates ($\tau^{low} = \tau$) (4)
Total leverage	.586	.551	.547	.548
External debt	.344	.301	.307	.342
Internal debt				
– total	.241	.250	.240	.205
– excluding loans from German parent	.106	.149	.162	.078
Observations	*128,892*	*57,049*	*31,919*	*31,521*

Debt shares of affiliates with non-zero sales. 10th-percentile (5th percentile): debt shares of affiliates of groups with an affiliate located in one of the low-tax countries, where a low-tax country is defined as a country with a statutory tax rate below the 10th (5th) percentile; ($\tau^{low} = \tau$) refers to all those foreign affiliates with the lowest tax rate within the group.

more prevalent among multinationals with affiliates in low-tax countries. Conversely, the affiliate experiencing the lowest tax rate within the group should display a lower share of internal debt. Indeed, as reported in Column (4), the mean share of internal debt for those affiliates is only three quarters of the overall mean.

Table 4 reports regression results for a basic specification following equation (1). In order to control for group structure and group-specific risks, all estimations employ fixed effects for the company group. Moreover, time dummies are included in order to capture differences in the taxation of the parent. Standard errors are computed by clustering at the level of the year-country cells as the host-country tax rate only varies across these cells in order to avoid random-group correlation problems (Moulton, 1990). Given the limited information in the balance sheet of the affiliates, only three affiliate-level control variables are included. Since the effective tax reduction from using debt might be zero if an affiliate carries forward any losses for tax purposes (see MacKie-Mason, 1990), we include a variable indicating whether a loss carry-forward is reported. We also include

the sales of the affiliate, because higher sales are positively correlated with the size and cash flow of a company, and thus, are associated with favorable lending conditions for external debt (*e.g.*, Graham and Harvey, 2001; Rajan and Zingales, 1995) which may substitute for internal debt. Finally, tangibility, defined as the ratio of fixed to total assets, is used as a further determinant of the financial structure.[7]

Throughout most specifications, the host-country statutory tax rate is positively related to the share of internal debt, confirming the standard host-country tax effect found in previous studies. We also find evidence that the lowest tax rate determines internal debt usage. The negative impact indicates that if the lowest tax rate among all affiliates declines, firms use more internal debt. This is consistent with the profit-shifting hypothesis. Column (4) includes the control for a loss carry-forward as the incentive to save taxes is reduced in this case. The positive sign might reflect the support of financially weaker firms by means of internal loans (Gopalan *et al.*, 2007). The results prove robust against the inclusion of controls for sales and tangibility, too. Both variables show the expected sign, but are not significant in all columns. The specification in Column (5) additionally employs industry-level dummies using a classification of affiliates according to 71 industries. This might help to further control for differences in the financial risk related to an affiliate's activities.

While the estimation exploits the cross-sectional tax distribution within each multinational group, it seems possible that there are certain characteristics of host countries that facilitate profit shifting into low-tax countries. For instance, high-tax countries often have special relations to specific tax havens, due to a joint colonial history or through the geographic location. As a consequence, the lowest tax rate might be correlated with host-country characteristics. As a robustness check,

[7]Higher tangibility, on the one hand, may be associated with an easier access to additional debt because firms can easily borrow against fixed assets. Agency costs of debt are then reduced by the value of collateral. On the other hand, the value of interest deduction may be crowded out by the non-debt tax shields generated by depreciation and investment tax credits related to tangible assets (DeAngelo and Masulis, 1980).

Table 4: Basic Results: Internal Debt of Foreign Affiliates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Host-country tax rate	.067 **		.071 **	.067 **	.064 **	.014	
	(.021)		(.021)	(.019)	(.018)	(.021)	
Lowest tax rate		-.070 **	-.082 **	-.081 **	-.073 **	-.066 **	
		(.019)	(.019)	(.020)	(.019)	(.018)	
Tax-rate difference							.066 **
							(.015)
Loss carry-forward				.032 **	.034 **	.033 **	.034 **
				(.002)	(.002)	(.002)	(.002)
(ln) Sales				-.004 **	-.001	-.005 **	-.001
				(.001)	(.001)	(.001)	(.001)
Tangibility				-.021 **	-.002	-.0001	-.002
				(.005)	(.005)	(.004)	(.005)
Industry effects	no	no	no	no	yes	yes	yes
Host-country effects	no	no	no	no	no	yes	no
Adj. R-Square	.2029	.2025	.2031	.2089	.2276	.2413	.2276

Dependent variable: internal debt ratio of foreign affiliates related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk indicates significance at 10% level, two asterisks at 5% level. 128,892 observations, 4,479 firms. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level.

Column (6) employs fixed effects for the host country. While the host-country tax rate turns insignificant, indicating that the cross-sectional variation in tax rates is important to identify the host-country tax effect in this specification, the estimate of the lowest tax rate among all affiliates in the multinational group proves to be robust. This indicates that the effect of the lowest tax rate, which is exclusively associated with the profit-shifting incentive, is not driven by any other host-country characteristics. In accordance with the literature, our preferred specification, therefore, does not include host-country fixed effects.

Quantitatively, we see from the preferred specification in Column (5) that a ten percentage point increase in the host-country tax rate leads to an approximately 0.64 percentage point higher internal debt ratio. This figure is within the range of existing estimates of the tax-sensitivity of multinationals' debt. Estimates by Desai *et al.* (2004a) indicate that an increase of the host-country tax rate by 10% is associated with an increase in the share of parent debt by about 0.82 percentage points. Expressed as a semi-elasticity evaluated at the mean share of internal debt (0.106), our results indicate that an increase in the host-country tax rate by 10 percentage points triggers an increase in the share of internal debt by approximately 6%. For the lowest tax rate we find the expected negative effect on internal debt which is very similar to the effect of the host-country tax rate in absolute value terms. In fact, also formal testing does not allow us to reject equal absolute values of the slope parameters (p-value: 0.706). According to Column (5), a ten percentage point decrease in the lowest tax rate leads to an approximately 0.73 percentage point higher internal debt ratio. Expressed as a semi-elasticity evaluated at the mean share of internal debt (0.106), a decrease in the lowest tax rate by 10 percentage points triggers an increase in the share of internal debt by approximately 7%.

Since our empirical results point to the equality of slope parameters, in absolute terms, for the host-

country tax rate and the lowest tax rate, they suggest that the tax incentive to use internal debt from related parties, excluding parent debt, is fully consistent with the profit-shifting hypothesis. Therefore, one might consider replacing the two indicators by the tax-rate difference ($\tau_{i,t} - \tau_{k,t}^{low}$). Column (7) provides estimates for a specification as in Column (5), except with the restriction that the sum of the coefficients is zero such that the estimation employs the tax-rate difference. Again, the positive impact of the tax-rate difference on internal debt is confirmed.

To assess the empirical magnitude of the tax effects implied by our estimates, consider the following relationship between the implied semi-elasticity of reported profits and the semi-elasticity of internal debt related to profit shifting (for the derivation, see the appendix)

$$\left| \frac{1}{\omega_1} \frac{\partial \omega_1}{\partial (\tau_1 - \tau_2)} \right| < \frac{\mu_1}{1 - \mu_1} \left| \frac{1}{\mu_1} \frac{\partial \mu_1}{\partial (\tau_1 - \tau_2)} \right|, \tag{2}$$

where ω_1 denotes reported profits before taxes in the host country, μ_1 is the internal debt-to-capital ratio, τ_1 is the local tax rate, and τ_2 is the lowest tax rate. Consider an increase of the host-country tax rate such that the spread between the host-country tax rate and lowest tax rate increases by one percentage point. With an average figure for μ_1 of .106 in the dataset and a semi-elasticity $\left| \frac{1}{\mu_1} \frac{\partial \mu_1}{\partial (\tau_1 - \tau_2)} \right|$ of internal debt equal to 0.62% (with respect to the tax-rate difference; see Column (7) in Table 4), the right-hand side of (2) shows a value of 0.07%. If internal debt were the only means to shift profits, our empirical results would suggest that this is an upper bound for the semi-elasticity of reported profits.[8] While the literature on profit shifting does not include the lowest-tax rate, and, hence, is not fully comparable, it generally points at much larger effects. The empirical literature surveyed by DeMooij (2005) points at a semi-elasticity of the reported tax base of about

[8]Note that this computation implicitly assumes that profit shifting works by manipulating quantities of debt rather than manipulating the interest rate. However, the latter is generally ruled out by the arm's-length principle (see Section 6.4, below).

2% if the host-country tax rate increases by one percentage point. Recently, Huizinga and Laeven (2008) have come up with a figure of 1.31%. Even the latter estimate exceeds the internal debt effect by a factor higher than 18. Shifting taxable profits by internal debt, therefore, seems to be a rather unimportant vehicle of profit shifting for the foreign affiliates of German multinationals.

6 Extensions and Robustness Checks

To see whether the above findings are driven by specifics of the investigation approach or the data and whether results are robust if further details of the tax law are taken into account, this section reports results of various extensions and robustness checks.[9]

6.1 The Impact of Taxes on Total Debt

A first test is concerned with the question of whether the lowest tax rate among all affiliates is really associated with profit shifting and does not capture a substitution effect – in the sense that the lower demand for debt by low-tax affiliates is associated with more debt at other affiliates in the group (Huizinga *et al.*, 2008). Table 5 provides a simple but powerful test. While we use the same empirical specification as above, the dependent variable is now the total debt-to-capital ratio. All specifications confirm a positive and significant impact of the host-country tax rate. In all specifications, however, the lowest tax rate shows no significant impact on total debt.

The estimations using total debt also allow us to check whether results found in the existing literature are supported by our data. The preferred estimate in Column (2) follows the existing

[9]We also explored whether our result might be explained by extreme values of internal debt chosen by the firms. However, when running further regressions, where such affiliates are excluded using varying thresholds, our findings proved robust.

Table 5: Results: Total Debt of Foreign Affiliates

	(1)	(2)	(3)
Host-country tax rate	.192 **	.214 **	.116 **
	(.042)	(.041)	(.034)
Lowest tax rate	.011	.010	.021
	(.023)	(.023)	(.021)
Loss carry-forward	.060 **	.061 **	.068 **
	(.003)	(.003)	(.002)
(ln) Sales	.017 **	.017 **	.018 **
	(.001)	.001	(.001)
Tangibility	-.113 **	-.076 **	-.055 **
	(.008)	(.008)	(.008)
Industry effects	no	yes	yes
Host-country effects	no	no	yes
Adj. R-Square	.2910	.3234	.3438

Dependent variable: total debt ratio of foreign affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk indicates significance at 10% level, two asterisks at 5% level. 128,892 observations, 4,479 firms. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level.

literature and does not include host-country dummies. It shows that an increase in the host-country tax rate by 10 percentage points raises the debt-to-capital ratio by about 2.1 percentage points. This estimate is very similar to results obtained in the existing literature. For instance, Desai *et al.* (2004a), using data from the U.S. Bureau of Economic Analysis, report estimates indicating that an increase of the tax rate by 10 percentage points is associated with an affiliate leverage that is 2.6 percentage points greater as a fraction of assets. Huizinga *et al.* (2008) use financial statement data for European firms and find that an increase in the marginal effective tax rate by 10 percentage points results in an increase in the total leverage by 2.59 percentage points. Given that we use a different dataset, this similarity with the existing literature is reassuring.

Table 6: Results: Alternative Definition of Lowest Tax

	(1)	(2)	(3)
Host-country tax rate	.070 **	.067 **	.026
	(.019)	(.018)	(.021)
Lowest tax rate (altern.)	-.088 **	-.079 **	-.073 **
	(.019)	(.018)	(.017)
Loss carry-forward	.032 **	.034 **	.033 **
	(.002)	(.003)	(.002)
(ln) Sales	-.004 **	-.0002	-.004 **
	(.001)	(.001)	(.001)
Tangibility	-.020 **	-.001	.001
	(.005)	(.005)	(.005)
Industry effects	no	yes	yes
Host-country effects	no	no	yes
Adj. R-Square	.2105	.2299	.2439

Dependent variable: internal debt ratio of foreign affiliates related to loans from other, non-German affiliates. Alternative computation of the lowest tax rate ($\tau_{k,t}^{low}$, see Section 3). Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk indicates significance at 10% level, two asterisks at 5% level. 124,255 observations, 4,438 firms. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level.

6.2 Alternative Specification of Profit-Shifting Incentive

In this section we explore whether the specification of tax incentives and, in particular, the construction of the lowest tax rate matters for the empirical findings. Even though estimations control for fixed group effects, the lowest tax rate within the group may capture some variation in incentives that results from location decisions of the firms. If these location decisions are driven by tax-rate changes, one might be concerned that the estimate of the effect of the lowest tax rate is biased. Following the above discussion, we therefore carry out regressions that rely on the alternative indicator $\tau_{k,t}^{\overline{low}}$. As explained above, this alternative measure of the lowest tax rate ignores that part of variation in the location pattern which is associated with tax-policy changes.

Table 6 provides the results using the alternative lowest tax rate. Qualitatively no differences are

encountered. Quantitatively, the results point at a slightly larger effect of the lowest tax rate on the use of internal debt compared with the basic estimation. The preferred specification with industry effects shows coefficients of -.079 for the lowest tax and .067 for the host-country tax rate. Since the increase in the tax effects is rather modest, the variation in tax incentives that is associated with policy-induced changes in location patterns does not seem to be important for our results.

To check further whether the empirical response to the profit-shifting incentive suffers from endogeneity, other alternatives of defining the lowest tax rate have been tested. One specification defines the lowest tax rate such that tax-haven countries (defined according to a list of countries provided by Dharmapala and Hines, 2009) are not considered in the computation of the tax measure. Another specification considers only countries in the computation of the lowest tax rate where the tax rate lies above the 25th percentile of the tax-rate distribution. The empirical results (available upon request) prove that our findings are also robust to these alternative specifications of the lowest tax rate. This implies that the lending entities are not necessarily located in countries with very low taxes or in tax-haven countries. One possible explanation for this may be that CFC rules effectively prevent multinationals to operate in such countries. We will explore this issue in more detail in Section 6.4.

6.3 Majority-Owned Subsidiaries

Leaving aside the identification of profit-shifting incentives, the small impact of the lowest tax rate on the use of internal debt might also reflect high costs of distorting the capital structure for tax purposes. While these costs are not directly observed in the dataset, some of their potential determinants are. Desai *et al.* (2004b) argue that shared ownership of foreign affiliates is associated with coordination costs which impede tax-efficient structuring of worldwide operations. This view

is supported by Mintz and Weichenrieder (2005), who find a higher tax-rate sensitivity of internal debt for wholly-owned subsidiaries. In terms of the above theoretical considerations, this would imply that the marginal cost of borrowing related to internal debt are lower when the ownership share is higher. Hence, we might expect that an affiliate uses more internal debt and displays a higher tax-sensitivity of internal debt if the ownership share of the parent is higher.

Columns (1) to (3) of Table 7 report results for a sample where only majority-owned subsidiaries are included. We find that the tax-sensitivity of the host-country tax rate is positive and slightly larger as compared to the results in Table 4. According to specification (2), a ten percentage point increase in the lowest tax rate leads to an approximately 0.79 percentage point lower internal debt ratio.

6.4 Taking Account of CFC Rules and Double Taxation Treaties

The rather small tax effects even for majority-owned firms indicate that there are important costs or restrictions, preventing corporations from heavily using internal debt for profit shifting. A first concern may be that profit shifting by means of internal debt could work through charging high interest rates rather than by the size of an internal loan (as implicitly assumed in the above setting). However, this strategy would usually conflict with the arm's-length principle (see Piltz, 1996: 103p). But nevertheless, firms may have some scope in classifying loans according to risk. In any case, note that we neither observe any credit risk classification nor do we have information on interest rates or interest payments and, therefore, cannot provide meaningful robustness tests in this matter.

Host countries may also enact specific policies that restrict the use of internal debt for tax-planning purposes. In particular, withholding taxes on interest payments (see Collins and Shackelford,

Table 7: Results: Majority-owned Subsidiaries, CFC Rules and DTTs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Host-country tax rate	.093 **	.088 **	.014	.137 **	.118 **	.079 **	.126 **	.107 **	.099 **
	(.020)	(.018)	(.024)	(.042)	(.040)	(.027)	(.046)	(.044)	(.030)
Lowest tax rate	-.088 **	-.079 **	-.074 **						
	(.021)	(.021)	(.020)						
Lowest tax rate (CFC)				-.106 **	-.101 **	-.092 **			
				(.041)	(.041)	(.041)			
Lowest tax rate (CFC-DTT)							-.082 *	-.074 *	-.071 *
							(.045)	(.045)	(.044)
Loss carry-forward	.033 **	.034 **	.034 **	.033 **	.035 **	.035 **	.036 **	.037 **	.037 **
	(.003)	(.003)	(.002)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)
(ln) Sales	-.004 **	-.001	-.005 **	-.004 **	-.001	-.006 **	-.003 **	.0003	-.005 **
	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)	(.001)
Tangibility	-.009	.006	.008	-.004	.011	.010	.007	.022	.017 **
	(.006)	(.006)	(.005)	(.007)	(.007)	(.006)	(.007)	(.007)	(.007)
Industry effects	no	yes	yes	no	yes	yes	no	yes	yes
Host-country effects	no	no	yes	no	no	yes	no	no	yes
Adj. R-Square	.2221	.2399	.2528	.2308	.2484	.2621	.2376	.2551	.2682

Dependent variable: internal debt ratio of foreign affiliates related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk indicates significance at 10% level, two asterisks at 5% level. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level. Lowest tax rate (CFC) takes into account the German CFC legislation (see Section 6.4). Lowest tax rate (CFC-DTT) takes into account the German CFC legislation and existing double taxation treaties (DTTs). Columns (1) to (3), 113,250 observations, 4,218 firms; columns (4) to (6), 94,314 observations, 4,050 firms, columns (7) to (9), 84,672 observations, 3,899 firms. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level.

1998) or thin-capitalization rules come to mind. While it proved impossible to augment the current analysis based on 145 countries with information about withholding taxes, Huizinga *et al.* (2008) note that withholding taxes on interest payments are mainly zero within Europe, where most of the foreign direct investment of German multinationals is located. Therefore, it seems unlikely that withholding taxes can explain the low tax-sensitivity. With regard to thin-capitalization rules, we should note that the current analysis is only concerned with internal loans received from other foreign affiliates. Thin-capitalization rules would also refer to related-party debt issued by the parent. Given that the mean share of internal debt owed to the parent is 13.5% as compared to 10.6% for the share of debt related to other foreign affiliates, in many cases foreign affiliates could lower the amount of debt owed to the parent in order to avoid the denial of interest deduction under a thin-capitalization rule. If foreign affiliates are hesitant to do so, we are back at the question of what prevents multinationals from rearranging their internal capital structure in a tax-efficient way. At any rate, thin-capitalization rules are one possible explanation of why the tax-sensitivity is low.

Not only host countries' tax policies matter, also the tax policy in the home country may be important for the tax incentives within a multinational firm. While German tax authorities tend to grant full tax exemption of foreign affiliates' earnings, the interest income of a subsidiary in a low-tax country may be taxable in Germany under the Controlled Foreign Corporation (CFC) rule. If this rule applies, the tax-advantage from profit shifting disappears because shifted income is immediately taxed with the relatively high German tax rate – even if it is not repatriated. The CFC regulation in the German tax code basically follows the U.S. subpart F legislation[10] – except for the "check-the-box" provision introduced in 1997, which allows U.S. companies to avoid taxation

[10]For a discussion of the German CFC rule see Ruf and Weichenrieder (2009), who provide evidence that the German CFC rule is effective in curbing profit shifting.

of intercompany payments under the CFC rule (see Altshuler and Grubert, 2006). Whether or not the German CFC rule applies depends on the host country, on the type of income, as well as on the characteristics of the affiliate. Basically, the rule applies to majority-owned subsidiaries in countries where the income of a foreign affiliate is taxed below 25% (until 2000: 30%). In addition, CFC regulation only applies to *passive income*, *e.g.* income arising from financial assets, loans, and other financial activities.[11] When the CFC rule applies, the earnings of foreign subsidiaries are fully and immediately taxable in Germany.

Though the German CFC rule principally aims at preventing corporations that are taxable in Germany from shifting taxable income to foreign affiliates, it matters also for the incentives of German-owned foreign subsidiaries to engage in profit shifting *vis-à-vis* third countries. Of course, a foreign subsidiary could also be subject to CFC regulation in the host country. In this case, however, the German parent would enjoy a tax credit for passive income (see OECD, 1996, p83). Since Germany is a high-tax country, at least in the time period covered by the data, this suggests that in most cases the host-country CFC legislation is of secondary importance in our setting.

To take account of a possible impact of the German CFC rule, we change again the computation of the lowest tax rate: the new measure only includes host countries with a tax rate above 25% (until 2000: 30%). While we cannot identify in the data whether the interest income of a foreign subsidiary is considered as passive income by German tax authorities, our approach allows us to analyze the tax-sensitivity of internal debt under the assumption that the tax incentive is effectively reduced by the CFC rule. The resulting lowest tax rate is much higher, and shows a mean of 29.8% – compared with the previous figure of 20.8% (see Table 2). Hence, the average effective tax-rate differential would be 3.2% = (33%-29.8%). The empirical results obtained with this modified

[11] Certain double taxation treaties include special provisions for passive investment income, which until 2003 resulted in a partial exemption (see Ruf and Weichenrieder, 2009).

lowest tax rate are depicted in Columns (4) to (6) of Table 7. Though the number of observations is slightly reduced, the results are qualitatively similar to those presented above. The local statutory tax rate exerts a positive impact, while the lowest tax rate is negatively related to the internal debt ratio. However, the coefficients are larger: Column (5) reports .118 and -.101 instead of .064 and -.073 in case of the basic specification in Column (5) of Table 4. The corresponding semi-elasticities amount to 10.4% and -8.9%, respectively, for a 10%-point increase in taxes evaluated at the mean internal debt ratio of .114. Although the adjusted tax incentive is associated with a higher tax-elasticity, the extent to which internal debt is used to shift profits is still modest. Of course, this might indicate that our stylized way to account for the CFC rule is not sufficient to capture the complex tax incentives that exist under this regulation. Perhaps, multinationals can organize foreign activities such as to avoid that interest income is characterized as passive income. Several countries in Europe also entertain special holding regimes, which may provide preferential tax treatments to interest from foreign subsidiaries, that could enable multinationals to avoid CFC rules. However, it is difficult to ascertain whether the precise conditions required to obtain a preferential tax status would apply and to quantify the effective tax-rate reduction associated with such status. Beside those concerns, the small tax effect might simply be attributed to the fact that under CFC regulation, the average effective tax-rate differential faced by German multinationals is rather small. Therefore, firms might choose not to incur the cost of setting up a fully tax-efficient financial structure when the potential gain from tax planning is low.

Another possibly important tax detail is the taxation of repatriated foreign profits. As noted above, Germany generally follows the exemption principle. Until recently though, the precondition was the existence of a double taxation treaty.[12] As of 1996, at the beginning of the period analyzed, 72 double taxation treaties existed covering all the major host countries for German FDI (Bun-

[12]Since 2002 a 95% exemption is granted to all repatriated profits (see Herrmann *et al.*, 2009: §26 KStG K 12).

desfinanzministerium, 2008). These treaties applied to about 80% of the observations in the basic sample. Nevertheless, some low-tax countries did not have double taxation treaties with Germany such that the foreign earnings did not enjoy tax exemption prior to 2002.

To take account of a possible impact of the double taxation treaties, we change the computation of the lowest tax rate within the group once more, and consider only countries that have a double taxation treaty *vis-à-vis* Germany (in addition, we focus on majority-owned subsidiaries and take into account CFC rules). Columns (7) to (9) of Table 7 reveal that the results are almost unchanged and also quantitatively very similar. The coefficient of the lowest tax rate is almost the same compared with the basic specification. Note, though, that the number of observations, compared with the basic sample, is reduced by more than 44,000 observations.

7 Summary and Conclusions

While the use of internal debt by multinational corporations serves several purposes, this study investigates whether it is used to shift taxable profits to low-tax jurisdictions. Our starting point is the notion that the profitability of this kind of tax arbitrage depends on the tax conditions not only in the host country of a subsidiary but also in the other countries where the multinational holds affiliates. In fact, the theoretical literature on profit shifting suggests that a foreign subsidiary will use more internal debt if the multinational holds another subsidiary in a low-tax country and if the spread between the host-country tax rate and the lowest tax rate within the multinational group is large.

The empirical analysis presented in this paper makes use of a large micro-level panel dataset of virtually all German multinationals made available for research by Deutsche Bundesbank. A

distinguishing characteristic of this dataset is that it includes information about the actual amount of internal debt used by the foreign affiliates, distinguished into loans from the parent and loans received from other foreign affiliates. This comprehensive dataset allows us to exploit differences in the tax conditions of 145 countries, including many low-tax countries, over a period of ten years. For each affiliate within the multinational group, we calculate the lowest tax rate observed among all foreign affiliates and use this to predict the amount of internal debt. Since the parent company of all multinationals in our dataset is located in Germany, which is a high-tax country by international standards – at least before the 2008 tax reform, we argue that internal loans from the parent cannot be explained by profit shifting. Therefore, we focus on internal loans granted by other affiliates in the multinational group.

The empirical results confirm significant effects of the host-country tax rate and the lowest tax rate within the multinational group on the use of internal debt, supporting the view that internal debt is used to shift taxable profits to low-tax countries. Nevertheless, our findings indicate that the magnitude of tax effects is rather small: internal debt seems to be a rather unimportant vehicle for German firms in shifting profits.

We provide several robustness checks that explore whether the specification used might be responsible for this result. Indeed, we find some evidence that the tax-rate effect is slightly underestimated due to the endogeneity of the location pattern of the multinational. Moreover, tax-rate effects also turn out to be slightly larger if we focus on majority-owned subsidiaries. But the empirical magnitude of effects is still small. According to our results, the upper limit for the implied tax-elasticity of reported profits due to profit shifting is around 0.11%. Existing estimates in the literature, however, point at figures of 1.31% or 2%.

While data limitations prevent us from exploring all potentially important features of tax systems,

such as the role of special holding regimes, our results show that the low tax-sensitivity can partly be explained by indirect effects related to the taxation of the parent. In particular, CFC rules seem to be curbing profit shifting into low-tax countries: if we take the German CFC rule into account when measuring the profit-shifting tax incentive, the predictive power of the tax incentive and its effect on internal debt increase. This finding has interesting implications for the U.S. case, where the so-called "check the box" rule allows U.S. multinationals' tax-haven subsidiaries to circumvent the CFC rule (Altshuler and Grubert, 2006), suggesting that U.S. multinationals engage more in profit shifting by means of internal debt than their German counterparts, and also that the empirical tax sensitivity of internal debt should be higher in the U.S. case.

Given that the empirical literature finds profit shifting to be quite significant, it seems that other strategies to shift income to low-tax countries are much more important. This is confirmed by Grubert (2003), who finds that the most important channel for profit shifting within multinational firms is associated with the allocation of R&D expenditures. Besides CFC rules, a possible explanation why multinationals are so reluctant to use internal debt for profit-shifting purposes could be that this implies costly distortions of the capital structure, for instance, in the form of adverse incentive effects on managers. From this perspective, restrictions on internal debt usage, established in order to limit profit shifting, might constitute a significant burden on the affiliates of foreign companies – with adverse consequences for investment and revenues. At any rate, regardless of the reasons why firms make little use of profit shifting by means internal debt, restrictions on internal debt finance would, according to our results, not generate much additional tax revenue.

Table A.1: Geographical Distribution of Affiliates

Country	obs.	$(\tau^{low} = \tau)$	τ	Country	obs.	$(\tau^{low} = \tau)$	τ
Albania	11	0	0.273	Ethiopia	4	0	0.425
Algeria	47	12	0.324	Finland	885	114	0.283
Angola	c)	c)	0.375	France	12,928	808	0.369
Antigua & Barbuda	c)	c)	0.390	Gabon	16	0	0.370
Argentina	938	62	0.341	Gambia	c)	c)	0.350
Armenia	c)	c)	0.240	Georgia	10	7	0.200
Australia	2,769	215	0.334	Ghana	23	7	0.333
Austria	8,387	1,568	0.331	Gibraltar	37	0	0.350
Azerbaijan	16	4	0.280	Greece	951	64	0.347
Bahamas	18	18	0.000	Guatemala	110	0	0.298
Bahrain	40	40	0.000	Guernsey	36	6	0.200
Bangladesh	55	0	0.350	Haiti	c)	c)	0.350
Barbados	38	0	0.380	Honduras	28	8	0.296
Belarus	17	5	0.278	Hong Kong	2,117	1,339	0.165
Belgium	4,588	232	0.383	Hungary	3,635	2,478	0.193
Belize	c)	c)	0.290	Iceland	16	0	0.258
Bermuda	210	210	0.000	India	1219	46	0.369
Bolivia	26	5	0.250	Indonesia	548	72	0.300
Brazil	3,138	614	0.323	Iran	78	7	0.453
British Virgin Isl.	94	43	0.135	Ireland	1,760	1,475	0.108
Brunei	13	0	0.300	Isle of Man	43	40	0.100
Bulgaria	309	83	0.293	Israel	179	7	0.358
Cambodia	c)	c)	0.200	Italy	7,752	107	0.423
Cameroon	19	0	0.385	Jamaica	9	0	0.333
Canada	2,467	75	0.413	Japan	2,667	14	0.453
Canary Isl.	10	7	0.350	Jersey	75	7	0.200
Cayman Isl.	589	589	0.000	Jordan	8	0	0.370
Chile	572	325	0.156	Kazakhstan	44	5	0.300
China	3,703	286	0.330	Kenya	83	0	0.318
Columbia	341	0	0.350	Korea (South)	1,056	178	0.299
Congo	10	0	0.440	Kuwait	17	0	0.550
Costa Rica	75	6	0.300	Kyrgyzstan	9	0	0.275
Côte d'Ivoire	43	0	0.350	Latvia	153	76	0.221
Croatia	414	89	0.265	Lebanon	28	18	0.125
Cyprus	358	80	0.215	Libya	50	0	0.460
Czech Republic	4,792	1,055	0.326	Liechtenstein	68	43	0.200
Democra. Rep. of Congo	14	0	0.425	Lithuania	163	124	0.224
Denmark	2,092	313	0.312	Luxembourg	2,234	386	0.351
Dominica	c)	c)	0.300	Macau	6	0	0.147
Dominican Republic	59	7	0.250	Macedonia	33	26	0.150
Ecuador	124	10	0.315	Malawi	7	0	0.363
Egypt	274	0	0.400	Malaysia	1,094	225	0.284
El Salvador	48	9	0.250	Maldives	4	4	0.000
Estonia	160	28	0.258	Malta	96	11	0.350

obs.: total number of observations per country (pooled in the period from 1996 until 2005); $(\tau^{low} = \tau)$: number of observations per country identified as low-tax observations (affiliates); τ: average host-country statutory tax rate; c) confidential data.

Table A.2: Geographical Distribution of Affiliates, cont.

Country	obs.	$(\tau^{low} = \tau)$	τ	Country	obs.	$(\tau^{low} = \tau)$	τ
Morocco	211	16	0.350	Slovenia	388	117	0.250
Mauritius	52	4	0.300	South Africa	1,649	39	0.393
Mexico	1,849	107	0.339	Spain	7,478	554	0.350
Moldova	28	9	0.226	Sri Lanka	59	11	0.355
Mozambique	5	0	0.371	St Kitts & Nevis	[c])	[c])	0.381
Myanmar	6	6	0.300	St Vincent	[c])	[c])	0.400
Namibia	12	8	0.350	Swaziland	9	0	0.345
Nepal	[c])	[c])	0.250	Sweden	2,784	716	0.280
Netherlands	8,661	1,114	0.345	Switzerland	7,851	4,750	0.245
Netherlands Antilles	121	5	0.363	Taiwan	620	84	0.250
New Caledonia	5	0	0.300	Tanzania	22	0	0.310
New Zealand	449	11	0.330	Thailand	735	105	0.300
Nicaragua	23	0	0.285	Trinidad & Tobago	34	0	0.335
Nigeria	91	16	0.300	Tunisia	103	15	0.346
Norway	1,190	298	0.280	Turkey	1,245	94	0.360
Oman	23	15	0.250	Uganda	18	0	0.300
Pakistan	160	7	0.356	Ukraine	246	22	0.290
Panama	97	0	0.342	United Arab. Emir.	103	8	0.333
Paraguay	41	17	0.300	United Kingdom	13,145	3,834	0.307
Peru	196	13	0.294	Uruguay	167	39	0.310
Philippines	364	16	0.329	USA	16,775	1,636	0.412
Poland	5,198	2,165	0.299	Uzbekistan	4	0	0.275
Portugal	1,922	370	0.319	Venezuela	312	22	0.340
Qatar	4	0	0.350	Vietnam	79	0	0.310
Romania	645	215	0.293	West Bank/Gaza	[c])	[c])	0.200
Russia	1,165	305	0.301	Yemen	[c])	[c])	0.345
Saudi Arabia	165	13	0.355	Yugoslavia	96	39	0.203
Senegal	11	0	0.344	Zambia	6	0	0.350
Singapore	2,191	619	0.245	Zimbabwe	21	0	0.338
Slovak Rep.	1,164	365	0.306	*All Countries*	*157,155*	*31,491*	*.302*

obs.: total number of observations per country (pooled in the period from 1996 until 2005); $(\tau^{low} = \tau)$: number of observations per country identified as low-tax observations (affiliates); τ: average host-country statutory tax rate. [c]) confidential data.

Appendix

A.1 Datasources and Definitions

Firm-level data are taken from the micro-level dataset of the Bundesbank, see Lipponer (2007), for an overview. The dependent variable (ID) is determined by a balance-sheet position capturing liabilities of foreign affiliates to other foreign affiliates within the multinational group divided by the affiliate's total stock of capital. The latter is defined as the sum of registered capital, capital reserves, profit reserves, as well as internal and external debt.

Corporate taxation data are taken from the International Bureau of Fiscal Documentation, and from surveys provided by the tax advisory companies Ernst&Young, PwC, and KPMG. The statutory tax rate variable contains statutory profit tax rates modified by applicable restrictions on interest deductions. The tax data covers 173 countries in a period of ten years from 1996 until 2005. However, since no German affiliate is reported in Aruba, Botswana, Ceuta and Melilla, Equitorial Guinea, Faroe Islands, Fiji, French Polynesia, Greenland, Grenada, Guinea, Guyana, Lesotho, Mauritania, Northern Mariana Islands, Papua New Guinea, Rwanda, Samoa, Seychelles, Sierra Leone, Solomon Islands, St Lucia, Sudan, Surinam, Svalbard, Syria, Turks & Caicos Islands, US Virgin Islands, Vanuatu, only the remaining 145 countries with positive numbers of affiliates are used in the analysis.

A.2 Implied Elasticity of Pre-Tax Profits

Consider a simple model of a multinational with affiliates in two countries where profits are shifted by means of internal debt. Country 1 is the high-tax country. Thus, profit shifting involves an internal loan provided by the affiliate in country 2 to the affiliate in country 1. The multinational's profit is

$$\Pi = (f(k_1) - i_1\mu_1 k_1)(1-\tau_1) + (f(k_2) + i_1\mu_1 k_1)(1-\tau_2) - (k_1+k_2)r - c(\mu_1)k_1,$$

where $f(k_1)$ is the operating profit from capital in the amount of k_1, μ_1 is the capital share of the internal loan, r is the rate of return on equity, i_1 is the interest rate, and $c(\mu_1)$ is a convex cost function that reflects the deadweight costs of profit shifting due to a distortion of the capital structure or because of the cost of concealing profit-shifting activities. The first-order condition for internal debt is

$$c'(\mu_1) = (\tau_1 - \tau_2) i_1.$$

The corresponding semi-elasticity of internal debt,

$$\left| \frac{1}{\mu_1} \frac{\partial \mu_1}{\partial (\tau_1 - \tau_2)} \right| = \left(\frac{c'}{\mu_1 c''} \right) \frac{1}{\tau_1 - \tau_2},$$

is inversely proportional to the tax-rate difference and the elasticity of the deadweight cost of profit-shifting. Let us consider the implications for the elasticity of the corporation tax base. The pre-tax profits ω_1 reported in country 1 are defined as

$$\omega_1 \equiv (f(k_1) - \sigma_1), \quad \sigma_1 \equiv i_1 \mu_1 k_1,$$

where σ_1 is the amount of shifted profits. Now assume that operating profits are given and compute the tax effect on reported profits due to profit shifting

$$\frac{\partial \omega_1}{\partial (\tau_1 - \tau_2)} = -\sigma_1 \left| \frac{1}{\mu_1} \frac{\partial \mu_1}{\partial (\tau_1 - \tau_2)} \right|.$$

For the implied semi-elasticity of reported profits we obtain

$$\left| \frac{1}{\omega_1} \frac{\partial \omega_1}{\partial (\tau_1 - \tau_2)} \right| = \frac{\sigma_1}{\omega_1} \left| \frac{1}{\mu_1} \frac{\partial \mu_1}{\partial (\tau_1 - \tau_2)} \right|.$$

The tax effect on reported profits depends on the elasticity of internal debt as well as on the ratio of shifted to reported profits ($\frac{\sigma_1}{\omega_1}$). Since it is difficult to come up with an estimate for this ratio, note that in the special case where the interest rate charged equals the profit rate, this ratio becomes $\frac{\mu_1}{1-\mu_1}$. Since the interest rate is usually below the profit rate, we have

$$\frac{\sigma_1}{\omega_1} < \frac{\mu_1}{1 - \mu_1}.$$

This relation is used above in order to define an upper bound to the implied tax effect on the corporation tax base.

A.3 Correlation Matrix

See Table A.3.

Table A.3: Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Host-country tax rate	(1)	1							
Lowest tax rate	(2)	.0215	1						
Lowest tax rate (alt.)	(3)	.0291	.8870	1					
Lowest tax rate (CFC)	(4)	.1147	.1370	.1959	1				
Lowest tax rate (CFC-DTT)	(5)	.1388	.1380	.1953	.8266	1			
Loss carry-forward	(6)	.0213	.0035	.0035	-.0048	-.0039	1		
Tangibility	(7)	-.0526	.0057	.0086	-.0065	-.0085	.1170	1	
(ln) Sales	(8)	.1140	-.0059	-.0030	.0062	.0064	-.0916	-.0530	1

Note: Correlation matrix corresponds to the set of transformed right-hand side variables (taking account of the year- and affiliate-specific components) used in the regression analyses.

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Results Available Upon Request

In Table 1 we define the lowest tax rate such that tax-haven countries (defined according to a list of countries provided by Dharmapala and Hines, 2009) are not considered in the computation of the tax measure. In Table 2, only countries where the tax rate lies above the 25th percentile of the tax-rate distribution are considered in the computation of the lowest tax rate. Both tables demonstrate that the results are also robust to these alternative specifications of the lowest tax rate. This implies that the lending entities are not necessarily located in low-tax or tax-haven countries. One explanation for this may be that the German CFC rule effectively prevents multinationals to operate in such countries. We explore this issue in more detail in Section 6.4 of the paper.

Table 1: Results: Lowest Tax Rate Excludes Tax Havens

	(1)	(2)	(3)
Host-country tax rate	.105 **	.093 **	.024
	(.027)	(.025)	(.021)
Lowest tax rate (excl. tax havens)	-.073 **	-.069 **	-.065 **
	(.025)	(.024)	(.022)
Loss carry-forward	.032 **	.033 **	.032 **
	(.003)	(.003)	(.002)
(ln) Sales	-.004 **	-.0004	-.005 **
	(.001)	(.001)	(.001)
Tangibility	-.024 **	-.003	-.003
	(.005)	(.006)	(.005)
Industry effects	no	yes	yes
Host-country effects	no	no	yes
Adj. R-Square	.2168	.2350	.2490

Dependent variable: internal debt ratio of foreign affiliates related to loans from other, non-German affiliates. Tax-haven countries (defined according to Dharmapala and Hines, 2009) are not considered in the computation of the lowest tax rate. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk indicates significance at 10% level, two asterisks at 5% level. 116,032 observations, 4,348 firms. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level.

Table 2: Results: Lowest Tax Rate Defined Using Taxes Above 25th Percentile

	(1)	(2)	(3)
Host-country tax rate	.086 **	.077 **	.069 **
	(.035)	(.033)	(.026)
Lowest tax rate (above 25th percentile)	-.049 *	-.055 *	-.061 **
	(.029)	(.029)	(.027)
Loss carry-forward	.032 **	.033 **	.033 **
	(.003)	(.003)	(.002)
(ln) Sales	-.003 **	-.0001	-.005 **
	(.001)	(.001)	(.001)
Tangibility	-.017 **	.003	.003
	(.006)	(.006)	(.005)
Industry effects	no	yes	yes
Host-country effects	no	no	yes
Adj. R-Square	.2153	.2336	.2483

Dependent variable: internal debt ratio of foreign affiliates related to loans from other, non-German affiliates. The computation of the lowest tax rate considers only countries where the tax rate lies above the 25th percentile of the tax-rate distribution. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk indicates significance at 10% level, two asterisks at 5% level. 110,226 observations, 4,330 firms. All regressions include time dummies and group-specific effects. Tests for the joint significance of group-, time-, industry-, and host-country effects show that the variables are jointly significant at the 1% level.