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

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Abstract: This paper is concerned with the shifting of taxable profits by means of borrowing and lending between affiliates of multinational corporations. Empirical evidence is provided using micro-level panel data of virtually all German multinationals made available by the German Central Bank (Bundesbank). This comprehensive dataset allows us to exploit differences in taxing conditions in more than 150 countries over a period of ten years. The empirical results confirm a robust impact of tax-rate differences within the multinational group on the use of internal debt, supporting the view that internal debt is used to shift profits to low-tax countries. However, the tax effects are rather small. Given that the empirical literature finds profit shifting to be substantial, our estimates suggest that other strategies to shift income to low-tax countries are relatively more important.

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

JEL Classification: H25; G32; F23

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1 Introduction

Due to the rising importance of foreign direct investment (FDI) and the emergence of multinational firms, international tax issues are of increasing importance for corporate taxation. As is well 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 the conventional decisions to set-up firms in a tax efficient way, as for instance using debt rather than equity in order to finance investment. Yet multinational tax planning also involves less conventional practices that exploit specific characteristics of multinationals. In particular, multinationals' tax planning employs profit-shifting techniques that only require to adjust the internal structure of the firm. While there are several possible routes, a prominent example involves internal loans: borrowing from affiliates located in low-tax countries and lending to affiliates in high-tax locations will allow the latter to reduce profits by deducting interest payments, which might then be taxed as earnings in a low-tax country. However, 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). 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 evidence about the extent to which internal debt is used for profit-shifting purposes.

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.*, 2009). 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 some evidence for a tax sensitivity of interest payments from foreign affiliates. While this empirical literature supports the view that internal debt is sensitive to taxes, these 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 from debt. This makes it difficult to assess attempts by governments to restrict interest deductibility for internal debt.

Against this background, the contribution of this paper is to provide evidence on whether and to what extent internal debt is used by multinational firms for profit-shifting purposes. The paper employs a large micro-level panel database of virtually all German multinationals made available for research by the German Central Bank (Bundesbank). This unique dataset allows us to consider the capital structure and, in particular, the determinants of internal debt of virtually all German multinationals in about 150 countries over a period of 10 years. More specifically, we follow suggestions by Graham (2003) and Mintz and Smart (2004) and test whether internal debt is not just tax sensitive, but whether it is sensitive to the profit-shifting incentive, which is captured by the *tax-rate difference* of the host country tax rate with regard to the lowest tax rate among all affiliates within the multinational group.

The empirical results clearly support a significant impact of the tax-rate difference on internal debt, suggesting that internal debt within German multinationals is indeed used to shift profits from high- to low-tax countries. These results prove robust if we take account of the potential effects of *Controlled Foreign Corporation* (CFC) rules and of double taxation treaties. 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.

The paper is organized as follows. In Section 2 we discuss theoretical issues and resulting 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 explores the robustness of the findings against alternative specifications of the profit-shifting incentive as well as against a different sample selection. In Section 7 our analysis additionally takes account of some specific characteristics concerning the taxation of the parent including CFC rules and the existence of double taxation treaties. Section 8 provides a summary and conclusions.

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 (*e.g.*, Modigliani and Miller, 1963). As a result, the value of a firm depends on its leverage, because the debt tax shield adds to the firm value (see Myers, 2001; Auerbach, 2002; Graham, 2003). However, firms trade-off the benefits from using debt against its costs. The literature proposes 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). As a consequence of these considerations, higher taxes imply, ceteris paribus, higher debt-to-asset ratios. This positive relation is confirmed not only in the literature on multinationals, as cited 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 debt-financing decisions of the different firms in a multinational group become interdependent if the parent company provides implicit or explicit guarantees for the debt of its subsidiaries. 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, however, 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 as multinationals can substitute external with internal debt (*e.g.*, Desai *et al.*, 2004a). The multinational may, for instance, issue external debt in some favorable credit market and subsequently allocate the funds by 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 take resort to using internal debt (see also Gopalan *et al.*, 2007). Further explanations might 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. This refers to a strategy of borrowing and lending among affiliates without increasing outside debt. A multinational could contract a loan granted by an affiliate located in a low-tax country 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. The 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. However, as emphasized by Mintz and Smart (2004), the empirical implication of this profit shifting by means of internal debt is more precisely characterized by a positive effect of the tax-rate difference with regard to the lowest tax rate among all affiliates of a multinational firm.

By investigating internal borrowing of foreign affiliates of German multinationals, the analysis below aims at empirically testing how important the profit-shifting effect is. Basically, we examine whether and to what extent internal debt usage is driven by the local tax rate and/or the tax-rate difference with regard to 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. This not only relates to the problem of capturing the taxing conditions in several countries including locations where direct investment associated with production takes place and locations for financial centers such as tax havens. It also seems 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 location 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 German 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 each of the foreign affiliates of multinationals that operate in various countries. While the database considers the multinationals' activities globally, the empirical analysis is based on a sample of 174 countries for which reliable information with regard to corporate income taxation is available.

2. Another dimension that offers variation in the taxing conditions is the time dimension. The panel data covers the multinationals' activities as well as the taxing conditions on an annual basis in the period from 1996 until 2005.

3. The third dimension is related to the heterogeneity of the location patterns of multinational groups. Since multinationals hold affiliates in different countries, the profit-shifting opportunities of affiliates held in a specific country 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 the different location decisions of firms. Since production technologies available to firms as well 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 choice

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, including both directly and indirectly held FDI, if it is above some lower threshold level.[1] Basically, the estimation sample comprises balance-sheet information of virtually all German outbound investments from 1996 to 2005, regardless of the degree of ownership.

With regard to the lending party of internal loans, the dataset distinguishes between internal debt received from the parent and internal debt received from other foreign affiliates.[2] 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, given the relatively high German tax rates, under standard conditions 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 taxing conditions in the host countries of these foreign affiliates are decisive for the multinational. This might be questioned in a context where the parent company would have to pay taxes on worldwide profits, as in a regime of foreign tax credit. However, note that for German multinationals the exemption principle usually applies. Hence, the German case might be much more straightforward as compared to the U.S. case, where taxes on foreign earnings are subject

[1] 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.

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

to a foreign tax credit and, furthermore, interest allocation rules apply (see Altshuler and Mintz, 1995). Yet the exemption principle might not be fully effective in the German case, for instance, due to Controlled Foreign Corporation (CFC) rules or if no double taxation treaty exists between Germany and the low-tax country; we will come back to this issue below.

Since taxing 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

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

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. $(\tau_{i,t} - \tau_{k,t}^{min})$ is the affiliate-specific tax-rate difference with regard to the lowest tax rate within the group, and $\tau_{i,t}$ is the statutory tax rate applicable to affiliate i to capture the conventional tax shelter from debt finance. The lowest tax rate within the group is formally defined as

$$\tau_{k,t}^{min} \equiv \min\left[(\tau_{1,t}\alpha_{1,k,t}), (\tau_{2,t}\alpha_{2,k,t}), ..., (\tau_{j,t}\alpha_{j,k,t}), ..., (\tau_{n,t}\alpha_{n,k,t})\right],$$

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 ($x_{k,i,t}$) 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. Finally, borrowing costs might also be related to country-specific conditions. While this would suggest to further include country-specific effects, the empirical literature (*e.g.*, Desai *et al.*, 2004a; Huizinga *et al.*, 2008) usually does not employ those effects, probably because they entirely remove the cross-country variation.

The basic specification does, however, take account of a specific fixed effect for each multinational group (γ_k). This is important in the current context 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 crucial since 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 tax-rate difference might be endogenous. For instance, one might be concerned that firms which are more active in profit shifting by means of internal debt are more likely to locate in low-tax countries. The large tax-rate difference 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 that experiences large tax-rate differences might differ systematically from other firms. Yet by conditioning on group effects, we avoid this bias and remove all cross-sectional variation between multinationals.

If the location pattern of the multinational is constant across time, the group effect is sufficient to control for selection effects. This is also true if the location pattern changes for reasons entirely unrelated to changes in tax policy. Yet 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 the tax-rate differential) is endogenous. Consider, for instance, the case where country j initially has a tax rate above the minimum tax rate within the group $\tau_{j,t-1} > \tau^{min}_{k,t-1}$ and is not hosting an affiliate $\alpha_{j,k,t-1} = 0$. Now let country j lower its tax rate such that $\tau_{j,t} < \tau^{min}_{k,t-1}$. Company k might respond and restructure its location pattern such that $\alpha_{j,k,t} = 1$ and $\tau^{min}_{k,t} = \tau_{j,t} < \tau^{min}_{k,t-1}$. As a consequence, the incentive to engage in profit shifting increases. In this case, one might be concerned that the change in the incentive to use internal debt results partly from the firm's adjustment to the tax-rate change. More specifically, if firms that are more active in profit shifting show a stronger sensitivity of location decisions to tax-policy changes, the variation in the tax incentive would partly capture firm characteristics. Indeed, without an adjustment of 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 minimum tax rate and assign a weight of zero to cases where a positive 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 of tax-rate differences that is based on a different definition of the lowest tax rate within the multinational group

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

which ignores the part of variation in the location pattern that is associated with tax-policy changes.[3]

4 Descriptive Statistics

Table 1 provides some information about the sample of multinationals. The basic sample includes FDI in about 150 countries held by German multinationals, excluding all bi-national 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 foreign FDI observations of Germany as the MiDi data covers virtually all German outbound investments. Note that this basic sample is used to describe the profit-shifting incentives for the multinationals. The distribution of internal debt that is empirically investigated, 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 the operating profits – which are eventually shifted – originate. Nevertheless, since the tax-rate difference with regard to the lowest tax rate observed among all foreign affiliates is determined using the basic sample, we take the tax incentives for internal debt into account in a comprehensive way including purely non-productive tax-haven affiliates.

[3]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

Table 1: Sample Characteristics

Sample	Number of Observations	Countries
(1) Basic sample excl. bi-national corp.	157,184	123.06
(2) Reduced sample excl. zero sales	128,892	119.01
All available observations	*196,111*	*136.42*

Sample 1 excludes bi-national 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 the average number of countries in the sample where at least one German investment is reported.

As has been discussed above, we employ affiliate- and group-specific indicators of the tax incentives for profit shifting. More specifically, we proceed in two steps. First, 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 affiliate as the *lowest-tax affiliate*. In a second step, we use this group-specific minimum tax rate as the benchmark for the group and compute the tax-rate difference of the host-country tax rate with regard to this benchmark for each of the affiliates. As a consequence, high-tax affiliates of a multinational will show large positive tax-rate differences, whereas the tax-rate difference for the lowest-tax affiliate is zero.

Using the basic sample, Table 2 provides some information about the 174 countries, where tax information is available. The second column lists the number of all affiliates reported in each of the countries. The third column, denoted with $\Delta\tau = 0$, lists the number of observations where the respective country hosts the lowest-tax affiliate. The fourth column reports the average tax rate. Most affiliates are reported in the U.S., in the U.K., in France, and in the Netherlands, reflecting the importance of these countries' export markets for the German multinationals. But the table also shows that if an affiliate is located in a tax haven such as Cayman Islands, Bermuda, Bahrain, or Bahamas, it is always the lowest-tax affiliate in the group. Also low-tax locations that are frequently mentioned in debates about tax evasion, like Ireland and Switzerland, are often hosting the lowest-tax affiliate.

endogeneity problem.

Table 2: Geographical Distribution of Affiliates

Country	obs.	$\Delta\tau = 0$	τ	Country	obs.	$\Delta\tau = 0$	τ
Albania	11	0	0.273	Egypt	274	0	0.400
Algeria	47	12	0.324	El Salvador	48	9	0.250
Angola	c)	c)	0.375	Equitorial Guinea	0	0	0.250
Antigua & Barbuda	c)	c)	0.390	Estonia	160	28	0.258
Argentina	938	62	0.341	Ethiopia	4	0	0.425
Armenia	c)	c)	0.240	Faroe Islands	0	0	0.210
Aruba	0	0	0.350	Fiji	0	0	0.335
Australia	2,769	215	0.334	Finland	885	114	0.283
Austria	8,387	1,568	0.331	France	12,928	808	0.369
Azerbaijan	16	4	0.280	French Polynesia	0	0	0.450
Bahamas	18	18	0.000	Gabon	16	0	0.370
Bahrain	40	40	0.000	Gambia	c)	c)	0.350
Bangladesh	55	0	0.350	Georgia	10	7	0.200
Barbados	38	0	0.380	Ghana	23	7	0.333
Belarus	17	5	0.278	Gibraltar	37	0	0.350
Belgium	4,588	232	0.383	Greece	951	64	0.347
Belize	c)	c)	0.290	Greenland	0	0	0.350
Bermuda	210	210	0.000	Grenada	0	0	0.300
Bolivia	26	5	0.250	Guatemala	110	0	0.298
Botswana	0	0	0.250	Guernsey	36	6	0.200
Brazil	3,138	614	0.323	Guinea	0	0	0.350
British Virgin Isl.	94	43	0.135	Guyana	0	0	0.450
Brunei	13	0	0.300	Haiti	c)	c)	0.350
Bulgaria	309	83	0.293	Honduras	28	8	0.296
Cambodia	c)	c)	0.200	Hong Kong	2,117	1,339	0.165
Cameroon	19	0	0.385	Hungary	3,635	2,478	0.193
Canada	2,467	75	0.413	Iceland	16	0	0.258
Canary Isl.	10	7	0.350	India	1219	46	0.369
Cayman Isl.	589	589	0.000	Indonesia	548	72	0.300
Ceuta and Melilla	0	0	0.350	Iran	78	7	0.453
Chile	572	325	0.156	Ireland	1,760	1,475	0.108
China	3,703	286	0.330	Isle of Man	43	40	0.100
Columbia	341	0	0.350	Israel	179	7	0.358
Congo	10	0	0.440	Italy	7,752	107	0.423
Costa Rica	75	6	0.300	Jamaica	9	0	0.333
Côte d'Ivoire	43	0	0.350	Japan	2,667	14	0.453
Croatia	414	89	0.265	Jersey	75	7	0.200
Cyprus	358	80	0.215	Jordan	8	0	0.370
Czech Republic	4,792	1,055	0.326	Kazakhstan	44	5	0.300
Democra. Rep. of Congo	14	0	0.425	Kenya	83	0	0.318
Denmark	2,092	313	0.312	Korea (South)	1,056	178	0.299
Dominica	c)	c)	0.300	Kuwait	17	0	0.550
Dominican Republic	59	7	0.250	Kyrgyzstan	9	0	0.275
Ecuador	124	10	0.315	Latvia	153	76	0.221

obs.: total number of affiliates (pooled in the period from 1996 until 2005); $\Delta\tau = 0$: number of affiliates with a tax-rate difference equal to zero, *i.e.* number of observations identified as low-tax affiliates; τ: average host-country statutory tax rate; c) confidential data.

Table 2: Geographical Distribution of Affiliates, cont.

Country	obs.	$\Delta\tau = 0$	τ	Country	obs.	$\Delta\tau = 0$	τ
Lebanon	28	18	0.125	Senegal	11	0	0.344
Lesotho	0	0	0.360	Seychelles	0	0	0.400
Libya	50	0	0.460	Sierra Leone	0	0	0.429
Liechtenstein	68	43	0.200	Singapore	2,191	619	0.245
Lithuania	163	124	0.224	Slovak Rep.	1,164	365	0.306
Luxembourg	2,234	386	0.351	Slovenia	388	117	0.250
Macau	6	0	0.147	Solomon Isl.	0	0	0.320
Macedonia	33	26	0.150	South Africa	1,649	39	0.393
Malawi	7	0	0.363	Spain	7,478	554	0.350
Malaysia	1,094	225	0.284	Sri Lanka	59	11	0.355
Maldives	4	4	0.000	St Kitts & Nevis	[c])	[c])	0.381
Malta	96	11	0.350	St Lucia	0	0	0.332
Morocco	211	16	0.350	St Vincent	[c])	[c])	0.400
Mauritania	0	0	0.200	Sudan	0	0	0.494
Mauritius	52	4	0.300	Surinam	0	0	0.379
Mexico	1,849	107	0.339	Svalbard	0	0	0.280
Moldova	28	9	0.226	Swaziland	9	0	0.345
Mozambique	5	0	0.371	Sweden	2,784	716	0.280
Myanmar	6	6	0.300	Switzerland	7,851	4,750	0.245
Namibia	12	8	0.350	Syria	0	0	0.470
Nepal	[c])	[c])	0.250	Taiwan	620	84	0.250
Netherlands	8,661	1,114	0.345	Tanzania	22	0	0.310
Netherlands Antilles	121	5	0.363	Thailand	735	105	0.300
New Caledonia	5	0	0.300	Trinidad & Tobago	34	0	0.335
New Zealand	449	11	0.330	Tunisia	103	15	0.346
Nicaragua	23	0	0.285	Turkey	1,245	94	0.360
Nigeria	91	16	0.300	Turks & Caicos Isl.	0	0	0.000
Northern Mariana Isl.	0	0	0.350	Uganda	18	0	0.300
Norway	1,190	298	0.280	Ukraine	246	22	0.290
Oman	23	15	0.250	United Arab. Emir.	103	8	0.333
Pakistan	160	7	0.356	United Kingdom	13,145	3,834	0.307
Panama	97	0	0.342	Uruguay	167	39	0.310
Papua New Guinea	0	0	0.265	US Virgin Isl.	0	0	0.385
Paraguay	41	17	0.300	USA	16,775	1,636	0.412
Peru	196	13	0.294	Uzbekistan	4	0	0.275
Philippines	364	16	0.329	Vanuatu	0	0	0.000
Poland	5,198	2,165	0.299	Venezuela	312	22	0.340
Portugal	1,922	370	0.319	Vietnam	79	0	0.310
Qatar	4	0	0.350	West Bank/Gaza	[c])	[c])	0.200
Romania	645	215	0.293	Yemen	[c])	[c])	0.345
Russia	1,165	305	0.301	Yugoslavia	96	39	0.203
Rwanda	0	0	0.350	Zambia	6	0	0.350
Samoa	0	0	0.346	Zimbabwe	21	0	0.338
Saudi Arabia	165	13	0.355	*All Countries*	*157,155*	*31,491*	*.302*

obs.: total number of affiliates (pooled in the period from 1996 until 2005); $\Delta\tau = 0$: number of affiliates with a tax-rate difference equal to zero, *i.e.* number of observations identified as low-tax affiliates; τ: average host-country statutory tax rate. [c]) confidential data.

Table 3: Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
Statutory tax rate	.330	.073	0	.600
Tax-rate difference	.121	.102	0	.550
Tax-rate difference (altern.) [a)]	.118	.100	0	.550
Tax-rate difference (CFC) [b)]	.055	.050	0	.300
Tax-rate difference (DTT) [c)]	.106	.089	0	.440
Total leverage	.586	.274	0	1
Internal debt				
– total	.241	.260	0	1
– excluding loans from German parent (ID)	.106	.196	0	1
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)] 111,101; [b)] 94,314; [c)] 109,066) observations. The tax-rate difference is the difference between the statutory tax rate at the affiliate's location and the minimum tax rate within the multinational group. [a)] Alternative specification of tax-rate differential (see Section 6); [b)] additionally takes the German CFC rules into account (see Section 7); [c)] Takes into account the existence of double tax treaties (see Section 7); [d)] confidential data.

Table 3 displays descriptive statistics for the variables used in the empirical analysis. While the tax-rate variable is measured at the level of the host country, all other variables including the tax-rate difference vary by affiliate. A first impression of the relative importance of internal debt as a means of shifting taxable profits, as compared to the conventional tax shelter from debt, is given by the three different debt variables. While the total leverage is almost 60%, internal debt makes up only a capital share of 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 solve agency problems with regard to the management of the affiliate (see Section 2). Internal loans received from other foreign affiliates, which are the focus of the subsequent empirical analysis, amount only to an average capital share of 10.6%. Yet this share is possibly highly sensitive to tax-rate differences.

Table 4: Leverage and Internal Debt

Variable	reduced sample (1)	multinational groups with an affiliate in a low-tax country: 10%-percentile (2)	multinational groups with an affiliate in a low-tax country: 5%-percentile (3)	lowest-tax affiliates $\Delta\tau = 0$ (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. 10 % percentile (5%-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 10% (5%) percentile; $\Delta\tau = 0$ refers to all those foreign affiliates with the lowest tax rate within the group.

5 Basic Results

Table 4 provides some first descriptive evidence for the impact of taxes on internal debt. It displays the share of capital financed with different kinds of debt for the basic sample as well as for various sub-samples. For ease of comparison, Column (1) repeats the mean figures reported above. 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 10% percentile of the tax-rate distribution among the countries. Column (3) uses the even stricter definition based on the 5% 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 capital 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 more prevalent among multinationals with affiliates in low-tax countries. Conversely, the affiliate experiencing the lowest tax rate within the group should display a much lower capital share of internal debt. As reported in Column (4), the mean capital share for those affiliates is only three quarters of the overall mean.

Table 5 reports regression results for a basic specification following Equation (1). In order to control for the 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. To avoid random group effects (*e.g.*, Moulton, 1990), standard errors are computed by clustering at the level of the year-country cells as the statutory tax rate only varies across these cells. 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 regarding external borrowing that replaces internal debt (*e.g.*, Graham and Harvey, 2001; Rajan and Zingales, 1995). Finally, tangibility, defined as the ratio of fixed assets to total assets, is used as a further determinant of the financial structure.[4]

Throughout most specifications, the tax-rate difference shows a significant positive effect, whereas the host-country tax rate proves insignificant. Note that when including both tax variables, the magnitude of the standard errors does not increase substantially. The effect of the tax-rate difference can therefore be distinguished statistically from the effect of the host-country tax rate.

Qualitatively, there is not much difference between specifications. 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). According to Columns (5) and (6), the results prove robust also against the inclusion of controls for sales and tangibility. Both variables show the expected sign, but are not significant in all columns. The specification in Column (7) 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. Column (8) uses fixed effects for the host country in order to make sure that no country-specific characteristics are driving the results. While the

[4]Higher tangibility, on the one hand, is 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 5: Basic Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax-rate diff. within comp. group	.073 **		.082 **	.081 **	.082 **	.081 **	.073 **	.066 **
	(.018)		(.019)	(.020)	(.020)	(.020)	(.019)	(.018)
Statutory tax rate		.067 **	-.011	-.020	-.012	-.014	-.009	-.052 **
		(.020)	(.026)	(.025)	(.025)	(.025)	(.024)	(.026)
Loss carry-forward				.032 **	.031 **	.032 **	.034 **	.033 **
				(.002)	(.003)	(.002)	(.002)	(.002)
ln(Sales)					-.004 **	-.004 **	-.001	-.005 **
					(.001)	(.001)	(.001)	(.001)
Tangibility						-.021 **	-.002	-.0001
						(.005)	(.005)	(.004)
Industry effects	no	no	no	no	no	no	yes	yes
Host-country effects	no	no	no	no	no	no	no	yes
R-squared	.231	.231	.231	.236	.236	.236	.255	.269

Dependent variable: internal-debt ratio related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk denotes significance at 10% level, two asterisks denote 5%. 128,892 observations, 4,479 firms. All estimates include a full set of group-level and time fixed effects.

estimate of the tax-rate differential proves to be robust, we are, however, concerned that some relevant part of the variation is swallowed up by the country-specific dummies.

Quantitatively, we see from the preferred specification in Column (7) that a ten percentage point increase in the tax-rate difference with regard to the group-specific lowest-tax affiliate 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), an increase of the tax-rate difference by ten percentage points triggers a response in the share of internal debt by 6.9%. This figure is within the range of existing estimates of the tax sensitivity of multinationals' debt. Corresponding calculations based on the estimates by Desai *et al.* (2004a) yield a semi-elasticity of 10.2% (5.5%) for the sensitivity of an affiliate's capital share of internal (external) debt with regard to the tax rate.

To assess the empirical magnitude of the effect of the tax-rate difference, consider the following relationship between the implied semi-elasticity of reported profits and the semi-elasticity of internal debt related to profit shifting (see the Appendix)

$$\left|\frac{1}{\omega_1}\frac{\partial\omega_1}{\partial\tau_1}\right| < \frac{\mu}{1-\mu}\left|\frac{1}{\mu}\frac{\partial\mu}{\partial\tau_1}\right|,$$

where ω_1 denotes reported profits before taxes in the host country, μ is the internal debt-capital ratio, and τ_1 is the local tax rate.

Consider an increase of the tax rate by one percentage point. With an average figure for μ of .106 in the dataset and a semi-elasticity $\left|\frac{1}{\mu}\frac{\partial\mu}{\partial\tau_1}\right|$ of internal debt to the tax rate of 0.69% – for a one percentage point increase in the tax-rate difference, the right-hand side shows a value of 0.08%. If internal debt were the only way to shift profits, our empirical results suggest that the semi-elasticity of reported profits is below this figure. For comparison, the empirical literature surveyed by DeMooij (2005) points at a semi-elasticity of the reported tax base to a tax rate increase by one percentage point of about 2%. Recently, Huizinga and Laeven (2008) have come up with a figure of 1.31%. Even the latter estimate exceeds ours by a factor higher than 15. 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 Robustness Checks

Facing a rather low sensitivity of internal debt with regard to the tax-rate difference, in this section we explore whether the choice of the specification might be driving this result. More specifically, we explore whether the construction of the indicator of the profit-shifting incentive or the specific selection of firms matter.[5]

6.1 Alternative Specification of Profit-Shifting Incentive

Even though estimations control for fixed group effects, the tax-rate difference with regard to the lowest-tax affiliate within the group captures a variation in incentives that partly results from location decisions of the firms. If these location decisions are driven by tax-rate changes, one might fear that the estimate of the effect of the tax-rate difference is biased. Following the above discussion, we, therefore, carry out regressions that rely on an alternative indicator of the profit-shifting incentive. As explained above, this alternative indicator of tax-rate differences ignores the part of variation in the location pattern that is associated with tax-policy changes.

Table 6 provides the results. Qualitatively not much differences are encountered. Quantitatively, the results point at slightly larger effects of the tax-rate difference on the use of internal debt. The preferred specification with industry effects shows a coefficient of .098 (a semi-elasticity of 8.8%, evaluated at the mean internal-debt ratio of .111) which is larger than the basic estimated by about a standard deviation. More precisely, the coefficient exceeds the basic estimate by a factor of 1.34.

The larger effect indicates that the impact of the tax-rate difference on internal debt is slightly underestimated in the basic estimation. Accordingly, firms whose location pattern is more responsive to taxes seem to respond less to profit-shifting incentives. This is intuitive since the tax burden is higher for firms which are less able to engage in profit shifting and, hence, real decisions of these firms, including location decisions, should be more sensitive to taxing conditions.

[5] We also explored whether our result might be explained by corner solutions to the optimal capital structure that involve very high shares of internal debt. However, when running further regressions, where such affiliates are excluded using varying thresholds, our findings proved robust.

Table 6: Results with Alternative Computation of Tax-Rate Differences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax-rate diff. (alternative)	.101 **	.105 **	.104 **	.105 **	.105 **	.098 **	.095 **
	(.018)	(.023)	(.023)	(.023)	(.023)	(.023)	(.022)
Statutory tax rate		-.006	-.016	-.007	-.008	-.007	-.067 **
		(.030)	(.030)	(.030)	(.030)	(.029)	(.030)
Loss carry-forward			.033 **	.032 **	.033 **	.035 **	.034 **
			(.003)	(.003)	(.003)	(.003)	(.002)
ln(Sales)				-.004 **	-.004 **	-.001	-.005 **
				(.001)	(.001)	(.001)	(.001)
Tangibility					-.009	.007	.009 *
					(.006)	(.006)	(.005)
Industry effects	no	no	no	no	no	yes	yes
Host-country effects	no	no	no	no	no	no	yes
R-Square	.2517	.2517	.2567	.2573	.2573	.2755	.2892

Dependent variable: internal-debt ratio related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk denotes significance at 10% level, two asterisks denote 5%. 111,101 observations, 4,047 firms. All estimates include a full set of group-level and time fixed effects.

6.2 Majority-Owned Subsidiaries

Leaving aside the identification of profit-shifting incentives, the small impact of the tax-rate difference on the use of internal debt might also reflect high costs of adjusting 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 additional costs of borrowing related to internal debt are lower when the ownership share is higher. Hence, we might expect an affiliate to use more internal debt and to display a higher tax sensitivity of internal debt if the ownership share of the parent is higher.

Since not only the level of internal debt will be different with a higher degree of ownership but also the sensitivity with regard to the tax-rate difference and all other determinants of internal debt, Table 7 reports results for a sample where only majority-owned subsidiaries are included. Indeed, the tax sensitivity is positive and slightly larger as compared to the results in Table 5. Taking the results from specification in Column (6), we find that the coefficient of the tax-rate difference is about 0.079 for majority-owned subsidiaries. This indicates that a ten percentage point increase in the tax-rate difference with regard to the lowest-tax affiliate leads to an approximately 0.79 percentage point higher internal-debt ratio. The respective semi-elasticity amounts to 7.05% (evaluated at the sample mean for the share of internal debt of .112).

Before presenting estimates from regressions that employ the alternative indicator of the profit-shifting incentive and, at the same time, focus on majority owned firms, let us further explore the role of tax institutions.

Table 7: Majority-Owned Subsidiaries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax-rate diff.	.094 **	.088 **	.087 **	.088 **	.088 **	.079 **	.074 **
	(.018)	(.021)	(.021)	(.021)	(.021)	(.021)	(.020)
Statutory tax rate		.007	-.003	.006	.005	.008	-.060 **
		(.028)	(.028)	(.028)	(.027)	(.027)	(.029)
Loss carry-forward			.034 **	.033 **	.033 **	.034 **	.034 **
			(.003)	(.003)	(.003)	(.003)	(.002)
ln(Sales)				-.004 **	-.004 **	-.001	-.005 **
				(.001)	(.001)	(.001)	(.001)
Tangibility					-.009	.006	.008
					(.006)	(.006)	(.005)
Industry effects	no	no	no	no	no	yes	yes
Host-country effects	no	no	no	no	no	no	yes
R-Square	.2454	.2454	.2505	.2511	.2511	.2689	.2822

Dependent variable: internal-debt ratio related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk denotes significance at 10% level, two asterisks denote 5%. 113,250 observations, 4,218 firms. All estimates include a full set of group-level and time fixed effects.

7 Taking Account of CFC Rules and Double Taxation Treaties

The rather small tax effects even for majority-owned firms might raise concerns that some important costs or restrictions preventing corporations from heavily using internal debt for profit shifting are neglected.

A first concern may be that profit shifting by means of internal debt might work through charging high interest rates rather than by the size of the 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 terms of classifying loans according to their risk. In any case, note that we neither observe any credit risk classification nor do we have information on interest rates or interest payments.

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, 1998) or thin-capitalization rules come to mind. While it proved impossible to augment the current analysis based on 174 countries with information about witholding taxes and these rules, 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 that is issued by the parent. Given that the 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. If foreign affiliates are hesitant to do so, we are back to the question of what prevents foreign affiliates to rearrange the capital structure in a tax efficient way. However, not only host countries' tax policies but also the tax policy in the parent country might affect the tax incentive for the shifting of taxable profits within the multinational if the exemption of foreign profits is limited.

German tax authorities grant full tax exemption of an affiliate's earnings only if they stem from active business operations. It seems likely that affiliates' interest income may be defined as passive income according to Germany's Controlled Foreign Corporation (CFC) rules.[6,7] In particular, if interest income of the low-tax affiliate is not reinvested, it might be classified as passive income under this rule. If the affiliate's income is defined as passive income and the host-country tax rate is below 30% (since 2001, 25%), income is immediately taxable in Germany; even if it is not repatriated (*Hinzurechnungsbesteuerung*, see §10, AStG).

Although the German CFC Rule principally aims at preventing corporations that are taxable in Germany to shift taxable income to foreign affiliates (*e.g.*, OECD, 1996), it might also affect the incentive of German owned foreign subsidiaries to engage in profit shifting *vis-à-vis* third countries. At the same time, also the foreign subsidiary might be subject to host-country CFC regulation. While it proved impossible to augment the dataset with CFC regulations of all host countries, note that in presence of binding foreign CFC regulations, the German tax authorities would give a tax credit on the corresponding tax payments (see OECD, 1996, p83). Since Germany is a high-tax country, this suggests that the host-country CFC is of secondary importance in our setting.

To take account of a possible impact of the German CFC rules, we change the computation of the tax-rate difference with regard to the lowest-tax affiliate within the group: the alternative measure only computes the tax-rate difference with regard to host countries with a tax rate above 30% (from 2001 on 25%). The resulting tax-rate difference is, as expected, much smaller, and shows a mean of 5.5% – compared with the previous figure of 12.1% (see Table 3).[8] The empirical results obtained with this modified tax–rate difference are depicted in Table 8.

Though the number of observations is slightly reduced, the results are qualitatively and quantitatively very similar to the basic results presented above. Again, the statutory tax rate does not prove significant. Only the tax-rate difference exerts a positive impact, with a coefficient that is

[6]Sec.7–Sec.14 *Außensteuergesetz* (AStG, International Transactions Tax Act).

[7]A recent paper by Ruf and Weichenrieder (2009) shows that the German CFC rule is quite effective.

[8]Note that the alternative definition of the tax-rate difference is quite restrictive: it seems unlikely that all affiliates removed would actually be subject to German CFC regulations.

Table 8: Majority-Owned Subsidiaries and CFC Rules

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax-rate diff. (CFC)	.129 **	.105 **	.099 **	.104 **	.104 **	.095 **	.086 **
	(.041)	(.042)	(.041)	(.041)	(.041)	(.041)	(.041)
Statutory tax rate		.027	.024	.033	.032	.023	-.008
		(.053)	(.052)	(.052)	(.053)	(.050)	(.047)
Loss carry-forward			.034 **	.033 **	.033 **	.035 **	.035 **
			(.003)	(.003)	(.003)	(.003)	(.003)
ln(Sales)				-.004 **	-.004 **	-.001	-.006 **
				(.001)	(.001)	(.001)	(.001)
Tangibility					-.004	.011	.010
					(.007)	(.007)	(.006)
Industry effects	no	no	no	no	no	yes	yes
Host-country effects	no	no	no	no	no	no	yes
R-Square	.258	.258	.263	.264	.264	.281	.295

Dependent variable: internal-debt ratio related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk denotes significance at 10% level, two asterisks denote 5%. 94,314 observations, 4,050 firms. All estimates include a full set of group-level and time fixed effects.

similar to the basic findings (0.095 instead of 0.073, and a corresponding semi-elasticity of 8.3% evaluated at an internal-debt ratio of .114).

Beside CFC rules, another possible tax issue is the taxation of repatriated foreign profits. As noted above, Germany generally follows the exemption principle. However, until recently the precondition was the existence of a double taxation treaty.[9] As of 1996, at the beginning of the period analyzed, 72 double taxation treaties existed covering all the major host countries for German FDI (Bundesfinanzministerium, 2008). These treaties apply to about 80% of the observations in the basic sample. Nevertheless, a significant share of low-tax countries do not have double taxation treaties with Germany such that the foreign earnings did not enjoy tax exemption.

To take account of a possible impact of the double taxation treaties, we again change the computation of the tax-rate difference with regard to the lowest-tax affiliate within the group and consider only tax-rate differences with regard to countries that have a double taxation treaty *vis-à-vis* Germany. Empirical evidence is provided by Table 9. Qualitatively, the results are almost unchanged and also quantitatively little changes are found. The coefficient of the tax-rate difference is even slightly smaller than above.

Let us finally provide some estimates of the tax effect jointly taking account of all qualifications, including CFC rules, double taxation treaties, majority subsidiaries, and taking account of the potential endogeneity of changes in the location pattern. Table 10 reveals that, although the number of observations is reduced by almost 40,000 observations compared with the basic sample, the findings are robust and very similar. Column (6) reveals a coefficient for the tax-rate difference of .097. The corresponding semi-elasticity is 8.5% (evaluated at the mean of the internal-debt ratio of .114). The implied upper bound for the elasticity of taxable profits (see above) is 0.11%.

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

Table 9: Majority-Owned Subsidiaries and Double Tax. Treaties

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax-rate diff. (DTT)	.115 **	.087 **	.086 **	.087 **	.087 **	.078 **	.074 **
	(.019)	(.022)	(.022)	(.022)	(.022)	(.022)	(.021)
Statutory tax rate		.036	.025	.034	.033	.029	-.058 *
		(.030)	(.029)	(.029)	(.030)	(.029)	(.031)
Loss carry-forward			.034 **	.033 **	.033 **	.035 **	.034 **
			(.003)	(.003)	(.003)	(.003)	(.002)
ln(Sales)				-.004 **	-.004 **	-.001	-.005 **
				(.001)	(.001)	(.001)	(.001)
Tangibility					-.007	.008 **	.008 **
					(.006)	(.006)	(.005)
Industry effects	no	no	no	no	no	yes	yes
Host-country effects	no	no	no	no	no	no	yes
R-Square	.2464	.2465	.2516	.2522	.2522	.2702	.2835

Dependent variable: internal-debt ratio related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk denotes significance at 10% level, two asterisks denote 5%. 109,066 observations, 4,129 firms. All estimates include a full set of group-level and time fixed effects.

Table 10: Majority-Owned Subs., Altern. Tax-Rate Diff., CFC Rules, and Double Tax. Treaties

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax-rate diff.	.131 **	.107 **	.102 **	.106 **	.107 **	.097 **	.090 **
	(.042)	(.043)	(.043)	(.043)	(.043)	(.043)	(.042)
Statutory tax rate		.026	.022	.030	.030	.019	.009
		(.055)	(.054)	(.054)	(.055)	(.052)	(.050)
Loss carry-forward			.035 **	.034 **	.034 **	.035 **	.035 **
			(.003)	(.003)	(.003)	(.003)	(.003)
ln(Sales)				-.004 **	-.004 **	-.000	-.005 **
				(.001)	(.001)	(.001)	(.001)
Tangibility					-.003	.014 *	.012 *
					(.007)	(.007)	(.006)
Industry effects	no	no	no	no	no	yes	yes
Host-country effects	no	no	no	no	no	no	yes
R-Square	.2670	.2670	.2723	.2727	.2727	.2906	.3050

Dependent variable: internal-debt ratio related to loans from other, non-German affiliates. Robust standard errors allowing for country-year cluster effects in parentheses. An asterisk denotes significance at 10% level, two asterisks denote 5%. 89,613 observations, 3,787 firms. All estimates include a full set of group-level and time fixed effects.

8 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-rate difference between the lending and the borrowing firms within the multinational group, because this determines the overall tax-saving potential for the multinational. Accordingly, the profit-shifting incentive is determined not by the host-country tax rate but by the difference of this tax rate with regard to the lending part of the multinational.

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 the German Central Bank. A special feature of this dataset is that it includes information about the actual amounts 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 taxing conditions of about 150 countries, including many low-tax countries, over a period of ten years. For each affiliate within the multinational group, we calculate the appropriate tax-rate difference relative to 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, we argue that internal loans from the parent cannot be explained by profit shifting. Therefore, we focus on internal loans granted by other subsidiaries in the multinational group.

The empirical results confirm a robust and significant positive impact of tax-rate differences 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. 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. However, the empirical magnitude of effects is still small. We provide an upper

limit for the implied tax-elasticity of reported profits due to profit shifting of 0.11%. Existing estimates in the literature, however, point at figures of 1.31% or 2%. Further analysis shows that the low tax sensitivity cannot be ascribed to indirect effects of the taxation of the parent due to CFC rules or due to the taxation of repatriated profits. On average, therefore, shifting taxable profits by internal debt seems to be a rather unimportant vehicle of profit shifting.

Given that the empirical literature finds profit shifting to be quite significant, our estimates suggest that other strategies to shift income to low-tax countries are relatively more important. Of course, we do not know why this is the case. It is possible that multinationals are reluctant to use internal debt for profit-shifting purposes as this would imply costly distortions of the capital structure, for instance, in the form of adverse incentive effects on managers. Restrictions on internal debt usage, imposed in order to limit profit shifting, would then impose a burden on the affiliates of foreign companies – with adverse consequences for investment. However, we cannot completely rule out that the small tax effects exerted on the capital structure are already a result of government intervention and regulation. In this case, our results would suggest that these interventions quite successfully curb profit shifting by means of internal debt. But even then, further restrictions on internal debt would, according to our results, not generate much additional tax revenue.

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 data covers 174 countries in a period of ten years from 1996 until 2005.

A.2 Implied Elasticity of Pre-Tax Profits

Consider a simple model of a firm with locations 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, where μ is the capital share of the internal loan.

The multinational's profit is

$$\Pi = \left(f(k_1) - i_2\mu k_1\right)(1-\tau_1) + \left(f(k_2) + i_2\mu k_1\right)(1-\tau_2) - (k_1+k_2)r - c(\mu)k_1,$$

where $f(k_1)$ is the operating profit from capital in the amount of k_1, r is the rate of return on equity, and $c(\mu)$ is a convex cost function that reflects the distortion of the capital structure or some cost of concealment. The first-order condition for internal debt is

$$c'(\mu) = (\tau_1 - \tau_2)i_2.$$

The corresponding semi-elasticity of internal debt

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

is inversely proportional to the elasticity of the marginal cost of the internal debt share and the tax-rate difference.

Let us consider the implications of profit shifting by means of internal debt for the elasticity of the corporation tax base. The pre-tax profits ω_1 reported in country 1 are defined as

$$\omega_1 \equiv \left(f(k_1) - \sigma_1\right), \quad \sigma_1 \equiv i_2\mu k_1,$$

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

$$\frac{\partial \omega_1}{\partial \tau_1} = -\sigma_1 \left| \frac{1}{\mu} \frac{\partial \mu}{\partial \tau_1} \right|.$$

For the implied semi-elasticity of reported profits we obtain

$$\left| \frac{1}{\omega_1} \frac{\partial \omega_1}{\partial \tau_1} \right| = \frac{\sigma_1}{\omega_1} \left| \frac{1}{\mu} \frac{\partial \mu}{\partial \tau_1} \right|.$$

The ratio $\frac{\sigma_1}{\omega_1}$ equals shifted to reported profits. 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 $\frac{\mu}{1-\mu}$. Therefore,

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

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

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