

Corporate Taxation and Thin-Capitalization Rules

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Abstract: A theoretical analysis shows that the imposition of Thin-Capitalization rules tends to reduce the leverage and the capital stock of affiliates. Moreover, with Thin-Capitalization rules, the debt-asset ratio should show a lower tax sensitivity while the tax sensitivity of the capital stock invested in a country should be increased. The empirical investigation of the leverage and the value of property, plant, and equipment of the affiliates of German multinationals in 24 countries in the period between 1996 and 2003 offers some support for these theoretical predictions. While Thin-Capitalization are found to be effective in restricting debt finance, investment is found to be more sensitive to taxes if debt finance is restricted supporting theoretical concerns about re-enforced tax competition.

Keywords: Corporate Income Tax, Multinationals, Leverage , Thin-Capitalization Rules, Tax Competition, Empirical Analysis, Firm-Level Data

JEL Classification: H25, H26, G32

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1 Introduction

While all companies will respond to taxation and capital market conditions with their financing and investment decisions, multinational companies seem to have enhanced opportunities. In particular, they may be able to structure their internal finances in order to save taxes (Desai, Foley and Hines, 2004). From a fiscal perspective the drawback is a reduction in taxable fiscal resources. Furthermore, enhanced opportunities for saving taxes may give the multinationals an advantage against companies operating only at a national level. Governments, thus, are tempted to fight back, for instance, by imposing Thin-Capitalization rules. Whether or not such policies are generally beneficial, is, however, discussed in the theoretical literature since restrictions to tax planning might re-enforce tax competition for investment (e.g., Janeba and Smart, 1999, Keen, 2001, and Bucovetsky and Haufler, 2005). However, empirical evidence on the effects of restrictions on financing and investment is generally lacking.

This paper investigates the effects of Thin-Capitalization rules on multinationals' financing and investment decisions. The empirical analysis employs a comprehensive micro-level panel database of virtually all German multinationals made available for research by the German Bundesbank. As in the analysis of Desai, Foley, and Hines (2004) the panel data structure and the possibility to identify all foreign affiliates belonging to the same multinational allow us to control for the heterogeneity across companies. A further advantage of the data is that under German tax law repatriated foreign profits are almost completely exempt from corporation taxes such that the taxes at the location of the affiliate are decisive for the financing and investment decisions.

The paper is structured as follows. A theoretical model considers the financing and investment decisions of a multinational corporation and derives empirical implications. More specifically, we model a company, active in two countries, which has the opportunity to use equity as well as debt subject to Thin-Capitalization rules. The empirical implications for

borrowing and investment are then investigated using panel-data for the period from 1996 until 2003. The results show a significant positive impact of local taxes on the financial structure but also an adverse impact of Thin-Capitalization rules indicating that these rules are effective to some extent. Moreover, investment is found to be more sensitive to taxes if debt finance is restricted supporting the theoretical concerns about re-enforced tax competition.

2 Theoretical Background

As has been emphasized by Modigliani and Miller (1958, 1963) companies would generally favor debt in the presence of taxes, since the tax shield by deductible interest expenses increases the company value. However, a high leverage involves other problems due to the potential conflict between the company and the external creditor. Thus, standard theories of the capital structure emphasize the trade off between the tax advantage of debt and the costs of increasing the leverage (*e.g.*, Myers, 2001, Auerbach, 2002). The following analysis applies this basic approach to the case of a multinational company. More specifically, the capital structure choice is modelled considering a case of a company with only two locations 1 and 2. Profits are determined by output

$$f(k_1) + f(k_2),$$

where k_1, k_2 is investment at the two locations. The cost for equity is given by

$$r[k_1(1 - \lambda_1) + k_2(1 - \lambda_2)],$$

where λ_1, λ_2 is the debt-asset ratio, or leverage. Interest expenses are

$$i_1 k_1 \lambda_1 + i_2 k_2 \lambda_2.$$

Taxes on taxable profits, defined by the output less interest deduction, are

$$t_1 [f(k_1) - i_1 \lambda_1 k_1] + t_2 [f(k_2) - i_2 \lambda_2 k_2],$$

where we assume an exemption system such that t_1 and t_2 are the local rates of profit taxation and there is no further taxation at the level of the company. Finally, additional cost of borrowing arising from asymmetric information and potential conflict between the creditor and the management of the affiliate. The corresponding agency cost function is defined as

$$c_j(\lambda_j), \quad c_{j,\lambda} \equiv \frac{\partial c_j}{\partial \lambda_j} > 0,$$

which is assumed to be convex,

$$c_{j,\lambda\lambda} \equiv \frac{\partial^2 c_j}{\partial \lambda_j^2} > 0.$$

Together, we obtain the profit function

$$\begin{aligned} \pi &= f(k_1)(1 - t_1) + f(k_2)(1 - t_2) \\ &\quad - [i_1 \lambda_1 k_1](1 - t_1) \\ &\quad - [i_2 \lambda_2 k_2](1 - t_2) \\ &\quad - r[k_1(1 - \lambda_1) + k_2(1 - \lambda_2)] \\ &\quad - [c_1(\lambda_1)k_1 + c_2(\lambda_2)k_2]. \end{aligned}$$

Suppose that i_2 is not different from r . Then a shift towards debt finance (higher λ_2) will tend to raise profits as a larger part of the earnings of capital is tax deductible. This would, of course, tend to lower corporate tax revenue. Hence, governments and tax administration may want to fight back, by imposing restrictions on corporate finances. In fact, many countries impose restrictions on debt finance such as Thin-Capitalization or earning stripping rules. Those rules typically limit interest deduction up to a fixed relation between equity and debt, usually qualified as the debt which is financed by a shareholder. Then, the interest paid for an excess leverage can not be deducted from the tax base.

In practice, Thin-Capitalization rules are often not limited to debt directly financed by shareholders. Tax administration or legislation will usually also prohibit what has been called back-to-back finance, where the affiliate issues external debt which is, however, guaranteed or secured by a deposit from the parent-company.¹ Therefore, in the following we will treat the Thin-Capitalization rule simply as a restriction on debt finance without, explicitly, distinguishing between internal and external debt.

If a Thin-Capitalization rule is imposed at location 2, the profit function of location 2 is extended by the additional tax payments arising from excess leverage above the limit $\bar{\lambda}_2$ at location 2,

$$\varphi_2 i_2 (\lambda_2 - \bar{\lambda}_2) k_2 t_2.$$

In order to consider the case with and without a binding debt restriction on tax deductions, we will set $\varphi_2 = 1$ if a Thin-Capitalization exists and, additionally, if $\lambda_2 > \bar{\lambda}_2$ and $\varphi_2 = 0$, otherwise.

Hence, the profit function becomes

$$\begin{aligned} \pi &= f(k_1)(1 - t_1) + f(k_2)(1 - t_2) \\ &- [i_1 \lambda_1 k_1](1 - t_1) \\ &- [i_2 \lambda_2 k_2](1 - t_2) \\ &- [\varphi_2 i_2 (\lambda_2 - \bar{\lambda}_2) k_2] t_2 \\ &- r[k_1(1 - \lambda_1) + k_2(1 - \lambda_2)] \\ &- [c_1(\lambda_1)k_1 + c_2(\lambda_2)k_2]. \end{aligned}$$

For the optimum share of debt used by an affiliate, say firm 2, we obtain the first-order

¹For instance the US Earnings Stripping Rules (Sec. 163 (j) IRC) prohibit back to back finance constructions.

condition

$$r - i_2(1 - t_2) - \varphi_2 i_2 t_2 = c_{2,\lambda}(\lambda_2). \quad (1)$$

Accordingly, the leverage is determined by the cost of own capital relative to capital. If $\varphi_2 = 0$ and $r > i_2(1 - t_2)$, the convexity of c_2 implies that λ_2 is positive. In other words, if the after tax return to capital is below the required return on equity, there will be some borrowing. If φ_2 equals 1, the marginal cost of borrowing jump up to i_2 as the tax deduction is no longer granted. As a consequence, the leverage λ_2 is reduced. If $r > i_2$ the leverage will be above $\bar{\lambda}_2$, but if $i_2 > r > i_2(1 - t_2)$ the leverage will be equal to the threshold level $\bar{\lambda}_2$.

The first order condition for the capital stock at location 2 is

$$f'(k_2)(1 - t_2) = \lambda_2 i_2(1 - t_2) + \varphi_2 i_2(\lambda_2 - \bar{\lambda}_2)t_2 + r(1 - \lambda_2) + c_2(\lambda_2). \quad (2)$$

The stock of capital is chosen such that the after tax marginal product equals the cost the investment consisting of the interest cost (first two terms), the opportunity rate of return (third term), and of the agency cost of debt (last term). Without restrictions on debt finance the cost of interest are reduced due to the tax deduction. If a Thin-Capitalization rule is imposed, the tax deduction is limited and, hence, borrowing is more costly, and the cost of the investment is increased. The consequence will be a lower level of investment.

The imposition of restrictions on debt finance will not only directly affect the leverage and the investment of capital but it will also affect the sensitivity investment and leverage to the tax policy. To see this we can derive the comparative static effect of an increase in the tax rate by differentiating the two first-order conditions

$$\begin{bmatrix} c_{2,\lambda\lambda} & 0 \\ r - i_2(1 - t_2) - \varphi_2 i_2 t_2 - c_{2,\lambda} & f''(k_2)(1 - t_2) \end{bmatrix} \begin{bmatrix} d\lambda_2 \\ dk_2 \end{bmatrix}$$

$$= \left[\begin{array}{c} (i_2 - \varphi_2 i_2) \\ f'(k_2) - i_2 \lambda_2 + \varphi_2 i_2 (\lambda_2 - \bar{\lambda}_2) \end{array} \right] dt_2$$

With regard to the tax effect on the leverage we can derive

$$\frac{d\lambda_2}{dt_2} = \frac{i_2 - \varphi_2 i_2}{c_{2,\lambda\lambda}}. \quad (3)$$

First, consider the case without a Thin-Capitalization rule ($\varphi_2 = 0$). Given the above assumptions, the term is positive and the strength of the response depends on the interest rate and on the agency cost function. If, however, there is a Thin-Capitalization rule in place and is binding ($\varphi_2 = 1$), the tax rate effect disappears.

With regard to the effect on the level of investment at location 2 we obtain

$$\frac{dk_2}{dt_2} = \frac{f'(k_2) - i_2 \lambda_2 + \varphi_2 i_2 (\lambda_2 - \bar{\lambda}_2)}{f''(k_2) (1 - t_2)}. \quad (4)$$

To simplify matters let us consider the impact relative to the stock of capital

$$\frac{d \log k_2}{dt_2} = -\frac{1}{\eta_2 (1 - t_2)} \left[1 - \frac{i_2 \lambda_2 - \varphi_2 i_2 (\lambda_2 - \bar{\lambda}_2)}{f'(k_2)} \right], \quad (5)$$

where $\eta_2 = -\frac{f''(k_2)k_2}{f'(k_2)}$ is the absolute value of the elasticity of the marginal product. If this elasticity is non-decreasing in the level of capital k_2 ,² we can state that the lower level of investment k_2 and the lower deduction of interest cost under conditions of a thin-capitalization rule $\varphi_2 = 1$ will lead to a higher tax sensitivity of the capital stock.

²This assumption is not particularly restrictive, a Cobb-Douglas function, for instance, would show a constant elasticity of the marginal product.

3 Empirical Implications

The first-order conditions and the corresponding comparative static effects suggest that the leverage of the affiliate in country j is a declining function of the after tax rate of interest, if no Thin-Capitalization rule is imposed. Then, a lower interest rate and a higher tax rate would lead to a increase in the leverage. If however, a Thin-Capitalization rule is imposed in the host country, the leverage is reduced and will show less tax sensitivity.

In order to empirically test these predictions we specify a simple estimation equation for the leverage of an investment in country j taken by company k in period t . Starting with the case without Thin-Capitalization rules, we might specify

$$LEV_{j,k,t} = a_0 + a_1 x_{j,k,t} + a_2 \log [(1 - t_{j,t}) i_{j,t}] + a_k + a_t + \epsilon_{i,t}^{LEV},$$

where a_t is a time-specific and a_k is a company-specific effect. Note that the former also captures the interest rate at the parent location if we consider a set of companies which share the same parent location. The company-specific effect encompasses the company-specific opportunity cost of capital which might include elements of personal taxation. $x_{j,k,t}$ captures further characteristics of the subsidiary which affect the use of debt or the access to credit. Since the lending rate $i_{j,t}$ is more difficult to measure, it seems useful to separate out interest and tax rates and make use of the fact, that the tax rate can be regarded as an approximation to the log of unity minus tax rate

$$LEV_{j,k,t} = a_0 + a_1 x_{j,k,t} + a_2 t_{j,t} + a_3 \log i_{j,t} + a_k + a_t + \epsilon_{i,t}^{LEV}.$$

In order to allow for the case where a Thin-Capitalization rule is imposed we introduce a dummy $THC_{j,t}$ indicating whether such a rule is imposed or not

$$LEV_{j,k,t} = a_0 + a_1 x_{j,k,t} + a_2 t_{j,t} + a_3 \log i_{j,t} + a_4 THC_{j,t} + a_k + a_t + \epsilon_{i,t}^{LEV},$$

where we expect a_4 to show a negative sign. To test for the reduced tax sensitivity we include a further interaction term with the tax rate

$$LEV_{j,k,t} = a_0 + a_1x_{j,k,t} + a_2t_{j,t} + a_3 \log i_{j,t} + a_4THC_{j,t} + a_5t_{j,t}THC_{j,t} + a_k + a_t + \epsilon_{i,t}^{LEV},$$

where a_5 should show the opposite sign than a_2 .

With regard to the stock of capital invested by the affiliate the empirical analysis is somewhat more involved as the production function as well as the market conditions for the final product matter. Hence, it might be useful to include further controls which capture differences in the cost of production, as, for instance, the cost of labor or the distance as an indicator of transport cost, or which capture the product market conditions, as the level of GDP. Of course, the tax system needs also to be taken into account. While the analysis of the leverage is essentially concerned with the statutory tax rate, in case of investment the depreciation allowances should be taken into account. The tax savings from depreciation are introduced by an interaction term of the present value of depreciation allowances, d_j with the statutory tax rate, formally denoted by $d_j\tau_i$.

A reasonable specification to start with is

$$\log PPE_{k,i,t} = b_0 + b_1y_{j,k,t} + b_2\tau_{j,t} + b_3d_{j,t}\tau_{j,t} + b_k + b_t + \epsilon_{k,j,t}^{PPE}, \quad (6)$$

where b_t is a time-specific and b_k is a company-specific effect. As above we might want to test the implications of Thin-Capitalization rules by introducing a dummy for the imposition of such rules in a host country. A different tax sensitivity of the capital stock can be tested for if we introduce an interaction term between the Thin-Capitalization dummy and the statutory tax rate. However, the existence of a tax restriction on finance has hardly an effect on tax savings due to depreciation allowances, and, thus, we don't use a corresponding variable.

$$\begin{aligned}\log PPE_{k,i,t} = & b_0 + b_1 y_{j,k,t} + b_2 \tau_{j,t} + b_3 d_{j,t} \tau_{j,t} \\ & + b_4 THC_{j,t} + b_5 THC_{j,t} \tau_{j,t} + b_k + b_t + \epsilon_{k,j,t}^{PPE}.\end{aligned}$$

As depicted above, the tax incentive on leverage is immediately caused by the statutory tax rate. A Thin-Capitalization rule should depress the extensive use of leverage. Therefore, b_5 should be negative if capital is adversely affected by the imposition of such a financing restriction, and moreover, the sensitivity is increased.

4 Data and Descriptive Statistics

The empirical analysis employs micro-level data for multinationals (MIDI) provided by the German Bundesbank. This includes a comprehensive annual database of direct investment stocks of German enterprises held abroad. The data provides information about each foreign subsidiary's balance sheet and some further information about the ownership and about the German investor. In its current version, firm-level panel data for foreign subsidiaries are available for the period 1996 to 2003. Data collection is enforced by German law, which determines reporting mandates for international transactions.³ 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.⁴ Since our model is concerned with a multinational which jointly determines the capital structure at both affiliates we focus on majority owned subsidiaries. As the model assumes a two-tier company structure, also indirectly held investment is excluded. Furthermore, as the underlying

³Sec. 26 Aussenwirtschaftsgesetz (Law on Foreign Trade and Payments) in connection with Aussenwirtschaftsverordnung (Foreign Trade and Payment Regulations).

⁴Since 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 Billion euro. For details see Lipponer (2006). Though previous years showed lower threshold levels, we apply this threshold level uniformly for all years in the panel.

Table 1: Descriptive Statistics

Variable	Mean	Std.Dev.	Min.	Max.
PPE (€ 1 Mill.)	10.4	106	.0001	14,400
Turnover (€ 1 Mill.)	51.7	364	1	51,900
Leverage	.614	.248	0	1
Statutory tax rate	.349	.068	.1	.532
PVD (d)	.769	.111	.281	.914
Lending Rate	.073	.041	.018	.273
Loss carry-forward	.291	.454	0	1
Hourly labor cost (U.S. \$)	16.4	6.52	2.79	32.2
GDP (Mill. U.S. \$)	1612717	2662592	18976	10600000
Distance (in km)	1899.57	3043.95	190	16470
Corr.perception	6.93	1.71	3.42	10.0
Thin-Cap. Dummy	.760	.427	0	1
39496 observations representing 24 countries observed over the period 1996 to 2003.				

model deals with a case where production takes place at each location, holdings and financial service providers as well as observations with non-positive capital and turnover are excluded.

In order to capture the tax incentive on the capital structure the analysis employs the statutory tax rate on corporate income modified by applicable restrictions on interest deductions, such as in the case of the Italian local business tax (IRAP). Thus, the statutory tax rate represents the tax savings from deducting one unit of interest.

Since the effective tax reduction from using debt might be zero if a subsidiary carries forward any losses for tax purposes (MacKie-Mason, 1990), we might include a dummy variable indicating whether some loss carry-forward is reported. Of course, the existence of some losses in the previous periods may capture other characteristics of the current decision problem of the company, such as the expected performance of an affiliate. Thus, the overall effect on leverage might well be ambiguous.

As the data does not contain any information about firm-specific interest expenses, we employ the lending rates for the private sector taken from the IMF International Financial Yearbook augmented, where possible, by ECB data. Furthermore, in order to control for company-specific variation in the lending conditions we employ the turnover, as an indicator of the size and the cash-flow of the affiliate both of which will generally be positively associated with the lending conditions of the affiliate. As agency cost may also vary across industries, we control for further heterogeneity by including dummies for 71 industries at the level of the affiliate.

Table 2 provides some descriptive statistics on the size and geographic distribution of the foreign subsidiaries analyzed. The list of host countries includes 24 countries, 14 of these countries are EU members in the period analyzed. Due to the exclusion of holdings and financial service providers Luxembourg and Ireland are only sparsely represented.

5 Results

The results for the leverage are presented in Table 3 and document a significant positive impact of the tax rate: an increase in the tax rate by 10 percentage points results in an increase in the leverage by 3.4 to 4.4 percentage points depending on the specification. Whereas column (1) only considers the tax rate and the lending rate, columns (2) to (5) show that the existence of a loss carry-forward shows a significant adverse effect on the leverage. This conforms with the view that the tax shield from using debt is less important, or, alternatively, could reflect some difficulties in the access to credit. Columns (3) to (5) include industry dummies in order to further reduce the heterogeneity across firms which may give rise to differences in the agency cost of debt. The size of the coefficient in specification (3) is remarkably close to the finding of Desai, Foley, and Hines (2004) who report an impact of 0.33. Moreover, Mintz and Weichenrieder (2005) using data covering a larger set of host countries find a similar effect (0.30) for German multinationals.

Table 2: German Outbound FDI 1996 - 2003

Destination Country	Observations		Capital	Share of	TCR
	Number	Percent	(€ 1,000) Mean	Debt Mean	
Australia	852	2.16	17,715	.619	1
Austria	2,600	6.58	25,318	.605	0
Belgium	1,664	4.21	43,044	.634	1
Canada	679	1.72	31,141	.541	1
Czech Republic	2,176	5.51	25,151	.623	1
Denmark	765	1.94	18,844	.656	1 ^{a)}
Finland	304	0.77	19,589	.566	0
France	4,861	12.31	27,890	.646	1
Great Britain	3,304	8.37	29,949	.560	1
Greece	404	1.00	22,245	.651	0
Hungary	1,368	3.46	36,191	.564	1 ^{b)}
Ireland	331	0.84	19,575	.502	0
Italy	3,304	8.37	28,951	.720	0
Japan	954	2.42	54,095	.672	1
Luxembourg	41	0.10	17,254	.702	1 ^{c)}
Netherlands	2,132	5.40	28,528	.576	1
Norway	327	0.83	26,060	.605	0
Poland	2,532	6.41	19,448	.610	1
Portugal	317	0.80	24,813	.562	0
Slovakia	374	0.95	28,476	.566	1
Spain	2,737	6.93	33,263	.607	1
Sweden	933	2.36	20,638	.614	0
Switzerland	2,607	6.60	18,674	.549	1
USA	3,930	9.95	57,781	.583	1
Total	39,496	100.00	31,258	.614	0.76

^{a)}: Since 1999. ^{b)}: Since 1997. ^{c)}: Since 2002.

Table 3: Results: Determinants of the Leverage

	(1)	(2)	(3)	(4)	(5)
Tax rate	.353 ** (.046)	.376 ** (.046)	.347 ** (.047)	.335 ** (.040)	.441 ** (.054)
TCR				-.052 ** (.010)	.003 (.027)
TCR \times Tax rate					-.160 * (.082)
(log)Lending rate	.010 (.006)	.003 (.006)	.010 (.006)	.003 (.006)	.000 (.007)
Loss carry-forward		.052 ** (.004)	.055 ** (.004)	.058 ** (.004)	.059 ** (.004)
(log)Turnover		.002 (.002)	.009 ** (.002)	.010 ** (.002)	.010 ** (.002)
<i>Industry effects</i> R^2	no .0296	no .0371	yes .0637	yes .0736	yes .0741

Dependent variable: Debt/asset ratio of foreign subsidiaries. Company level and time fixed effects included. Robust standard errors in parentheses. A star denotes significance at 10% and two stars at 5% level. 39496 observations, 4097 firms.

In column (4) the dummy for the existence of a Thin-Capitalization rule shows the expected negative effect suggesting that the leverage is about 5 percentage points lower in countries imposing such financing constraints. Column (5) reports results of a specification where, in addition, an interaction effect between the tax rate and the Thin-Cap. dummy is included. The significant negative impact indicates that the tax sensitivity is reduced in countries which impose such constraints. The larger coefficient for the tax rate indicates that the tax sensitivity is slightly underestimated in a specification which neglects the existence of Thin-Capitalization rules.

Table 4: Results: Determinants of PPE

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-.985 ** (.287)	-1.17 ** (.276)	-.004 (.453)	-.998 ** (.243)	-1.15 ** (.229)	-.039 (.373)
Tax rate \times PVD	.659 ** (.300)	1.13 ** (.333)	.879 ** (.355)	.478 * (.243)	.878 ** (.277)	.643 ** (.284)
TCR		.117 ** (.042)	.650 ** (.138)		.100 ** (.030)	.612 ** (.120)
Tax rate \times TCR			-1.56 ** (.383)			-1.49 ** (.337)
(log) Lend. rate	-.004 (.046)	.031 (.047)	.002 (.048)	.031 (.036)	.061 (.037)	.033 (.038)
(log) GDP	.207 ** (.020)	.179 ** (.018)	.181 ** (.018)	.011 (.015)	-.013 (.014)	-.011 (.014)
(log) Labor cost	-.110 ** (.043)	-.046 ** (.044)	-.071 (.046)	-.254 ** (.032)	-.199 ** (.034)	-.223 ** (.034)
(log) Distance	-.019 (.016)	-.009 (.016)	.005 (.015)	.044 ** (.014)	.053 ** (.014)	.066 ** (.013)
(log) Corruption	.201 ** (.071)	.135 * (.070)	.210 ** (.077)	.148 ** (.058)	.091 (.059)	.163 ** (.061)
(log) Turnover				.751 ** (.013)	.750 ** (.013)	.750 ** (.013)
Loss carry-forw.				.096 ** (.016)	.094 ** (.016)	.098 ** (.016)
R^2	.2449	.2456	.2464	.4176	.4181	.4189

Dependent variable: logarithm of property, plant, and equipment (PPE) of foreign subsidiaries. Robust standard errors in parentheses, a star denotes significance at 10% level, and two stars at 5%, 39496 observations, 4097 firms, all estimates include a full set of company-level, industry-level, and time fixed effects.

Table 4 provides results for the size of the capital stock invested as captured by the level of Property, Plant, and Equipment (PPE). The first column employs a specification where the tax rate as well as its interaction with the depreciation allowances is considered. Confirming theoretical predictions, a lower statutory tax rate and higher tax savings due to tax depreciation are both associated with a lower level of investment. The further control variables show some significance, pointing at an adverse effect of corruption and labor cost, whereas GDP shows the usual positive impact. The lending rate proves insignificant. Theoretically, one might expect a negative effect, however, as shown by Buettner, Overesch, Schreiber, Wamser (2006), the local lending rate exerts offsetting effects on external and internal debt. Column (2) includes the dummy for a Thin-Capitalization rule. Accordingly, the level of capital invested is higher in countries which impose such rules. While one might speculate whether this is attributable to the difficulties in capturing all determinants of investment decisions, we should note that this result deviates from the theoretical predictions. Column (3) includes the interaction term with the statutory tax rate which is significantly negative. This supports the above hypothesis of a higher tax sensitivity of capital if a Thin-Capitalization rule is imposed. Columns (4) to (6) report results, where, we include, in addition, two firm-specific controls, turnover and loss carry-forward, which have been used in the above leverage regressions. The results, however, do not change much.

6 Conclusions

The theoretical analysis has shown that the imposition of Thin-Capitalization rules tends to reduce the leverage and the capital stock of affiliates located in countries which impose such rules. Further comparative static effects point at a lower tax sensitivity of the debt-asset ratio in countries which impose those rules. The tax sensitivity of the capital stock invested in a country should, however, be increased.

The empirical investigation of the leverage and the value of property, plant, and equipment of the affiliates of German multinationals in 24 countries in the period between 1996 and 2003 offers some support for the theoretical predictions. The leverage in countries with Thin-Capitalization rules is found to be reduced significantly, suggesting that these rules cannot easily be circumvented. Also the lower tax sensitivity of the leverage is confirmed in the estimations.

With regard to the level of property, plant, and equipment held by an affiliate, the analysis confirms the usual determinants found in previous empirical studies: lower tax rates, a higher present value of tax depreciation allowances, a higher level of GDP, and a lower level of corruption all exert positive effects. While the sensitivity to the statutory tax rate is found to be higher in countries where a Thin-Capitalization rule is imposed, no significant sensitivity is found for countries where such rules are not imposed. This might be due to higher tax planning flexibility by means of capital structure choices. However, the amount of capital invested is not lower in those countries, that impose a Thin-Capitalization rule. Whether this is attributable to some omitted variable bias is an issue for future research.

Datasources and Definitions

Firm-level data are taken from the micro-level dataset of the Bundesbank, see Lipponer (2006) for an overview. The internal and external components of the leverage are determined by the level of balance-sheet liabilities in the respective category divided by total capital consisting of registered capital, capital reserves and profit reserves, as well as internal and external debt.

Corporate taxation data are taken from the IBFD, and from tax 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.

Thin-Capitalization information is from the same source as the tax data.

Present values of depreciation are calculated for investments in machinery, assuming a discount rate of 7.1 percent. Depreciation rules are taken from the references

considered in case of corporate taxation data (see above).

Lending rates refer to credits to the private sector taken from the IMF International Financial Yearbook (2005) augmented with corresponding ECB figures.

GDP in U.S. Dollars, nominal. Source: World Economic Outlook Database.

Hourly compensation of workers: Hourly compensation costs in U.S. Dollars for production workers in manufacturing. Source: U.S. Bureau of Labor Statistics and Eurostat.

Distance is taken from “www.etn.nl/distance.htm”.

Corruption Perception Index is published annually by Transparency International which ranks countries in terms of perceived levels of corruption, as determined by expert assessments and opinion surveys. The scores used range from 10 (country perceived as virtually corruption-free), down to close to 0 (country perceived as almost totally corrupt).

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