Buettner, Thiess; Overesch, Michael; Schreiber, Ulrich; Wamser, Georg

Working Paper

Taxation and capital structure choice: evidence from a panel of German multinationals

CESifo working paper, No. 1841

Provided in Cooperation with:
Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Buettner, Thiess; Overesch, Michael; Schreiber, Ulrich; Wamser, Georg (2006) : Taxation and capital structure choice: evidence from a panel of German multinationals, CESifo working paper, No. 1841, Center for Economic Studies and Ifo Institute (CESifo), Munich

This Version is available at:
http://hdl.handle.net/10419/25886

Standard-Nutzungsbedingungen:
Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.
Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.
Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:
Documents in EconStor may be saved and copied for your personal and scholarly purposes.
You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.
If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.
TAXATION AND CAPITAL STRUCTURE CHOICE – EVIDENCE FROM A PANEL OF GERMAN MULTINATIONALS

THIESS BUETTNER
MICHAEL OVERESCH
ULRICH SCHREIBER
GEORG WAMSER

CESifo Working Paper No. 1841
Category 1: Public Finance
November 2006

An electronic version of the paper may be downloaded
• from the SSRN website: www.SSRN.com
• from the RePEc website: www.RePEc.org
• from the CESifo website: www.CESifo-group.de
TAXATION AND CAPITAL STRUCTURE CHOICE – EVIDENCE FROM A PANEL OF GERMAN MULTINATIONALS

Abstract

This paper analyzes the impact of taxes and lending conditions on the financial structure of multinationals' foreign affiliates. The empirical analysis employs a large panel of affiliates of German multinationals in 26 countries in the period from 1996 until 2003. In accordance with the theoretical predictions, the effect of local taxes on leverage is positive for both types of debt. Moreover, while adverse local credit market conditions are found to reduce external borrowing, internal debt is increasing, supporting the view that the two channels of debt finance are substitutes.

JEL Code: H25, H26, G32.

Keywords: corporate income tax, multinationals, capital structure, firm-level data.

Thiess Buettner
Ifo Institute for Economic Research at the University of Munich
Poschingerstr. 5
81679 Munich
Germany
buettner@ifo.de

Michael Overesch
ZEW
Center for European Economic Research
PO Box 103443
68034 Mannheim
Germany
overesch@zew.de

Ulrich Schreiber
Mannheim University
Chair of Business Administration and Taxation
Schloss
68131 Mannheim
Germany

Georg Wamser
Ifo Institute for Economic Research at the University of Munich
Poschingerstr. 5
81679 Munich
Germany
wamser@ifo.de

July 2006
1 Introduction

Multinational corporations use not only external capital but also intercompany loans in order to optimize their capital structure. This might contribute to a lower sensitivity of investment decisions to differences in taxation across countries, and, in addition, aggravates the adverse revenue consequences of tax planning for tax policy. While the impact of taxes on finances is well established in the literature on corporation taxes (see Auerbach, 2002, and Graham, 2003, for a survey), the multinationals’ choice of the capital structure has only recently been addressed in the empirical literature. For Canadian- and US-controlled firms Jog and Tang (2001) found a significant impact of tax rate differentials between Canada and the US. For a sample of US controlled affiliates Desai, Foley, and Hines (2004) show that especially internal borrowing of US corporations is sensitive to taxation. It is, however, not obvious whether these results can be generalized to other countries where multinationals are not subject to a tax credit system. The current paper considers the impact of taxes on the capital structure of German corporations for which, as is typical for EU countries, repatriated foreign profits are basically exempt from corporation taxes.

2 Theoretical Background

Following Modigliani and Miller (1958, 1963), corporations would generally favor debt, since the tax shield from deductible interest expenses increases the company value. In order to explain why corporations nevertheless use equity, the literature uses alternative theories (see Myers, 2001, and Auerbach, 2002). Generally, these theories stress the trade-off between the gains from the tax shield through interest deductions and the agency cost of debt, reflecting the inability to solve potential conflict between equity and debt claimants by means of contracts (Jensen and Meckling, 1976, and Myers, 1977).
To derive the optimal capital structure, consider the profit function for a multinational

\[ \pi = f(k_1)(1 - t_1) + f(k_2)(1 - t_2) \]

(1)

\[ - [i_1 \lambda_1 k_1 + i_2 \mu_1 k_1](1 - t_1) \]
\[ - [i_2 \lambda_2 k_2 + i_1 \mu_2 k_2](1 - t_2) \]
\[ - r [k_1 (1 - \lambda_1 - \mu_1) + k_2 (1 - \lambda_2 - \mu_2)] \]
\[ - [c_1 (\lambda_1, \mu_1) k_1 + c_2 (\lambda_2, \mu_2) k_2], \]

where \( f(k_i) \) denotes the output at location \( i \) where \( k_i \) units of capital are employed. \( t_i \)

is the local tax rate on capital income. The second and third lines capture the cost of
debt, where \( \mu_i, \lambda_i \) denote the share of capital financed with internal and external debt,
respectively. Internal debt is remunerated at the other location’s interest rate.\(^1\) While the
fourth line contains the opportunity cost of equity, the last line captures the agency cost
of debt, which is not only increasing in both external and internal debt but also convex
\( c_{j,\mu\mu} \equiv \frac{\partial^2 c_j}{\partial \mu_j^2} > 0, \quad c_{j,\lambda\lambda} \equiv \frac{\partial^2 c_j}{\partial \lambda_j^2} > 0. \) If the cross-partial derivative \( c_{j,\lambda\mu} \equiv \frac{\partial^2 c_j}{\partial \lambda_j \partial \mu_j} \) is positive,
the two types of finance are substitutes, since the marginal agency cost for each type of
debt would increase if the other type of debt is used more heavily. We further impose some
regularity conditions \( c_{j,\mu\mu} > |c_{j,\mu_j,\lambda_j}|, \quad \text{and} \quad c_{j,\lambda\lambda} > |c_{j,\lambda_j,\mu_j}| \) such that cross-effects are
always dominated by the own effects.

The profit function assumes that the lending part of the multinational incurs debt in order
to finance the loan, implying that the required rate of return on equity is higher than the
net-of-tax cost of debt. This assumption is likely to be met if the lending part is located
in a high-tax country, such that there is little incentive to transform foreign into domestic
profits.\(^2\) We retain this assumption, since the empirical analysis is concerned with the case of
German multinationals, where the parent company is indeed located in a high tax country.

\(^1\)The company might have an incentive to set the interest rates above the market value, but we assume
that the arm’s length principle is effective.

\(^2\)The alternative case is discussed by Mintz and Smart (2005).
Given the profit function the optimum share of external debt incurred by affiliate 2 obeys

\[ r - (1 - t_2) i_2 = c_{2,\lambda} (\lambda_2, \mu_2). \]  

(2)

The convexity of \( c_2 \) implies that if \( r > (1 - t_2) i_2 \), \( \lambda_2 \) is positive. Thus, if the after-tax return to capital is below the required rate of return on equity, there will be some external borrowing. The optimum share of internal funds used at location 2 is determined by

\[ r - (1 - t_2) i_1 = c_{2,\mu} (\lambda_2, \mu_2). \]  

(3)

If the after-tax return to capital for intercompany debt is below the required rate of return on equity \( r > (1 - t_2) i_1 \), a part of the capital invested at location 2 is financed with internal debt.

We can derive the comparative static properties by differentiating the system of the two first-order conditions which we obtained from our profit function.

\[
\begin{bmatrix}
  i_2 dt_2 - (1 - t_2) di_2 \\
  i_1 dt_2 - (1 - t_2) di_1
\end{bmatrix} =
\begin{bmatrix}
  c_{2,\lambda\lambda} & c_{2,\lambda\mu} \\
  c_{2,\mu\lambda} & c_{2,\mu\mu}
\end{bmatrix}
\begin{bmatrix}
  d\lambda_2 \\
  d\mu_2
\end{bmatrix}
\]

Solving for the respective channel of finance we can state the corresponding comparative static effects. Let us consider first the effects of the interest rate on external debt

\[
\frac{d\lambda_2}{di_2} = \left( \frac{1}{|H|} \right) \left( - (1 - t_2) c_{2,\mu\mu} \right) < 0,
\]  

(4)

where the determinant of the Hessian \(|H|\) is positive given the regularity assumptions about the cost function.\(^3\) Thus, the expression is unambiguously negative, indicating that an increase in the local interest rate causes a reduction in the external leverage.

\(^3\) \( c_{j,\mu\mu} > |c_{j,\mu\lambda}|, \quad \text{and} \quad c_{j,\lambda\lambda} > |c_{j,\lambda\mu}| \)
With regard to internal debt we obtain

\[
\frac{d\mu_2}{dt_2} = \left( \frac{1}{|H|} \right) \left( + (1 - t_2) c_{2,\lambda\mu} \right) \succcurlyeq 0.
\]  

(5)

Assuming that the two types of debt act as substitutes \((c_{2,\lambda\mu} > 0)\) the expression is positive, indicating that an increase in the local interest rate causes an increase in inter-company debt. Making use, once more, of the imposed regularity conditions we note that the direct impact on external borrowing \((4)\) always dominates and total leverage declines.

Furthermore, let us consider the effects of the tax rate

\[
\frac{d\lambda_2}{dt_2} = \left( \frac{1}{|H|} \right) \left( i_2 c_{2,\mu\mu} - i_1 c_{2,\lambda\mu} \right) \succcurlyeq 0.
\]  

(6)

Given the two types of debt act as substitutes \((c_{2,\lambda\mu} > 0)\), the sign is ambiguous. But if the interest rate at the parent location is not much higher than the interest rate at the affiliate, the derivative will be positive: higher taxation leads to a higher leverage. Similarly, for the intercompany loans:

\[
\frac{d\mu_2}{dt_2} = \left( \frac{1}{|H|} \right) \left( i_1 c_{2,\lambda\lambda} - i_2 c_{2,\lambda\mu} \right) \succcurlyeq 0.
\]  

(7)

If the interest rates differ not much, higher taxation also leads to a higher leverage related to intercompany loans.

### 3 Data and Specification

The first-order conditions give rise to two basic testable relationships for the finances of foreign affiliates of German multinationals. The comparative static properties suggest that external capital used at location \(j\) should decline in the pre-tax rate of interest but increase in the local tax rate. With regard to intercompany loans our analysis suggests that the amount
of intercompany loans used at a location is an increasing function of the local tax rate as it reduces the net-of-tax rate of interest. Via its impact on external borrowing, however, also the local interest rate will matter. Given these considerations, the same estimation equation can be used for either type of leverage of an affiliate in country \( j \) held by a German multinational \( k \) in period \( t \)

\[
Y_{j,k,t} = a_0 + a_1 x_{j,k,t} + a_2 t_{j,t} + a_3 \log i_{j,t} + a_k + a_t + \epsilon_{j,t},
\]

where \( a_t \) is a time-specific and \( a_k \) group-specific effect for all affiliates held by company \( k \). Note that the former also captures the interest rate at the parent location as we consider only German multinationals. The company-specific effect encompasses the company-specific opportunity cost of capital \( r \) which might also include elements of personal taxation at the level of the shareholder. \( x_{j,k,t} \) captures further characteristics of the subsidiary which affect the use of debt or the access to credit. As the lending rate is difficult to measure we separate out its impact from that of taxes, captured by the tax rate as an approximation to the log of unity minus tax rate.

The empirical analysis uses a Bundesbank database providing annual firm-level panel data for the period 1996 to 2003. The collection of the data is prescribed by German law, which determines reporting mandates for international transactions (Lipponer, 2006). Since the model assumes a two-tier company structure, we focus on majority owned subsidiaries and exclude indirectly held investment. Furthermore, as the underlying 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 as well.

In order to capture the tax incentive, the analysis employs the statutory tax rate on corporate income modified by applicable restrictions on interest deductions. Thus, the statutory tax rate represents the tax savings from deducting one unit of interest. Since the effective tax reduction from using debt is zero if there is a loss carry-forward (MacKie-Mason, 1990)
Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital (€ 1,000)</strong></td>
<td>31,258</td>
<td>175,776</td>
<td>112</td>
<td>15,200,000</td>
</tr>
<tr>
<td><strong>Turnover (€ 1,000)</strong></td>
<td>52,486</td>
<td>370,006</td>
<td>1,000</td>
<td>51,900,000</td>
</tr>
<tr>
<td>External leverage</td>
<td>.364</td>
<td>.250</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Internal leverage</td>
<td>.248</td>
<td>.250</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Statutory tax rate</td>
<td>.346</td>
<td>.068</td>
<td>.100</td>
<td>.532</td>
</tr>
<tr>
<td>Loss carry-forward</td>
<td>.292</td>
<td>.455</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Lending rate</td>
<td>.075</td>
<td>.044</td>
<td>.027</td>
<td>.364</td>
</tr>
</tbody>
</table>

40,300 observations covering subsidiaries in 26 host countries in the eight years from 1996 - 2003. Tax rate and lending rate vary only by country-year cells.

corresponding dummy variable is included. In the lack of information about firm-specific interest expenses, we employ the lending rates for credit to the private sector taken from the IMF, augmented, where possible, with ECB data. In order to control for further variation in the lending conditions we employ turnover as an indicator of size and cash-flow of the affiliate both of which will generally be positively associated with the lending conditions. 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 1 and 2 report descriptive statistics.

4 Results

Columns (1)-(3) of Table 3 report estimation results for the ratio of external debt to the affiliate’s total stock of capital. The results confirm a positive impact of taxes and an adverse effect of local lending conditions on the leverage. The presence of a loss carry-forward exerts
Table 2: Descriptive Statistics for Outbound FDI

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Mean (€ 1,000)</td>
<td>Mean</td>
<td>Mean</td>
<td>Mean</td>
</tr>
<tr>
<td>Australia</td>
<td>852</td>
<td>17,715</td>
<td>.619</td>
<td>.303</td>
<td>.316</td>
</tr>
<tr>
<td>Austria</td>
<td>2,601</td>
<td>25,318</td>
<td>.605</td>
<td>.380</td>
<td>.225</td>
</tr>
<tr>
<td>Belgium</td>
<td>1,666</td>
<td>43,044</td>
<td>.634</td>
<td>.381</td>
<td>.253</td>
</tr>
<tr>
<td>Canada</td>
<td>679</td>
<td>31,141</td>
<td>.541</td>
<td>.316</td>
<td>.225</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2,180</td>
<td>25,151</td>
<td>.623</td>
<td>.360</td>
<td>.264</td>
</tr>
<tr>
<td>Denmark</td>
<td>765</td>
<td>18,844</td>
<td>.656</td>
<td>.404</td>
<td>.253</td>
</tr>
<tr>
<td>Finland</td>
<td>304</td>
<td>19,589</td>
<td>.566</td>
<td>.325</td>
<td>.240</td>
</tr>
<tr>
<td>France</td>
<td>4,861</td>
<td>27,890</td>
<td>.646</td>
<td>.405</td>
<td>.241</td>
</tr>
<tr>
<td>Great Britain</td>
<td>3,312</td>
<td>29,949</td>
<td>.560</td>
<td>.350</td>
<td>.246</td>
</tr>
<tr>
<td>Greece</td>
<td>404</td>
<td>22,245</td>
<td>.651</td>
<td>.373</td>
<td>.278</td>
</tr>
<tr>
<td>Hungary</td>
<td>1,368</td>
<td>36,191</td>
<td>.564</td>
<td>.335</td>
<td>.229</td>
</tr>
<tr>
<td>Ireland</td>
<td>331</td>
<td>19,575</td>
<td>.502</td>
<td>.279</td>
<td>.224</td>
</tr>
<tr>
<td>Italy</td>
<td>3,305</td>
<td>28,951</td>
<td>.720</td>
<td>.439</td>
<td>.282</td>
</tr>
<tr>
<td>Japan</td>
<td>954</td>
<td>54,095</td>
<td>.672</td>
<td>.460</td>
<td>.211</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>58</td>
<td>17,254</td>
<td>.702</td>
<td>.496</td>
<td>.206</td>
</tr>
<tr>
<td>Mexico</td>
<td>562</td>
<td>62,787</td>
<td>.512</td>
<td>.245</td>
<td>.267</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2,133</td>
<td>28,528</td>
<td>.576</td>
<td>.336</td>
<td>.240</td>
</tr>
<tr>
<td>New Zealand</td>
<td>116</td>
<td>11,101</td>
<td>.536</td>
<td>.269</td>
<td>.267</td>
</tr>
<tr>
<td>Norway</td>
<td>327</td>
<td>26,060</td>
<td>.605</td>
<td>.345</td>
<td>.260</td>
</tr>
<tr>
<td>Poland</td>
<td>2,533</td>
<td>19,448</td>
<td>.610</td>
<td>.341</td>
<td>.269</td>
</tr>
<tr>
<td>Portugal</td>
<td>317</td>
<td>24,813</td>
<td>.562</td>
<td>.344</td>
<td>.218</td>
</tr>
<tr>
<td>Slovakia</td>
<td>448</td>
<td>28,476</td>
<td>.566</td>
<td>.328</td>
<td>.238</td>
</tr>
<tr>
<td>Spain</td>
<td>2,739</td>
<td>33,263</td>
<td>.607</td>
<td>.379</td>
<td>.227</td>
</tr>
<tr>
<td>Sweden</td>
<td>934</td>
<td>20,638</td>
<td>.614</td>
<td>.339</td>
<td>.274</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2,610</td>
<td>18.674</td>
<td>.549</td>
<td>.367</td>
<td>.182</td>
</tr>
<tr>
<td>USA</td>
<td>3,941</td>
<td>57,781</td>
<td>.583</td>
<td>.300</td>
<td>.283</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40,300</strong></td>
<td><strong>31,258</strong></td>
<td><strong>.612</strong></td>
<td><strong>.364</strong></td>
<td><strong>.248</strong></td>
</tr>
</tbody>
</table>

Descriptive statistics for the estimation sample covering German outbound FDI in the period from 1996 until 2003. The list of host countries includes 26 countries, 14 of these countries are EU members in the period analyzed.
a weak negative impact, indicating that a loss carry-forward either directly reduces the gain from tax savings by debt finance, or, alternatively, that uncertainties hamper access to credit. The positive sign of turnover in column (2) is in accordance with the view that a larger size or cash-flow improves the access to external capital. Column (3) shows that the results are robust if also industry dummies control for further heterogeneity among affiliates. Columns (4)-(6) report results for internal debt. Again, we find a significant positive effect of the statutory tax rate. After inclusion of controls for industries and turnover, the coefficient is only slightly smaller than in the case of external debt. The effect of the lending rate, however, differs, showing a positive effect on the share of internal debt. This conforms with the view that external and internal debt are substitutes. A substitutive relationship is further in accordance with the results for the turnover, which exerts opposite effects on external and internal debt.

While the empirical results represent average effects, some affiliates report zero levels of external and/or internal capital, where specific conditions may impede an interior solution. The results, reported in Table 4, are, however, not much different.

The impact of local lending conditions is in accordance with Desai et al., who employ indicators of the local credit market including the rate of inflation, measures of country risk, creditor rights, and the size of the credit market. As shown in Table 5, the empirical variation in the lending rate used in our analysis can be well predicted by their measures. Consequently, alternative estimations using the predicted lending rate or instrumental variable approaches obtained rather similar results.

With regard to the magnitude of the estimated effects, the results suggest that a 10 percentage point increase in the statutory tax rate on corporate earnings is associated approximately with a 1.9 percentage point increase in the external debt ratio (column 3) and a 1.5 percentage point increase in the internal debt ratio (column 6), taken together the leverage increases by 3.4 percentage points. This is partly consistent with Mintz and Weichenrieder (2005), who
Table 3: Results

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Share of External Debt</th>
<th>Share of Internal Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Statutory tax rate</td>
<td>.240 *</td>
<td>.177 *</td>
</tr>
<tr>
<td></td>
<td>(.046)</td>
<td>(.050)</td>
</tr>
<tr>
<td>(log)Lending rate</td>
<td>-.042 *</td>
<td>-.035 *</td>
</tr>
<tr>
<td></td>
<td>(.006)</td>
<td>(.007)</td>
</tr>
<tr>
<td>Loss carry-forward</td>
<td>-.007 *</td>
<td>-.003</td>
</tr>
<tr>
<td></td>
<td>(.003)</td>
<td>(.003)</td>
</tr>
<tr>
<td>(log)Turnover</td>
<td>.028 *</td>
<td>.027 *</td>
</tr>
<tr>
<td></td>
<td>(.002)</td>
<td>(.002)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry effects</th>
<th>no</th>
<th>no</th>
<th>yes</th>
<th>no</th>
<th>no</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R^2$</td>
<td>.029</td>
<td>.044</td>
<td>.052</td>
<td>.022</td>
<td>.032</td>
<td>.068</td>
</tr>
</tbody>
</table>

Company and time fixed effects included. Standard errors are robust against random firm-specific and country effects using the usual Huber-White sandwich formula. An asterisk denotes significance at 5% level. 40,300 observations, 4,115 firms.
Table 4: Results for Non-Zero Observations

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Share of External Debt</th>
<th>Share of Internal Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Statutory tax rate</td>
<td>.225</td>
<td>.154</td>
</tr>
<tr>
<td></td>
<td>(.047)</td>
<td>(.051)</td>
</tr>
<tr>
<td>(log)Lending rate</td>
<td>-.050 *</td>
<td>-.042 *</td>
</tr>
<tr>
<td></td>
<td>(.006)</td>
<td>(.007)</td>
</tr>
<tr>
<td>Loss carry-forward</td>
<td>-.012 *</td>
<td>-.007 *</td>
</tr>
<tr>
<td></td>
<td>(.003)</td>
<td>(.003)</td>
</tr>
<tr>
<td>(log)Turnover</td>
<td>.031 *</td>
<td>.030 *</td>
</tr>
<tr>
<td></td>
<td>(.002)</td>
<td>(.002)</td>
</tr>
<tr>
<td>Industry effects</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.034</td>
<td>.055</td>
</tr>
</tbody>
</table>

Empirical results for observations with non-zero debt only. The sample size is reduced slightly. Company level and time fixed effects included. Standard errors are robust against random firm-specific and country effects using the usual Huber-White sandwich formula. An asterisk denotes significance at 5% level. 35,469 observations, 3,761 firms.

find that German multinationals respond almost exclusively with internal debt. However, our results do support effects on external debt as well.

Comparing our results with Desai, Foley and Hines (2004) we find that the elasticity of external borrowing implied by the point estimate is rather similar. Evaluated at mean values of taxes and leverage, the elasticity of external borrowing is 0.18 in the German case compared with 0.19 in the US case. The elasticity of internal borrowing in the German case is, however, only 0.21 as compared to 0.35 in the US case.
Table 5: Determinants of the Lending Rate

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation</td>
<td>1.03  *</td>
<td>.691  *</td>
<td>.692  *</td>
<td>.667  *</td>
</tr>
<tr>
<td></td>
<td>(.058)</td>
<td>(.068)</td>
<td>(.068)</td>
<td>(.071)</td>
</tr>
<tr>
<td>Country risk</td>
<td>2.47  *</td>
<td>2.25  *</td>
<td>2.37  *</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.476)</td>
<td>(.502)</td>
<td>(.526)</td>
<td></td>
</tr>
<tr>
<td>Private credit</td>
<td>-.004</td>
<td>-.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.003)</td>
<td>(.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creditor rights</td>
<td></td>
<td></td>
<td>-.195  *</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(.098)</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.770</td>
<td>.808</td>
<td>.810</td>
<td>.816</td>
</tr>
</tbody>
</table>

Determinants of the lending rate for the panel of 26 host countries from 1996 to 2003. Inflation is taken from World Economic Outlook Database. Country risk is an index provided by the German investment credit insurance agency which ranks from 1 (low risk) to 7 (high risk). Private credit represents the ratio of domestic credit to the private sector to GDP in % taken from World Development Indicators as provided by the World Bank. The Creditor rights index is also taken from the World Bank. It ranges from 0 to 10, with higher scores indicating that the risk to the creditor is lower. Standard errors are robust to heteroscedasticity. An asterisk denotes significance at 5% level. Time dummies are included. 184 observations covering 26 countries over 8 years.
5 Conclusions

The empirical analysis of the capital structure choice of multinationals confirms that the local tax burden exerts important effects on the affiliate’s leverage. This refers not only to external debt; our findings indicate that a higher local tax rate is also associated with an increase in internal debt. This shows that multinationals have access to an additional instrument which can be used to exploit the tax savings opportunities of debt finance.

The failure to find a higher tax sensitivity in the German as compared to the US case indicates that the international tax regime with regard to tax exemption vs. tax credit has little impact on the tax sensitivity of finances. This suggests that the foreign tax credit may actually be alleviated by deferred repatriation of profits (e.g., Hines and Rice, 1994, Altshuler and Grubert, 2003, Grubert, 2003) or other forms of tax planning.

A final remark is in order on the potential role of constraints such as thin-capitalization rules. Given the existence of such rules, the tax sensitivity of the capital structure might be underestimated to some extent. The analysis of the consequences of those constraints is, however, left for future research.

Datasources and Definitions

Firm-level data are taken from the micro-level dataset of the Bundesbank (MiDi), 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 vari-
able contains statutory profit tax rates modified by applicable restrictions on interest deductions.

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

**Country Risk** is a risk index provided by the German investment credit insurance agency (Auslandsgeschäftsabsicherung der Bundesrepublik Deutschland), which ranks from 1 (low risk) to 7 (high risk).

**Creditor Rights** index taken from World Bank doing business project ranges from 0 to 10, with higher scores indicating that collateral and bankruptcy laws are better designed to expand access to credit.

**Inflation** is taken from World Economic Outlook Database.

**Private Credit** contains domestic credit to private sector to GDP in % taken from World Development Indicators provided by World Bank.

**References**


CESifo Working Paper Series
(for full list see www.cesifo-group.de)

1780 Gregory Ponthiere, Growth, Longevity and Public Policy, August 2006

1781 Laszlo Goerke, Corporate and Personal Income Tax Declarations, August 2006


1783 Adam S. Posen and Daniel Popov Gould, Has EMU had any Impact on the Degree of Wage Restraint?, August 2006

1784 Paolo M. Panteghini, A Simple Explanation for the Unfavorable Tax Treatment of Investment Costs, August 2006

1785 Alan J. Auerbach, Why have Corporate Tax Revenues Declined? Another Look, August 2006

1786 Hideshi Itoh and Hodaka Morita, Formal Contracts, Relational Contracts, and the Holdup Problem, August 2006

1787 Rafael Lalive and Alejandra Cattaneo, Social Interactions and Schooling Decisions, August 2006

1788 George Kapetanios, M. Hashem Pesaran and Takashi Yamagata, Panels with Nonstationary Multifactor Error Structures, August 2006

1789 Torben M. Andersen, Increasing Longevity and Social Security Reforms, August 2006

1790 John Whalley, Recent Regional Agreements: Why so many, why so much Variance in Form, why Coming so fast, and where are they Headed?, August 2006

1791 Sebastian G. Kessing and Kai A. Konrad, Time Consistency and Bureaucratic Budget Competition, August 2006


1793 Peter Birch Sørensen, Can Capital Income Taxes Survive? And Should They?, August 2006


1795 Marcel Gérard, Reforming the Taxation of Multijurisdictional Enterprises in Europe, a Tentative Appraisal, September 2006
1796 Louis Eeckhoudt, Béatrice Rey and Harris Schlesinger, A Good Sign for Multivariate Risk Taking, September 2006


1798 Dan Bernhardt, Stefan Krasa and Mattias Polborn, Political Polarization and the Electoral Effects of Media Bias, September 2006

1799 Pierre Pestieau and Motohiro Sato, Estate Taxation with Both Accidental and Planned Bequests, September 2006

1800 Øystein Foros and Hans Jarle Kind, Do Slotting Allowances Harm Retail Competition?, September 2006

1801 Tobias Lindhe and Jan Södersten, The Equity Trap, the Cost of Capital and the Firm’s Growth Path, September 2006


1804 David-Jan Jansen and Jakob de Haan, Does ECB Communication Help in Predicting its Interest Rate Decisions?, September 2006


1806 Friedrich Schneider, Shadow Economies and Corruption all over the World: What do we really Know?, September 2006


1808 Axel Dreher, Jan-Egbert Sturm and James Raymond Vreeland, Does Membership on the UN Security Council Influence IMF Decisions? Evidence from Panel Data, September 2006

1809 Prabir De, Regional Trade in Northeast Asia: Why do Trade Costs Matter?, September 2006

1810 Antonis Adam and Thomas Moutos, A Politico-Economic Analysis of Minimum Wages and Wage Subsidies, September 2006

1811 Guglielmo Maria Caporale and Christoph Hanck, Cointegration Tests of PPP: Do they also Exhibit Erratic Behaviour?, September 2006
1812 Robert S. Chirinko and Hisham Foad, Noise vs. News in Equity Returns, September 2006

1813 Oliver Huelsewig, Eric Mayer and Timo Wollmershaeuser, Bank Behavior and the Cost Channel of Monetary Transmission, September 2006

1814 Michael S. Michael, Are Migration Policies that Induce Skilled (Unskilled) Migration Beneficial (Harmful) for the Host Country?, September 2006

1815 Eytan Sheshinski, Optimum Commodity Taxation in Pooling Equilibria, October 2006

1816 Gottfried Haber and Reinhard Neck, Sustainability of Austrian Public Debt: A Political Economy Perspective, October 2006


1818 Eric O’N. Fisher and Sharon L. May, Relativity in Trade Theory: Towards a Solution to the Mystery of Missing Trade, October 2006

1819 Junichi Minagawa and Thorsten Uppmann, Labor Supply and the Demand for Child Care: An Intertemporal Approach, October 2006


1821 Sijbren Cnossen, Alcohol Taxation and Regulation in the European Union, October 2006

1822 Frederick van der Ploeg, Sustainable Social Spending in a Greying Economy with Stagnant Public Services: Baumol’s Cost Disease Revisited, October 2006


1824 J. Atsu Amegashie, A Psychological Game with Interdependent Preference Types, October 2006

1825 Kurt R. Brekke, Ingrid Koenigbauer and Odd Rune Straume, Reference Pricing of Pharmaceuticals, October 2006

1826 Sean Holly, M. Hashem Pesaran and Takashi Yamagata, A Spatio-Temporal Model of House Prices in the US, October 2006

1827 Margarita Katsimi and Thomas Moutos, Inequality and the US Import Demand Function, October 2006

1828 Eytan Sheshinski, Longevity and Aggregate Savings, October 2006
1829 Momi Dahan and Udi Nisan, Low Take-up Rates: The Role of Information, October 2006

1830 Dieter Urban, Multilateral Investment Agreement in a Political Equilibrium, October 2006


1832 Wolfram F. Richter, Taxing Human Capital Efficiently: The Double Dividend of Taxing Non-qualified Labour more Heavily than Qualified Labour, October 2006

1833 Alberto Chong and Mark Gradstein, Who’s Afraid of Foreign Aid? The Donors’ Perspective, October 2006


1835 Andy Snell and Jonathan P. Thomas, Labour Contracts, Equal Treatment and Wage-Unemployment Dynamics, October 2006

1836 Peter Backé and Cezary Wójcik, Catching-up and Credit Booms in Central and Eastern European EU Member States and Accessing Countries: An Interpretation within the New Neoclassical Synthesis Framework, October 2006


1838 Michael Rauscher, Voluntary Emission Reductions, Social Rewards, and Environmental Policy, November 2006

1839 Vincent Vicard, Trade, Conflicts, and Political Integration: the Regional Interplays, November 2006

1840 Erkki Koskela and Mikko Puhakka, Stability and Dynamics in an Overlapping Generations Economy under Flexible Wage Negotiation and Capital Accumulation, November 2006