Restricted Interest Deductibility and Multinationals' Use of Internal Debt Finance[†]

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Abstract:

This paper reconsiders the role of interest deductibility for internal debt financing of multinational corporations (MNCs). We provide quasi-experimental evidence using restrictions on interest deductibility through thin-capitalization (TC) rules. Explicitly distinguishing between firms subject to a binding restriction and unrestricted firms, a panel-data sample selection model is used to explore the tax sensitivity of the capital structure of foreign subsidiaries of MNCs. Our results confirm that the tax incentive for using internal loans is effectively removed for restricted subsidiaries. While internal debt financing of unrestricted subsidiaries positively responds to taxes, the effects are relatively small.

Keywords: Corporate Taxation; Multinational Firms; Internal Debt; Thin-Capitalization Rules; Sample Selection

JEL-Classification: H25; G32; F23

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1 Introduction

This paper examines whether restrictions on the tax deductibility of interest payments, so-called thin-capitalization (TC) rules, affect the tax sensitivity of internal debt financing by multinational corporations (MNCs). We contribute to the previous literature on the effects of TC rules by explicitly distinguishing between restricted and unrestricted foreign subsidiaries of MNCs.

Internal debt financing provided via an internal capital market is one of the key distinguishing features of a multinational firm compared to a domestic one. An internal capital market enables an MNC to use internal debt as a substitute to other forms of foreign subsidiary financing, in particular, to external debt. With internal debt, MNCs may overcome adverse conditions in the local credit market, for instance, due to specific country risks or specific creditor rights (*e.g.*, Desai, Foley, and Hines, 2004). If foreign subsidiaries are financially weak, an internal capital market may also help overcoming difficulties in getting access to external funds (*e.g.*, Gopalan, Nanda, Seru, 2007).

Yet, apart from reasons of adverse local financing or institutional conditions, a large literature argues that internal debt is an important tax planning instrument of MNCs (Chowdry and Coval, 1998; Schindler and Schjelderup, 2012). If subsidiaries from low tax countries lend to subsidiaries in high tax countries, internal debt becomes a vehicle of tax planning and profit shifting within an MNC.

Several empirical studies confirm that corporate taxes affect financial choices of MNCs (*e.g.*, Desai, Foley, and Hines, 2004; Huizinga, Laeven and Nicodème, 2008; Arena and Roper, 2009). The available empirical evidence, however, suggests that the sensitivity of the capital structure of MNCs with regard to the corporation tax rate is not larger than the tax-rate sensitivity of domestic firms (*e.g.*, Feld, Heckemeyer and Overesch; 2013) and also the effect on internal debt and parental debt is similar to the effect on external debt of domestic firms (*e.g.*, Desai, Foley, and Hines, 2004, Buettner *et al.*, 2009). Yet it seems possible that the marginal tax incentive to raise debt is not precisely captured by the corporation tax rate. In many countries, tax planning activities of multinational corporations are already restricted by so-called thin-capitalization (TC) rules. These rules deny the interest deduction of internal debt (*i.e.*, of loans from affiliated corporate entities) if the debt-to-equity ratio is above a certain threshold.

As many countries – about two thirds of all OECD countries – have implemented those rules, recent literature has considered their consequences for capital structure choice. Buettner *et al.* (2012) and Blouin *et al.* (2014) show that subsidiaries of MNCs tend to rely less on internal debt financing in host countries with tight thin-capitalization rules. Overesch and Wamser (2010) and Weichenrieder and Windischbauer (2008) focus on changes in the German TC rule and confirm an effect on debt financing. However, identification in the existing empirical literature comes from cross-country and time variation in TC rules. This approach blurs the treatment effects at the level of the individual firm entities and is subject to biases from composition effects as only a fraction of the foreign subsidiaries is actually facing a binding restriction; others are operating under fully unrestricted conditions.

We contribute to the literature on the effects of TC rules on capital structure choice by explicitly distinguishing between subsidiaries subject to a binding TC restriction and unrestricted subsidiaries. Our identification approach relies on exogenous variation in tax legislation provided by the specific design of TC rules. The limitation of interest deduction by thin-capitalization rules is defined in the tax law and usually involves a two-stage approach. First, the capital structure of a firm is assessed using an explicit threshold level for the debt-to-equity ratio. If the firm's debt-to-equity ratio is above this level, in the second stage, the deduction of interest on internal debt exceeding this safe haven debt-to-equity ratio is disallowed. The existing empirical literature on the effects of thin-capitalization rules has not distinguished between these two stages and provided evidence simply by comparing the capital structure of firms in periods or countries where thin-capitalization rules are applied with that of firms in other periods or countries without such rules. However, if a thin-capitalization rule exists in a country, due to the two-stage procedure, only a fraction of the foreign subsidiaries is actually operating under restricted conditions.

Using a large panel data-set of MNCs, our empirical approach takes explicitly into account the two-stage procedure that determines interest deductibility. Utilizing a sample selection estimator that takes account of unobserved heterogeneity, we distinguish between restricted and unrestricted foreign subsidiaries. Our results show that the incentive for tax planning by means of internal loans is effectively removed for about a quarter of all foreign subsidiaries that have debt levels exceeding the safe haven debt-to-equity ratio (restricted firms). The unrestricted affiliates, on the other hand, positively respond to taxes. The estimated tax effect, conditional on being unrestricted,

is comparable to previous literature. Thus, TC rules at the subsidiary level cannot explain why the average tax sensitivity of MNCs is smaller than often expected.

The paper proceeds as follows. The next section lays out the investigation approach and explains how the effects of thin-capitalization rules are identified. Section 3 describes the data and provides the results. Section 4 provides a brief summary and concludes.

2 Investigation Approach

With interest deductibility, the subsidiary saves corporate profit taxes by using debt instead of equity. The tax savings per unit of debt are a function of the interest rate and increase with the host-country tax rate τ. TC rules usually aim at denying interest deduction associated with internal debt. If debt exceeds a safe haven debt-to-equity ratio as defined by the TC rule, the interest deduction for the marginal unit of internal debt is disallowed.[1] Table 5 in the Appendix provides information on the debt-to-equity thresholds among OECD countries. If a thin-capitalization rule is imposed by a host country, subsidiaries with debt below the safe haven debt-to-asset ratio would still face a tax incentive because interest is still deductible. Only if debt exceeds the threshold determined by the safe haven debt-to-equity ratio, the firm is in an excess-debt position and the interest deduction for the marginal unit of internal debt is disallowed.

Empirically, this suggests that for subsidiaries with debt above the threshold level the tax incentive should be absent and the host-country tax rate should have no effect on internal debt. The role of the debt-to-equity ratio is to assign subsidiaries to different tax treatments. But, conditional on assignment, the safe haven rule is irrelevant at the intensive margin of internal debt finance.

To test whether TC rules affect the tax sensitivity of the capital structure, we distinguish between restricted ($d_{i,t} = 1$) and unrestricted foreign subsidiaries of MNCs ($d_{i,t} = 0$). Subsidiary i is restricted if its debt-to-equity ratio in year t is above the safe haven as defined by the host country TC rule and unrestricted otherwise.

[1] For details see Buettner *et al.* (2012).

Assume that the internal-debt-to-capital ratio $y^0_{i,t}$ of an unrestricted subsidiary obeys

$$y^0_{i,t} \quad = \quad (1 - d_{i,t}) \cdot \widetilde{y}^0_{i,t} = (1 - d_{i,t}) \cdot \left(\tau_{i,t}\beta^0 + x_{i,t}\delta^0 + \alpha^0_i + \epsilon^0_{i,t}\right). \tag{1}$$

For restricted subsidiaries we have

$$y^1_{i,t} \quad = \quad d_{i,t} \cdot \widetilde{y}^1_{i,t} = d_{i,t} \cdot \left(\tau_{i,t}\beta^1 + x_{i,t}\delta^1 + \alpha^1_i + \epsilon^1_{i,t}\right). \tag{2}$$

$\widetilde{y}^0_{i,t}$ and $\widetilde{y}^1_{i,t}$ are latent variables whose observability depends on the indicator variable $d_{i,t}$. α^0_i and α^1_i are time-invariant affiliate-specific effects which remove differences across countries, and $\epsilon^0_{i,t}$ and $\epsilon^1_{i,t}$ are disturbance terms. The controls $x_{i,t}$ include dummy variables for the years, capturing changes in conditions in the parent country. The host country tax rate is denoted by $\tau_{i,t}$. If the tax incentive is removed, we should have $\beta^1 = 0$, while $\beta^0 > 0$.

Estimation of equations (1) and (2) gives rise to a potential endogeneity problem due to sample selectivity. Whether or not a firm is restricted depends not only on the tightness of the restriction but also on the level of internal debt. In order to yield consistent estimates for β^0 and β^1, we employ a two-stage panel-data estimator by Kyriazidou (1997). Whether or not a firm is restricted is captured by a selection equation

$$d_{i,t} \quad = \quad 1\left\{w_{i,t}\gamma + \eta_i - u_{i,t} \geq 0\right\}, \tag{3}$$

where the function $1\{.\}$ is an indicator function, $w_{i,t}$ is a vector of explanatory variables, η_i an affiliate-specific effect, and $u_{i,t}$ an unobserved disturbance term. Since the selection into the subsample with unrestricted firms is the complement of $d_{i,t} = 1$, the same estimation can be used to control for selection effects in estimations focusing on restricted and unrestricted firms. The set of explanatory variables includes the basic determinants of capital structure choice in equations (1) and (2). In addition, $w_{i,t}$ includes a measure of the tightness of the debt-to-equity threshold as defined by the TC rule which is positively associated with the probability that the affiliate is restricted. This measure serves as a natural instrument since, at the margin, only the effective tax deductibility matters.

Equation (3) is estimated using Chamberlain's (1980) fixed effects logit estimator. The estimated

parameters of the selection equation are used to construct observation-specific weights, such that observations staying in the same subgroup of restricted or unrestricted firms, even if changes in the control variables $[\Delta w_{i,t}\widehat{\gamma}]$ suggest that the propensity to switch from unrestricted to restricted regimes (or vice versa) is high according to the first-stage regression, are given a smaller weight. Equations (1) and (2) are estimated after transformation into first-differences using only observations of affiliates that are restricted or unrestricted in at least two consecutive periods.

3 Empirical Analysis

3.1 Data

The empirical analysis employs subsidiary-level information of all German MNCs taken from the *MiDi* dataset provided by the *Deutsche Bundesbank*. This data contains balance-sheet information for foreign affiliates of German enterprises, starting in 1996. Data collection is required by German law, which determines reporting mandates for international transactions.[2]

Since several countries define ownership requirements for the application of thin-capitalization rules, we focus on majority-owned subsidiaries. Furthermore, financial service providers and holdings are excluded because they face special tax treatments, including special provisions of thin-capitalization rules.

Tax rate and controls are chosen in accordance with Buettner *et al.* (2012). To capture the tax incentives for the capital structure, the analysis employs the statutory tax rate on corporate income. We further include subsidiary-specific indicators to capture specific borrowing conditions under which foreign subsidiaries operate. The first subsidiary-specific variable measures asset tangibility as the ratio of fixed assets to the balance-sheet total. A higher asset tangibility is often assumed to facilitate access to external debt financing because more tangible assets can be used as collateral (see

[2]Sec. 26 Aussenwirtschaftsgesetz (Foreign Trade and Payments Act) in connection with Aussenwirtschaftsverordnung (Foreign Trade and Payment Regulations). Each German multinational has to report its foreign assets, including both direct FDI and indirect FDI, conditional on some lower threshold level for mandatory reporting. Since 2002, FDI has to be reported if the participation is 10% or more and if the balance-sheet total of the foreign object exceeds 3 million euros (for details see Lipponer, 2006). Though previous years showed lower threshold levels, we apply this threshold level uniformly in all years in order to avoid discrete changes in the sample selection.

Huizinga, Laeven and Nicodème, 2008). If a larger share of tangible assets leads to more external debt financing, and external debt substitutes for internal debt, then we expect that tangibility is negatively related to internal debt financing. We further include the sales as an indicator for size and cash flow of a subsidiary. If the sales variable captures size effects, its impact may be negative because being large (measured by the sales) is associated with more external debt financing and, given the substitution hypothesis, less internal debt financing. If higher sales means that subsidiaries are profitable and retained earnings are used to finance new investments, a negative impact of sales is possible as well. The third variable measured at the subsidiary level is the indicator variable loss carry-forward. This variable equals one if a subsidiary carries forward any losses, and zero otherwise. If loss carry-forward is equal to one, the effective tax reduction from using debt is zero in the short run (see MacKie-Mason, 1990), which suggests a negative impact on internal debt. Internal debt financing is, on the other hand, a flexible way of providing internal capital if affiliates are in a loss situation and equity capital is not available (see Gopalan, Nanda, and Seru, 2007). This reasoning suggests a positive impact of the loss carry-forward dummy.

To capture local borrowing conditions, we employ the host-country's lending rate for the private sector taken from the IMF, augmented with OECD data. While measures of country risk, creditor rights, and the size of the credit market in the relevant host country are not included, please note that we condition on affiliate-specific effects. This removes all cross-affiliate as well as all cross-country variation. Moreover, note that Buettner *et al.* (2009) show that the lending rate is a sufficient statistic as the variable reflects all relevant determinants of local borrowing costs.

In order to identify firms that are facing binding restrictions of interest deductibility, we combine information about thin-capitalization rules in each country and over time with subsidiary-specific data. We take account of the specifics of the host countries' rules, which differ as to whether the safe haven debt-to-equity ratio is referring to total debt or related party debt (*cf.* also Table 5 in the Appendix). In order to capture the tightness of the host country thin-capitalization rule, we construct a variable $TIGHT$. This indicator maps the complete possible range of the debt-to-equity ratio defined by the thin-capitalization rules in the $[0, 1]$ interval. The variable is calculated as follows. Denote the safe haven debt-to-equity ratio by σ. For example, a safe haven ratio of 1.5:1 would translate to $\sigma = 1.5$. $TIGHT$ is then calculated to reflect the minimum equity share that allows full interest deductibility, $TIGHT = \frac{1}{1+\sigma}$. In the example, $TIGHT = 0.4$. If no restriction

Table 1: Descriptive Statistics

Variable	Mean	Std.Dev.	Min.	Max.
Subsidiary-level variables				
Internal debt (rel. to total capital)	.279	.246	0	1
Total debt (rel. to total capital)	.616	.244	0	1
Asset tangibility	.249	.228	0	1
Sales (in € mill.)	52.7	354.3	[b]	[b]
Loss carry-forward (binary)	.302	.459	0	1
Debt-to-equity above safe haven ratio (binary)	.248	.432	0	1
Tax variables				
Statutory tax rate	.340	.069	0	.532
$TIGHT$ (tightness of the safe haven debt-to-equity ratio)	.217	.168	0	0.5
Other country characteristics				
Lending rate	.074	.064	.018	1.23

Notes: Statistics based on 42,950 ([a] 41,418) observations representing 36 countries in the time period from 1996 to 2004. Subsidiary-level variables taken from the Bundesbank (*MiDi*) data. [b] confidential. Corporate taxation data taken from the International Bureau of Fiscal Documentation (IBFD), and from tax surveys provided by Ernst&Young, PwC and KPMG. The lending rate refers to private sector debt taken from the IMF International Financial Statistics Yearbook (2006) augmented with corresponding OECD figures.

is imposed $TIGHT = 0$; if interest deduction is completely denied, $TIGHT = 1$. Moreover, based on the balance-sheet information for each subsidiary we determine a binary variable that has unit value if the amount of total debt, or related party debt – depending on the host country's definition of the thin-capitalization rule – exceeds the admissible amount according to the host-country's safe haven debt-to-equity ratio and the firm's equity.[3]

The estimation sample covers MNCs in 36 countries over the time period from 1996 to 2004. Descriptive statistics in Table 1 show that 24.8 percent of the subsidiaries face a binding TC restriction.

3.2 Results

Results are provided in Table 3. The dependent variable is always the internal-debt-to-capital ratio. As depicted in Column (1) of Table 3, a positive and significant tax-rate sensitivity is confirmed in a basic regression with all subsidiaries included. This effect is also found for unrestricted subsidiaries (2). For restricted subsidiaries, *i.e.* for subsidiaries with a debt exceeding the safe haven, the tax rate has no significant effect (3).[4] Note, though, that in the case of restricted firms, stronger effects are found for asset tangibility and sales as compared to the case of unrestricted firms. This indicates that restricted firms differ in their response to variables that matter for borrowing conditions, which is at odds with the assumption that selection is fully captured by subsidiary fixed effects.

To account for sample selection effects that are not captured by the subsidiary-level fixed effects, we use the two-stage approach outlined above. We estimate separate selection equations depending on the specific type of TC rule in place in a host country. This seems important since the selection rule differs between countries where the safe haven debt-to-equity ratio refers to internal debt and countries where it refers to total debt.[5] The results for the selection equations are provided in

[3]In some countries where the safe haven debt-to-equity ratio refers to total debt, loans from financial institutions are not considered. However, our dataset does not allow us to distinguish between different sources of external debt.

[4]In unreported placebo tests we split our sample along the level of debt financing and do not consider host countries' thin-capitalization rules. These additional tests, however, do not suggest that highly leveraged firms are generally insensitive to taxes.

[5]See Table 1 in Buettner *et al.* (2012) for this information. The Kyriazidou (1997) estimator uses the first-stage estimation in order to define weights that are used for a second-stage weighted least squares regression. Since weights are determined specifically for each observation, we use two different sets of weights, depending on the specific type of rule in place in a host country. The coefficient vectors of the two estimations shown in columns (1) and (2) of

Table 2: Determinants of Excess Debt: Logit Estimates

	(1)	(2)
	Debt-to-equity ratio refers to	
	Total debt	Related party debt
Statutory tax rate	5.51 **	5.47 **
	(1.98)	(2.18)
ln(Lendingrate)	.489 *	.796 **
	(.252)	(.230)
Asset tangibility	-.004	-2.04 **
	(.418)	(.487)
ln(Sales)	.357 **	.017
	(.082)	(.084)
Loss carry-forward	.428 **	-.024
	(.111)	(.111)
TIGHT	25.05 **	29.95 **
	(1.71)	(2.22)
Observations	6,078	4,815

Notes: Dependent variable ($d_{i,t}$) is binary with unit value if total or related party debt is above the safe haven debt-to-equity ratio times the amount of equity. Fixed effects logit estimation with affiliate-level fixed effects. Time-specific fixed effects included. Heteroskedasticity robust standard errors clustered at the level of country-year cells (in parentheses). A star denotes significance at the 10% level and two stars at the 5% level.

Table 2.[6]

As expected, the tightness of the restrictions (TIGHT) exerts a positive effect on the probability of a binding restriction. Since the incentive for a subsidiary to use more debt depends on the host-country tax rate, it seems reasonable to find that the tax rate is positively associated with the probability of a binding restriction. Similarly, also the lending rate in the host country is found to raise the probability of an excess debt position. With regard to the other controls, we find some differences between the selection equations. This points to the different definitions of the safe haven debt-to-equity ratio. If it is defined using related-party debt, the subsidiary may avoid the denial of interest deductibility by substituting with external debt. Interestingly, the results in Column (2) of Table 2 support the view that with adverse conditions in lending markets (high lending rate) or low asset tangibility, this substitution is more difficult. As a consequence, the probability of a restriction is increased under such conditions. If the debt-to-equity ratio is defined using total debt, a substitution with external debt does not help to avoid facing a restriction. It is, therefore, plausible to find that these effects are absent (see column (1) of Table 2). Instead, here, we find some positive association with sales and loss carry-forward, which may reflect the lack of internal funds of newly established and growing subsidiaries.

The results for the second-stage estimations are reported in columns (4) and (5) of Table 3. Note that the loss of observations relative to columns (2) and (3) is not only explained by the first-differencing transformation but also by the additional restriction that every unit needs to be included at least two consecutive periods in a regime (see Kyriazidou, 1997). Column (4) shows the determinants of internal debt in the subsample of firms for which the TC restriction is not binding; column (5) is concerned with the group where the TC restriction is binding. In contrast to the estimates that ignore endogenous sample selection, we do not find any differences in the significance of the controls. This lack of differences is reassuring regarding the removal of endogenous sample-selection effects. Only with regard to the tax rate, we find different effects: a positive effect is found for unrestricted firms. Here the point estimate is smaller than indicated by the specification that ignores sample selectivity.[7] For restricted firms the tax rate proves insignificant. This is fully

Table 2 are then used to construct observation-specific weights (results are shown in columns (4) and (5) of Table 3).

[6]Note that the fixed effects logit estimator removes all observations where no change in the *regime* is observed. As a consequence, the number of observations is relatively small.

[7]Additional tests replicating columns (3) and (4) but using a first-differencing transformation suggest that the

Table 3: Determinants of Internal Loans for Restricted and Unrestricted Firms

	(1) All firms	(2) Unrestricted firms	(3) Restricted firms	(4) Unrestricted firms	(5) Restricted firms
Statutory tax rate	.214 **	.228 **	.091	.157 **	.090
	(.095)	(.095)	(.129)	(.059)	(.152)
ln(Lendingrate)	.021 **	.009	.002	.005	-.025
	(.008)	(.009)	(.014)	(.006)	(.017)
Asset tangibility	-.068 **	-.041 **	-.108 *	-.112 **	-.117 **
	(.012)	(.014)	(.037)	(.019)	(.043)
ln(Sales)	-.005 *	-.001	-.018 **	.001	-.004
	(.003)	(.003)	(.005)	(.004)	(.007)
Loss carry-forward	.036 **	.038 **	.031 **	.020 **	.024 **
	(.003)	(.004)	(.006)	(.004)	(.007)
R^2	.7643	.7585	.8235		
Observations	42,950	32,310	10,640	23,672	6,606

Notes: Dependent variable is the internal-debt-to-capital ratio. Restricted firms are subsidiaries with a debt-to-equity ratio exceeding the host-country's safe haven ratio in the respective year. columns (1) to (3) report heteroskedasticity robust standard errors clustered at the level of country-year cells (in parentheses). All estimates take account of affiliate-level fixed effects. Columns (1) to (3) result from OLS regressions including time-specific fixed effects. Columns (4) and (5) report sample selection panel data estimates following Kyriazidou (1997); regressions employ kernel weights based on one of two selection equations depending on whether the subsidiary is located in a country where the safe haven ratio is defined using total or related party debt. A star denotes significance at the 10% level and two stars at the 5% level.

consistent with the argument that TC rules effectively remove the tax incentives for using internal debt. The finding of a significant impact of asset tangibility and of loss carry-forward demonstrates that subsidiaries may use internal debt even if they are restricted for reasons other than taxes.

With regard to unrestricted firms, evaluated at mean value for internal debt, the coefficient in column (4) suggests that an increase of the tax rate by one percentage point is associated with an increase in the share of internal debt of about 0.56 percent. This effect is consistent with existing evidence from cross-country studies: Desai *et al.* (2004) and Huizinga *et al.* (2008) report semi-elasticities of 0.47 and 0.42, respectively.

The results presented above focus on internal debt as we expect intra-firm loans to be the main vehicle for shifting profits to low tax countries. Table 4 makes use of the distinction between those rules that apply to total debt and those that apply to internal debt. In particular, the outcome in columns (1) and (2) of Table 4 corresponds to the internal debt ratio, and the selection rule corresponds to internal debt and estimation (2) in Table 2. In columns (3) to (4) we examine the total debt ratio and account for selection based on total debt and the relevant selection estimates in column (1) of Table 2.

The estimates in columns (1) and (2) in Table 4 are consistent with the findings in columns (4) and (5) of Table 3. The tax response of the group of unrestricted subsidiaries is confirmed to be positive and significant, while the restricted units do not respond to tax incentives (the estimated coefficient is now very close to zero and insignificant). We should note, though, that the loss in the number of observations by focusing on countries with an internal debt rule is substantial, and the estimates in column (2) are based on less than 2,200 observations.

However, the definition of the safe-haven debt-to-equity ratio might matter for the extent to which substitution of internal by external debt is used to mitigate the tax effects. Instead of internal debt, the results presented in columns (3) and (4) examines total debt. The selection estimator corresponds to estimation (1) in Table 2, and considers the restriction through thin-capitalization rules that refer to total debt. The results support the effectiveness of this type of thin-capitalization rule as the tax response of restricted subsidiaries is close to zero (the point estimate is 0.06), while

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difference in the tax responsiveness between columns (4) and (2) is mainly related to the way how the unobserved affiliate heterogeneity is taken into account (first-differencing vs. demeaning of the equation) rather than to sample selection effects.

Table 4: Robustness Checks: Determinants of Internal and Total-Debt-to-Capital

	(1) Unrestricted firms	(2) Restricted firms	(3) Unrestricted firms	(4) Restricted firms	(5) Unrestricted firms	(6) Restricted firms
Statutory tax rate	.084 **	.030	.358 **	.063	.108 *	.001
	(.042)	(.255)	(.135)	(.083)	(.057)	(.127)
ln(Lendingrate)	.007	-.015	.012	.005	.008	.028 **
	(.007)	(.022)	(.010)	(.009)	(.007)	(.013)
Asset tangibility	-.115 **	-.037	-.081 **	-.132 **	-.184 **	-.137 **
	(.023)	(.070)	(.030)	(.030)	(.024)	(.035)
ln(Sales)	.001	-.007	.024 **	.010 **	.025 **	.011 **
	(.004)	(.011)	(.006)	(.005)	(.003)	(.005)
Loss carry-forward	.016 **	.033 **	.025 **	.016 **	.013 **	.020 **
	(.004)	(.010)	(.006)	(.005)	(.003)	(.005)
Observations	16,051	2,157	12,081	4,449	16,051	2,157

Notes: Dependent variable is the internal-debt-to-capital ratio in columns (1) - (2), and the total-debt-to-capital ratio in columns (3) - (6). Restricted firms are subsidiaries with a debt-to-equity ratio exceeding the host-country's safe haven ratio in the respective year. Columns (1) - (2) and (5) - (6) focus on subsidiaries in countries where the safe haven debt-to-equity ratio refers to internal debt or where no thin-capitalization rule is applied. Columns (3) - (4) focus on subsidiaries in countries where the safe haven debt-to-equity ratio refers to total debt or where no thin-capitalization rule is applied. The table reports sample selection panel data estimates following Kyriazidou (1997); regressions employ kernel weights based on one of two selection equations depending on whether the subsidiary is located in a country where the safe haven ratio is defined using total or related party debt. The results for the selection equations are provided in Table 2. A star denotes significance at the 10% level and two stars at the 5% level.

the unrestricted subsidiaries turn out to be highly responsive to the tax rate. The estimated coefficient of 0.358 is somewhat larger compared to previous findings. For example, the estimated effect in a comparable specification in Huizinga *et al.* (2008) (Table 8, column 1) is 0.259. These coefficients imply similar semi-elasticities (evaluated at means) of 0.58 (conditional on being in the sample of unrestricted subsidiaries), and 0.42 (for Huizinga et al.).

Columns (5) and (6) finally examine total debt of those subsidiaries that are affected by the selection rule referring to internal debt (note that the number of observations corresponds to the first two columns). The idea here is that if a restriction on internal debt can be avoided by substituting other types of debt (see Wamser, 2014), we may still find a positive response to the tax rate for the group of restricted subsidiaries. The results do not support such an effect but a tax sensitivity of zero. This suggests that the substitution between different types of debt is limited or that the potential for substituting internal with external debt is fully exhausted by restricted subsidiaries.

4 Summary

Given concerns that MNCs use internal debt financing as a tax planning device, this paper provides new estimates on the effects of thin-capitalization (TC) rules (restrictions on interest deductibility) on internal debt financing of MNCs. We have argued that the formal two-stage procedure of TC rule application allows us to provide quasi-experimental evidence on how restriction on interest deductibility affect the financing behavior of firms.

The empirical analysis uses a large micro-level panel dataset of the subsidiaries of German MNCs in 36 countries. Distinguishing restricted subsidiaries from subsidiaries which are most likely to be unrestricted, and using an estimation procedure that takes account of sample selectivity, we find that binding thin-capitalization restrictions effectively remove the incentive for tax planning by means of internal loans. For unrestricted firms, the tax sensitivity of internal debt is statistically significant but relatively small. Even though our results clearly show that the tax sensitivity differs substantially between restricted and unrestricted subsidiaries, the effects for unrestricted firms are not bigger than found by previous literature. This suggests that internal debt finance is not heavily used for tax planning. Given the basic notion that MNCs are very mobile and to a significant extent able to avoid taxes (or regulation and other restrictions imposed by countries),

our results indicate that tax policy can use TC rules to shut down one channel through which MNCs adjust. However, there might be more important channels than using internal debt. This also raises questions concerning real (investment and production) consequences of TC rules which are left for future research.

Appendix: Datasources and Definitions

Micro-Level Data are taken from the micro-level dataset (MiDi) of the Deutsche Bundesbank (see Lipponer, 2006, for an overview). Internal debt is defined as liabilities to shareholders/affiliated enterprises/enterprises linked through participating interests. The share of internal debt is determined by the level of balance-sheet internal debt divided by total capital consisting of nominal capital, capital reserves, profit reserves, and total debt. Investment is defined as the logarithmic difference in the balance-sheet position of fixed assets. Asset tangibility is defined as the ratio of fixed assets to balance-sheet total.

Corporate Taxation data are taken from the International Bureau of Fiscal Documentation (IBFD) and from tax surveys provided by Ernst&Young, PricewaterhouseCoopers (PwC), and KPMG. The statutory tax rate variable contains statutory profit tax rates modified by restrictions on interest deduction – as in the case of the Italian IRAP.

Thin-Capitalization Rules: Details on the type and tightness of thin-capitalization rules for all countries and over time are taken from Buettner *et al.* (2012).

Lending Rates refer to private sector debt taken from the IMF International Financial Statistics Yearbook (2006) augmented with corresponding OECD figures.

Table 5: Safe Haven Debt-to-Equity Ratios

Country	Debt-to-Equity Ratio Refers to	1996	1997	1998	1999	2000	2001	2002	2003	2004
Australia	total debt	3	3	2	2	2	2	3	3	3
Bulgaria	total debt	-	-	2	2	2	2	2	2	2
Canada	related party debt	3	3	3	3	3	2	2	2	2
Croatia	related party debt	-	-	-	-	-	-	-	-	-
Czech Republic	related party debt	4	4	4	4	4	4	4	4	4
Denmark	total debt	-	-	-	4	4	4	4	4	4
France	related party debt	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Hungary	total debt	-	4	4	4	4	3	3	3	3
Italy	related party debt	-	-	-	-	-	-	-	-	5
Japan	total debt	3	3	3	3	3	3	3	3	3
Latvia	total debt	-	-	-	-	-	-	-	4	4
Lithuania	total debt	-	-	-	-	-	-	-	-	4
Luxembourg	related party debt	-	-	-	-	-	-	5.7	5.7	5.7
Mexico	total debt	-	-	-	-	-	-	-	-	-
Netherlands	total debt	3	3	3	3	3	3	3	3	3
New Zealand	total debt	-	3	3	3	3	3	3	3	3
Poland	total debt	-	-	-	3	3	3	3	3	3
Portugal	related party debt	2	2	2	2	2	2	2	2	2
Romania	total debt	-	-	-	-	-	-	3	3	3
Slovakia	related party debt	4	4	4	4	4	4	4	4	-
Slovenia	related party debt	-	-	-	-	-	-	-	-	-
South Korea	related party debt	-	3	3	3	3	3	3	3	3
Spain	related party debt	3	3	3	3	3	3	3	3	-[a]
Switzerland	total debt	6	6	6	6	6	6	6	6	6
Turkey	related party debt	2	2	2	2	2	2	2	2	2
United Kingdom	total debt	1	1	1	1	1	1	1	1	1
USA	total debt	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Source: Buettner et al. (2012).

Number of debt units in relation to equity capital that are accepted by the thin-capitalization rules for unrestricted interest deduction from taxable profits. Special rules for financial institutions and holdings are not reported. Belgium is excluded as the rules do not apply for the German multinationals. [a]) Since 2004 the Spanish rule does not apply to related party debt provided by a German parent company.

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