Capital Structure Choice in Germany: Federal and Local Tax Incentives

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Abstract: This paper analyzes the effects of taxation on financial leverage decisions of German companies. There are several forms of business taxation in Germany that may impact a companies´ choice of capital structure in different ways. In general, due to the deductibility of interest expenses from the corporate tax base, debt may be preferred to equity finance. The local trade tax, however, is levied on an adjusted measure of profit where, among other things, fifty percent of long-term interest payments have to be added to the tax base. This leads to an additional, separate tax burden at the margin and can, thus, be seen as a disincentive of using debt. Especially companies with low profits may negatively be affected. Our results, which are based on a panel of matched survey and financial accounts data, suggest that an increase of the tax benefit of debt over equity has a positive and statistically significant effect on the incentive of using debt, while the additions in the local business tax imply a disincentive for debt finance, making it less attractive to use an additional unit of debt. On average, an increase of the tax benefit by about 10 percentage points increases the debt ratio by 13.7 percentage points. Opposed to this, the local additional tax burden on debt decreases the debt ratio by about 9.8 percentage points. Our results further indicate that the disincentive of using debt is higher for firms relying more heavily on long-term debt.

Keywords: Capital Structure; Financial Leverage; Corporate Income Taxation; Firm-Level Data; Local Business Tax

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1 Introduction

The effects of corporate taxation on financial leverage are a key issue in the public debate about tax policy. Generally, in contrast to costs of equity, interest payments on debt can be deducted from the corporate tax base, providing an incentive for using debt finance. This preferential tax treatment may distort capital structure choices. In Germany, however, besides the conventional tax advantage of debt financing, there is a separate, adverse tax incentive to use less instead of more debt. Since 1984, 50 percent of interest on long-term debt are added to the tax base. This may especially be important for firms with few or no taxable income as the trade tax acts like a definite tax on a firm´s stock of debt.

As discussed e.g. by Graham (2003) or Auerbach (2002), to generate empirical predictions about how taxes actually affect financial leverage of firms is not as straightforward as it may seem. Even if cross-sectional or time series data on firms is available, attempts to relate financial leverage decisions on statutory or effective tax rates often fail because there is either insufficient variation in the tax rate across companies or time or because effective tax rates calculated from actual tax payments are endogenous. Thus, empirical estimates tax effects are often rather small and insignificant (see, e.g. Myers, 1984). Recent studies (an overview is, *e.g.*, given in Graham, 1996b, or Weichenrieder, 2006), however, find a positive impact of tax benefits on financial leverage or, depending on the focus of interest, mostly substitutive effects of alternative non-tax debt shields. To identify tax effects, studies exploit loss carry-forwards as well as differential treatment of small or large firms (see, *e.g.* MacKie-Mason, 1990, Alworth and Arachi, 2001, or Gordon and Lee, 2001) or take advantage of the differences in national tax rates using international data (see, *e.g.* Rajan and Zingales, 1995). Furthermore and especially during the last years, international tax planning activities and financing decisions of multinationals gained much interest (see, *e.g.* Altshuler and Grubert, 2002, Desai, Foley and Hines, 2004, Mintz and Weichenrieder, 2005, or Buettner and Wamser, 2007) and several studies emphasize the importance of taking into account not only corporate profit but also personal capital income tax burdens (see, *e.g.* Graham, 2003, Gordon and Lee, 2001, 2007, or) when considering the impact of taxation on capital structure decisions.

This paper employs a new firm-level dataset of German, mostly standalone, manufacturing com-

panies that covers the period 1994-2007, when major institutional changes in the German tax law took place. This data provides us with ample information on financial leverages and other financial statement variables of different firms and years. Furthermore, due to the institutional setting in Germany, we can formulate tax indicators that contain not only corporate profit and personal tax rates but also firm-specific local tax rates which vary at the level of municipalitites. The tax indicator is based on a theoretical model of capital structure choice that allows us to formulate the incentive of using a unit of debt instead of equity and, at the same time, separate out the tax effects due to the tax-base additions as part of the local business tax. Therefore, we can also measure the disincentive of using debt exerted by the local business tax.

Our empirical results suggest that the conventional tax shield of debt finance is associated with a higher financial leverage. The estimated coefficient is statistically significant and rather large: on average, an increase of the tax benefit by 10 percentage points leads to an increase in the ratio of debt to total capital by about 13.7 percentage points. An increase in the additional tax burden of about 10 percentage points, however, implies an almost equal sized and statistically significant reduction in the financial leverage of firms. This result is robust to different specifications and may impact companies´ marginal financial decisions in general. The positive tax incentive, in contrast, may only be effective for firms with positive taxable income.

The paper is organized as follows. In Section 2, based on a theoretical model of capital structure choice, we derive the tax indicators used to estimate the impact of tax benefits and the additional local tax burden on debt and discuss how to empirically implement them. The dataset and the investigation approach are presented in Section 3. Section 4 provides the basic results using a fixed effects model, which has often been used in the literature. In the near future, these results will be complemented by further estimations on the responsiveness of debt ratios in case that firms have shares of long-term debt above average. Furthermore, I want to find out if more elaborated methods allow to differentiate between firms with different profit status as this may provide us with further insights. Finally, Section 5 provides a brief summary and concludes.

2 Taxation and Choice of Capital Structure

To capture the role of taxation for a company´s choice of debt versus equity finance, we first derive the firm value V by considering the return of a company investment relative to an investment in some alternative asset earning a fixed rate of interest r:

$$\theta_r r = \theta_g \frac{\dot{V}}{V} + \frac{R_n}{V},$$

Here, $\theta_r r = (1 - \tau_r)r$ captures after tax interest revenues with τ_r being the tax rate on interest charged at the level of the lender, $\theta_g = 1 - \tau_g$ is the respective tax factor if there are capital gains and R_n is the after-tax dividend paid to shareholders. In equilibrium, i.e. for an investor to be indifferent between both alternatives, the return from the company investment consisting of dividend payments and payments due to changes in firm value ($\dot{V}$) must be equal to the return of the alternative asset. This asset may be some government bond, but also the firm may issue debt. Let D be new debt which augments the existing stock of debt B according to $\dot{B} = D$, and which is also served according to the interest rate r.

Taking account of this fact, the dividends net of taxes, R_n, are then given by

$$R_n = \theta_d \left[\theta_c \left(\Pi\left(K\right) - rB\right) - I + D\right],$$

where $\Pi(K)$ is operating profit earned on capital inputs K and θ_c is the net tax factor on corporate profits ($\theta_c = 1 - \tau_c$, with τ_c as statutory corporate tax rate). As can be seen, following most tax systems around the world, interest payments on debt rB can be deducted from the tax base and therefore reduce cash flows. The firm carries out investment I which lowers the amount of distributable profits, but receives additional debt D if it opts for debt financing.[1] However, when distributing profits, there is an additional tax burden on dividends (τ_d), resulting in a net dividend of θ_d times the term in brackets.

[1]Here, we have ignored that there are investment related factors like cost for adjusting the capital stock, depreciation, etc. As we are not interest in investment, however, the theoretical model is kept as short as possible.

Together with the expression for net dividends, rearranging the arbitrage condition yields

$$\dot{V} = V \underbrace{r\frac{\theta_r}{\theta_g}}_{\rho} - \frac{R_n}{\theta_g}$$

resulting in a firm value of

$$V = \int_t^{\infty} e^{-\rho(s-t)} \left(\frac{R_n}{\theta_g}\right) ds,$$

which is equal to the present value of all current and future dividend payments net of taxes.

Based on a given initial stock of capital K and a sequence of investment $I = \dot{K} + \delta K$, with δ being economic depreciation, we have thus arrived at a model explaining firm value and which could be used to make predictions about which sequence of investment is chosen by the firm. In that case, we would also need to account for the fact that marginal investment can be financed differently and that current investment has consequences for the next periods´ stock of capital. Thus, we have an intertemporal optimization problem that can be solved using the current value Hamiltonian

$$H = \frac{R_n}{\theta_g} + q[I - \delta K] + pD.$$

Instead of considering a one-period increase of the capital stock, however, we focus on the choice between debt and equity finance and consider how an additional unit of debt changes the value of the firm. This is captured by the shadow price p.

Assuming that the company´s general purpose is to maximize the wealth of its owners, *i.e.* the market value V, and accounting for the fact that B is a state variable which changes according to the equation of motion given above, we obtain the first order condition

$$-\frac{\partial H}{\partial B} = \frac{\theta_d \theta_c}{\theta_g} r \stackrel{!}{=} \dot{p} - \rho p$$

and, finally, a differential equation for the shadow value of debt

$$p = \int_t^{\infty} e^{-\rho(s-t)} \left(-\frac{r\theta_d\theta_c}{\theta_g}\right) ds.$$

Now, since all parameters are constant, taking into account that the discount rate is equal to $\rho = \frac{\theta_r}{\theta_g} r$, this can be solved to obtain

$$p = -\frac{\theta_d \theta_c}{\theta_r} \tag{1}$$

as the marginal effect of debt on firm value. Thus, if the (total) tax burden on corporate profits is higher than the tax burden on interest income at the personal level, i.e. if $\theta_d \theta_c < \theta_r$, each additional unit of debt is decreasing the firm value less than proportionally, such that debt will be favoured over equity. Intuitively, this makes sense: As, via interest payments, the stock of debt reduces cash flow, its marginal effect on cash flow after corporation and dividend taxes is $-\theta_d \theta_c r$. Since after-tax cash flows enter the firm value after division by θ_g we obtain $\frac{-\theta_d \theta_c r}{\theta_g}$ and, accounting for the fact that an additional unit of debt will change cash flows in all periods, using the discount rate ρ, we finally end up with $p = -\frac{\theta_d \theta_c}{\theta_r}$ as derived above.

2.1 Federal and Local Taxes in Germany

The tax indicators calculated so far account for the statutory tax rate τ_c on retained earnings or distributed profits as well as the personal tax rate on dividend (τ_d) and interest income (τ_r). During the period 1994-2007, the German government changed these taxes several times and there was a major change in the tax law with the full imputation and split rate system being replaced in 2001 by the so-called half-income system (Tax Relief Act 2001). This implied the replacement of two corporate tax rates - one on retained earnings (40%) and one on distributed profits (30%) - by a lower, overall statutory tax rate of 25% and the broadening of the tax base by lowering depreciation allowances and cutting tax loss carry-back opportunities. Moreover, a firm's corporation tax was no longer fully credited against the shareholder's income tax - instead, to avoid double taxation of distributed profits under the new system, only half of the distributions of a corporation are included in the personal income tax base of the shareholder.[2]

[2]Under the old tax-credit method applied until 2000, the tax burden at the company level acted as a payment in advance for the personal income tax. It was charged to ensure taxation of capital income but credited against the shareholder´s personal income tax liability if profits were distributed.

Our calculation of the tax-indicators is, however, incomplete. In the German case, we also have to account for the solidarity surcharge, a proportional surcharge on the corporate and personal income tax, and, especially, for the local business tax rate. Furthermore, we have to pay attention on their interactions with the corporate and personal income tax.[3] The business tax payment T_{GSt}, *e.g.*, is a deductible expense in both of these taxes and also reduces its own tax base. Nevertheless it increases the general tax burden of the firm. Dividends net of taxes can then be described by

$$R_n = \theta_d \left[\Pi(K) - rB - \tau_c \left(\Pi(K) - rB - T_{GSt} \right) - T_{GSt} - I + D \right], \tag{2}$$

with the effective business tax burden being determined by

$$T_{GSt} = \frac{t_{GSt}}{1 + t_{GSt}} \left(\Pi(K) - rB + \psi rB \right). \tag{3}$$

The business tax rate t_{GSt} depends on a municipality-specific multiplier according to $t_{GSt} = 0.05 * cr/100$ with cr being the local collection rate in %. The collection rate is set by each municipality more or less independently. Therefore, firms in different locations face different business tax rates and local governments may compete for nationally and internationally mobile capital by setting attractive collection rates. Of greater importance, however, is the feature captured by the additional term ψrB in the last equation: While the business tax is also levied on profits, there are important additions to the tax base. In particular, and opposed to corporate tax interest deductions, 50% of long-term[4] interest payments as well as other additions and deductions have to be included in the tax base of the business tax. As already mentioned, this might affect the choice between different sources of finance and is to be tested empirically. [5]

The term ψrB thus reflects an additional tax burden induced by the local tax, *i.e.*, the disadvantage

[3] We do not consider corporate real estate taxes, net wealth taxes or other non-profit taxes in this paper.

[4] Any debt position is defined as long-term debt if it is not paid back within 12 months and serves the business in a longer perspective. Often, long-term debt is related to a company´s foundation or purchase as well as borrowed funds used to improve or expand business operations.

[5] A second important element of the business tax that is not considered here, however, is the formula apportionment based on the payroll which applies to multiregional corporations with branches and/or subsidiaries in different locations. As is well known from the theoretical literature on formula apportionment, such institutions alter the nature of the tax and, at least partially, the tax becomes a tax on the formula weights. With payroll, we should expect that high tax rates provide incentives to substitute labor with other inputs and factors such as capital.

of using debt and, especially, long-term debt financing. As will be seen, it is opposed to the general advantage of being able to deduct interest payments.

If we reformulate (2) using (3) as well as $\widetilde{\tau}_{GSt} = \frac{t_{GSt}}{1+t_{GSt}}$ for the effective business tax rate, our dividends net of taxes ignoring investment expenditures and new debt, thus amount to

$$R_n = \theta_d \left[\theta_c \left(1 - \widetilde{\tau}_{GSt}\right) \Pi \left(K\right) - \theta_c r B \left(1 - \widetilde{\tau}_{GSt} + \widetilde{\tau}_{GSt}\psi\right)\right]. \tag{4}$$

Taking again the derivative of the Hamiltonian with respect to debt, $-\frac{\partial H}{\partial B}$, and accounting for $\rho = \frac{\theta_r}{\theta_g} r$ we finally obtain the modified shadow value

$$p = -\frac{\theta_d \theta_c}{\theta_r} \left(1 - \widetilde{\tau}_{GSt} + \widetilde{\tau}_{GSt}\psi\right). \tag{5}$$

Again, in case of the denominator being larger than the numerator, the marginal effect of debt on firm value is below unity in absolute terms. In this case, one additional unit of debt is decreasing the firm value less than proportionally, *i.e.* due to the tax advantage, debt is preferred as marginal source of finance. Let us explore this further.

Total tax benefit of debt finance

Assuming that there is a company with positive profits but no piece of long-term, *i.e.*, only short-term debt, the last term in the numerator of 5 drops out. Thus, at the margin and by means of the local business tax in Germany, the incentive of using debt becomes even greater as compared to the situation described in (1). This was already observed by Gropp (2002) and may be an explanation for higher debt positions of German firms. We can reformulate (5) and calculate the tax benefit of debt financing relative to equity financing as

$$\begin{aligned} TAX &= \theta_r - \theta_d \theta_c (1 - \widetilde{\tau}_{GSt}) \\ &= 1 - \tau_r - (1 - \tau_c) + \tau_d (1 - \tau_c) + (1 - \tau_d)(1 - \tau_c)\widetilde{\tau}_{GSt} \\ &= [\tau_c (1 - \widetilde{\tau}_{GSt}) + \widetilde{\tau}_{GSt}] + \tau_d (1 - \tau_c (1 - \widetilde{\tau}_{GSt}) - \widetilde{\tau}_{GSt}) - \tau_r \end{aligned}$$

which is positive if there is a tax benefit from interest deductions.

Note that our TAX indicator equals the tax measure ususally employed in the literature (see, *e.g.*, Gordon and Lee, 2001), with the only difference being that the local business tax rate is taken into account. Of course, it implies that profits are immediately distributed in the form of dividends. However, it would also be possible to consider the effect of retaining profits accompanied by an increase in firm value. In this case, the relevant tax rate for the choice between debt or equity finance would be the one on capital gains and the expression in (5) would change accordingly.

Additions to the local tax base

To clarify the impact of the additions for business tax purposes, we consider another extreme case: Assuming that there is a company with no positive taxable income ($\Pi(K) - rB = 0$) but all debt positions being long-term debt, *i.e.* $\psi = 0.5$, the local tax burden can no longer be deducted from the corporate tax base. Furthermore, if there is no profit to distribute, there are no dividend payments. In that case, the expressions for (2) and (3) change, respectively, and if we take the derivative of the Hamiltonian with respect to debt, $-\frac{\partial H}{\partial B}$,as well as $\rho = \frac{\theta_r}{\theta_g} r$ into account, we finally obtain

$$DIS = -\frac{\widetilde{\tau}_{GSt}\psi}{\theta_r}. \tag{6}$$

Thus, the higher the effective local business tax rate, the larger the reduction in firm value if debt is increased at the margin. As a result, the business tax creates an incentive to use less instead of more debt. Especially firms with low or even no positive taxable income, that are located in high-tax jurisdictions and rely heavily on long-term debt might be negatively affected.

This is also the reason why it seems necessary to treat the impact of the business tax on debt financing in a separate way: Due to various additions and deductions, the tax base of the business tax deviates significantly from the tax base of the corporate income tax. In addition, the tax penalty for long-term debt is not conditional on the existence of taxable profits - it is a definitive tax burden on the firms stock of long-term debt.

To provide empirical evidence, we use these two tax indicators, TAX and DIS, and estimate the impact of an increase in the tax benefit and in the tax disincentive on the debt ratio of firms. Of course, these indicators can only reflect upper bounds as there will be companies with positive taxable income which do not exclusively rely on long-term debt positions. In that case, due to the deductibility of the business tax in the corporate income tax base, we would have to add a correction term resulting, of course, in a lower disincentive (6) for debt usage.[6] However, there is high correlation between the correction term and the indicator for DIS, that we cannot control for yet. Therefore we confine ourself on using upper bounds.

To complete our calculation of tax indicators, Table (1) displays the main parameter values. Besides the headline rates on retained earnings (and distributed profits until 2000 in brackets) we present the solidarity surcharge and the average business tax in our sample for each year. The overall tax burden on the company level, including statutory tax rates on retained earnings (distributions), surcharges, business tax, and the interactions thereof can be calculated from these figures as indicated above. In the last column of Table (1) the personal income tax rates (top income tax brackets) on interest and dividend payments are presented.

3 Empirical Evidence on Financial Leverage

We use an unbalanced panel of matched survey and financial statement data which focuses on German firms and covers the period 1994-2007. Our panel mainly consists of stand-alone companies as well as unconsolidated balance sheets. Nevertheless, there may be some firms which belong to a company group, thus having additional opportunities for internal financing. Tax code information and information on the location of companies is used to calculate our tax indicators as outlined in the previous section. The survey data stems from the manufacturing sector of the monthly Ifo Business Survey but until now, we did not take advantage of this information.

In total there are about 8000 observations based on more than 1800 firms in the dataset with information on all required variables being available for approximately 5000 observations.

[6]The correction term would be $+DIS * (1 - \theta_d \theta_c)$.

Table 1: Tax Parameters for Calculating Tax Indicators

year	Headline rates retained earnings (distributed profits) in %	Solidarity surcharge in %	Business tax in %	Headline rates interest (dividend) taxation in % (top income tax brackets)
1994	45.0 (30.0)	0	15.94	53.0
1995	45.0 (30.0)	7.5	15.95	53.0
1996	45.0 (30.0)	7.5	16.17	53.0
1997	45.0 (30.0)	7.5	16.30	53.0
1998	45.0 (30.0)	5.5	16.41	53.0
1999	40.0 (30.0)	5.5	16.45	53.0
2000	40.0 (30.0)	5.5	16.17	51.0
2001	25.0	5.5	16.40	48.5 (24.25)
2002	25.0	5.5	16.20	48.5 (24.25)
2003	26.5	5.5	16.00	48.5 (24.25)
2004	25.0	5.5	15.91	45.0 (22.5)
2005	25.0	5.5	15.99	42.0 (21.0)
2006	25.0	5.5	16.01	42.0 (21.0)
2007	25.0	5.5	16.13	45.0 (22.5)

The solidarity surcharge's assessment base is the overall corporate profit or personal income tax that has to be paid. There was no solidarity surcharge in 1994. The business tax as displayed here is calculated as the yearly average out of the sample, but we do not account for the specific adjustments in the computation of the business income mentioned in the text. The basic federal rate (Steuermeßzahl) is always 5%, the collection rate (Hebesatz) varies among municipalities. The headline rates for personal interest and dividend taxation are presented in the last column. If there is no term in brackets, both rates are identical.

3.1 Financial Leverage and Non-Tax Parameters

To isolate the tax effects from other factors influencing financial leverage, we follow the literature and control for further firm-level variables that may impact a companies´ capital structure choice.

As most important non-tax parameters, the debt ratio might depend on the size of the respective firm and on the economic risks it faces. The size is controlled for by using the log of sales and might reflect that it should be easier for large firms to collect external capital. As these are probably more diversified and face lower risk of bankruptcy, debt ratios might be higher. Currently, we do not account for the economic risk of a firm. This could be included, however, using indicators of the survey data contained in our panel, or taking advantage of the variation of a company´s sales what would reflect something like volatility of earnings. Corporations using a tax loss carry-forward are identified via profits of the previous period being negative and receive a dummy variable that equals one. For the rest of the firms, this dummy is zero. Of course, such measure only roughly indicates something like an alternative non-debt tax shield. However, our panel does not include information on accumulated losses at the firm level that could be used. Nevertheless, it seems important to have some kind of indicator because using tax loss carry-forwards implies that current profits can be offset and, if the tax base becomes zero or even negative, that no corporate taxes have to be paid. In that case, the effective tax rate becomes zero.

Another control variable used regularly in empirical estimations (see, *e.g.* Gordon and Lee, 2001) is tangibility as the share of tangible assets relative to total assets. Tangibility is taken into account because it may proxy for the liability of debt (collateral), or, in an alternative interpretation, for the amount of investment tax credits associated with tangible assets. While in the first case its´ impact on the debt ratio would be positive, in the second, it would be negative as the presence of high tangible assets is connected with alternative non-debt tax shields in concurrence to tax benefits (DeAngelo and Masulis, 1980). Thus, the expected impact on financial leverage is indetermined. Myers and Majluf (1984) suggest that firms face costs of issuing new equity like, *e.g.* transaction costs. Therefore, they prefer capital from retained earnings and debt rather than raising new equity. As a consequence, profitability of a firm that reflects the amount of earnings available should influence capital structure decisions and therefore reduce financial leverage. On the other

hand, according to the trade-off theory, profitable firms with low risk of financial distress and good expectations for the future should have higher debt ratios. The effect of profitability on financial leverage is, thus, ambiguous. In eiter case we measure profitability by the EBITD (Earnings before Interest, Taxes and Depreciation) in a specific year, thus displaying the profits before any tax shields have been used.

If we had a cross-border sample, also institutional and macroeconomic differences between countries had to be taken into account. This includes, e.g. the quality of the banking system, the legal environment or differences in inflation rates. In the national context, however, we would only have to control for the county or region where the company is located. For the most part, using time dummies and dummies for each company these aspects might be covered. Especially, unobserved time-invariant factors that may be correlated with both the endogenous as well as the exogenous variables are controlled for by using firm-specific fixed effects. Such factors may include branch of industry, age or legal form of the respective company.

An overview on the variables employed and some descriptive statistics for our sample is presented in Table (2) [7]. In general, with regard to average sales mostly large companies seem to be included in the sample. Nevertheless, the annual median value of sales makes up only some 20 % of the annual mean. This points at a skewed distribution which is also reflected by the large standard deviation. In general, we did not include observations of the financial sector.[8]

3.2 Investigation Approach

To estimate the impact of tax benefits for debt and disincentives due to additions on the financial leverage of firms, we use the ratio of debt to total capital, DR,[9] and regress it on the tax indicators derived in the theoretical section together with a set of control variables X. Let the subscript i

[7] For further information on the dataset used see the Appendix and Hoenig, Mittelmeier and Neudecker, 2009.

[8] Observations that represent extreme outliers with respect to the debt ratio were removed from the dataset.

[9] With total capital being the sum of equity and debt but abstracting from profits.

Table 2: Summary Statistics of Firm and Tax Variables

Variable	Mean	Std.Dev.	Definition
Ratio of Debt to Total Capital (DR)	.818	.153	Total debt divided by total capital
Sales (tsd. EUR) (Y)	522.515	2.289.617	Sales in thousand EUR
Loss Carry-Forward (LCF)	.068	.252	Loss in previous year, binary
Tangibility (TAN)	.261	.189	Tangible assets divided by total assets
Profitability ($PROF$)	.119	.123	EBITD divided by total assets
Tax Benefit Debt (TAX)	.247	.377	Tax benefit of debt relative to equity
Disadvantage of additions (DIS)	.162	.025	Local additions, disadvantage of debt financing

The summary statistics represent unweighted averages of the sample employed. In total, there are about 8000 observations for the period 1994-2007, resulting in an average of 500 to 600 observations per year. There are, however, only some 5000 observations containing all variables necessary for our empirical specification. The financial statement data are taken from the EBDC Business Expectations panel (Ifo Institute, Munich) which takes recourse on the Hoppenstedt and Amadeus firm databases for German companies.

denote a company identifier and t the year of obersation, then our estimation equation reads as

$$DR_{i,t} = \beta_0 + \beta_1 TAX_{i,t} + \beta_2 DIS_{i,t} + \beta_3 X_{i,t} + \gamma_i + \delta_t + \epsilon_{i,t}. \tag{7}$$

To control for time effects common to all firms like cyclical productivity or price level shocks, we include time-fixed effects δ_t. In addition, by γ_i, we control for heterogeneity among firms, *i.e.* unobservable, time-invariant company characteristics like industry, legal form or product and market characteristics. $\epsilon_{i,t}$ is the remaining disturbance. As explanatory variables that might influence financial leverage of firms, we use the parameters described in the previous section: The log of sales ($Y_{i,t}$) as an indicator of size, a dummy capturing if there are loss carry-forwards ($LCF_{i,t}$), tangibility ($TAN_{i,t}$) to capture the value of collateral or, alternatively, investment credits via depreciation, and finally profitability ($PROF_{i,t}$) reflecting available internal cash flow or the risk of financial distress.

Equation 7 is estimated using a fixed-effects model.[10] We expect a positive sign for the impact of the tax benefit on financial leverage (β_1), but a negative sign with regard to the penalty due to additions for business tax purposes (β_2).

The existence of a loss carry-forward may decrease the amount of debt used. Moreover, if it constitutes a non-debt tax shield, in case of losses, the tax sensitivity with respect to the effective tax rate at the company level $\tau^e_{i,t}ff = \tau_c(1-\widetilde{\tau}_{GSt}) + \widetilde{\tau}_{GSt}$ should decrease, calling for an interaction term $LCFint_{i,t} = LCF_{i,t}\tau^e_{i,t}ff$. In an alternative setting we may, thus, also try to estimate the relationship

$$DR_{i,t} = \beta_0 + \beta_1 TAX_{i,t} + \beta_2 DIS_{i,t} + \beta_3 X_{i,t} + \beta_4 LCFint_{i,t} + \gamma_i + \delta_t + \epsilon_{i,t}. \tag{8}$$

[10] Although it may be possible that even statutory tax rates are endogenous with respect to financial leverage or other right hand side variables (see Gordon and Lee, 2001), we only account for this fact by using time dummies.

4 Results of the Fixed Effects model

Some basic results for the fixed effects model are provided in Table 3. Yet, in contrast to other studies, we do not treat the size variable as being endogenous, although this might cause problems if capital structure choices have an impact on a firm´s state of business. Therefore, we are currently exmamining if a state´s GDP (in logs) would be a suitable instrument. Nevertheless, by using - in a first step - the log of sales instead of total assets, we hope to circumvent part of the problem. Moreover, since company-specific dummy variables are contained in each specification, we are able to control for any additional information like, *e.g.*, firm age, etc. that might be correlated with the right hand side variables and, especially, our tax indicators. By the way, we do not include dummies for the German states as fixed effects at the level of the firm nest regional, time constant, fixed effects.

Columns (1) to (4) in Table 3 show different specifications to check for the robustness of our results. While column (1) reports the correlation between our tax indicators and financial leverage when only accounting for time dummies, columns (2) to (4) use the control variables described above. All columns, except column (1), show a positive, significant effect of the tax benefit of debt on leverage, while the penalty of using another unit of debt, captured by DIS, is negative and significant. This suggests that companies tend to increase their financial leverage if the tax benefit of debt over equity is rising. The estimated coefficient in our preferred specification (3) indicates that a 10 percentage point increase in the tax benefit results in an increase of the debt ratio by about 13.7 percentage points. In contrast, companies decrease their share of debt by some 9.85 percentage point if the disadvantage of using debt due to further additions for business tax purposes increase by 10 percentage points.

As compared to coefficients reported by Gordon and Lee (2001) or Graham (1999), these effects seem to be quite large - even in the German context. However, as has already been mentioned, they must be taken as reflecting the upper bounds for two companies in extremely advantageous and, opposed to this, rather underprivileged situations. Most of the companies might find themselves somewhere in between. What can be seen, however, is the relative robustness of the results. In general, the coefficients do not change by much. The same is true for the rest of the right hand

Table 3: Tax benefits, penalties and financial leverage

$DR_{i,t}$	(1)	(2)	(3)	(4)	(5)
$TAX_{i,t}$	.814	1.373 ***	1.347 ***		.257
	(.555)	(.540)	(.539)		(.454)
$DIS_{i,t}$	-.859 **	-.979 ***	-.979 ***	-.626 ***	
	(.269)	(.262)	(.261)	(.220)	
$ln(Y_{i,t})$		.026 ***	.025 ***	.025 ***	.025 ***
		(.002)	(.002)	(.002)	(.002)
$TAN_{i,t}$		-.061 ***	-.058 ***	-.058 ***	-.059 ***
		(.013)	(.013)	(.013)	(.013)
$PROF_{i,t}$		-.055 ***	-.055 ***	-.056 ***	-.055 ***
		(.012)	(.012)	(.012)	(.012)
$LCF_{i,t}$		***	-.081 ***	-.011 ***	-.081 ***
			(.002)	(.004)	(.020)
$LCFint_{i,t}$		***	.154 ***		.155 ***
			(.043)		(.043)
Observations	5249	5249	5249	5249	.5249
R^2	.009	.0661	.0708	.0708	.0677

Dependent variable is debt to total capital. Robust standard errors are given in parentheses, time and firm-specific dummies are not reported. A * denotes significant at 10%; ** significant at 5%; *** at 1%.

side variables in columns (2) to (4), and they seem to show the expected sign: Our size variable has a slightly positive effect on financial leverage, indicating that above average firms prefer higher debt ratios. Tangibility, in contrast, has a negative effect on financial leverage, although we could also expect a positive one. It seems, however, that increases in the capital stock and associated depreciations slightly outweigh the positive effect that may arise due to increased collateral value of tangible assets. As concerns profitability, we find a significant negative effect on financial leverage which is almost of equal sign as tangibility. Conceptually, this makes sense, as a company with increased profitability might have more internal cash flows to finance its investment and does not have to rely on debt.

In column (3) we test the alternative specification (8) reflecting that existing non-debt tax shields

may serve as a substitute for tax benefits. If a company records a loss carry-forward in this period, its debt ratio is expected to decrease slightly as compared to the previous period. However, our interaction term does not show the expected negative effect on the tax incentive to use debt, what may point at general problems with the loss carry-forward dummy variable or the effective corporate tax rate. Nevertheless, (3) is our preferred specification.

In column (4) we neglect any impact of the tax benefit of debt over equity and focus on the disadvantage of using debt as tax benefits from debt finance might only have an effect for firms with positive taxable income. For the penalty, though, we can say that it is even larger if a company has a higher share of long-term debt or if the municipality where it is located imposes a high local business tax rate. Moreover, especially firms with low or even no profits might be negatively affected although the disadvantage of using debt should exert an impact on every firm if we think that each firm uses some long-term debt and other values that have to be added for business tax purposes.[11]

In fact, the results suggest that this view might be correct although our our variable of interest drops as compared to the basic scenario. The estimated coefficient in column (4) indicates that financial leverage is decreased by 6.27 percentage points if the disadvantage of using debt due to further additions for business tax purposes increases by 10 percentage points. Nevertheless, the results seem to be robust, with all other control variables keeping their sign and significance. The slight downward bias that arises if we do not control for the tax benefit of debt over equity may be explained by the following: Part of the tax incentive of using debt is due to the business tax burden and this, in turn, is contained in our penalty parameter. Omitting the tax benefit from the estimation might therefore lead to a situation where DIS takes over some advantage of debt finance such that the negative effect due to additons cannot be separated properly.

The same is true for the opposite direction: If we omit the penalty parameter from the estimation and use only the indicator for tax benefits, it drops as compared to the basic scenario in (3) indicating that it captures part of the disadvantage. This is confirmed by the correlation figure between both parameters which amounts to 0.3. More important, however, is the fact that the tax

[11] Only if losses completely outweigh the additions to be made in the tax base, any business tax payments can be avoided.

benefit coefficient becomes insignificant in column (5), thus reinforcing the view that it may only be effective for profitable firms.

5 Conclusion

While several papers analyzing the relationship between tax benefits and financial leverage are mainly based on US or international data, empirical evidence for Germany is still scarce. The setting with regard to German tax rules is, however, of special interest, as there is not only the corporate profit and personal income tax, but also a local business tax on the company level which provide a tax incentive for using debt. A specific feature in the local business tax is the fact that, among other things, fifty percent of long-term interest payments are added to the tax base. Thus, the local business tax may exert a separate, countervailing effect on the choice between debt and equity finance.

Based on a theoretical model of capital structure choice we formulate tax indicators containing corporate profit, personal income, but also firm-specific local tax rates which vary at the level of municipalities. These indicators allow us to measure the incentive of using a unit of debt instead of equity and, at the same time, separate out the countervailing tax effects due to the additions of 50 % of interest on long-term debt associated with the local business tax. Therefore, we take account not only of the conventional tax incentive to use debt, but also of the countervailing disincentive exerted by the local business tax.

For the empirical analysis, we employ a panel of German, mostly standalone, manufacturing companies covering the period 1994-2007 when major changes in German tax law took place. This novel and unique dataset contains balance-sheet as well as survey data that we supplemented with information on the local business tax rate faced by each firm. So far, we did not take advantage of the survey data contained in the panel although this may provide us with further controls regarding business climate, economic risk, etc.

The results confirm the conventional positive impact of taxation on the financial leverage of firms.

Controlling for a firm's sales as an indicator of size, tangibility, profitability as well as possible loss carryforwards, our preferred specification suggests that a 10 percentage point increase in the tax benefit results in a 13.7 percentage point higher debt ratio. Compared to previous estimations, these effects seem quite large, however, they have to be taken as an upper bound. Results for the coutervailing effect due to the extra tax burden of the local business tax suggest that a 10 percentage point increase in the penalty reduces financial leverage by about 9.8 percentage points. Focusing solely on the penalty for using long-term debt, the estimation results suggest that it exerts an impact on all firms while the tax benefit might only be effective for those who actually make profits. In fact, the distortion associated with the business tax might even be greater after the tax reform of 2008 when various positions were added to the list of additions for business tax purposes.

Appendix

A.1 Datasource

Firm-level data are taken from the Economics and Business Data Center in Munich which provides a new EBDC dataset combining survey data from the Ifo Business Surveys and financial statement data from the firm databases Amadeus and Hoppenstedt (see Hoenig, Mittelmeier and Neudecker, 2009 for an overview).[12] By adding information on tax rates and locations of companies we can further calculate firm-specific statutory tax rates and, using balance-sheet information on a firm's capital and asset structure,[13] we can compute the aforementioned cost of capital variable. This can then be analyzed together with a firm's investment, sales and business expectations.

With respect to survey data from the Ifo Business Survey one has to account for the fact that it is collected monthly and refers to products instead of companies. Thus we collapsed the information by year and company after constructing semi-annual indicators as mentioned in the text. As regards the appraisal of the current and expected economic situation, companies can give one of

[12]Specific information on the Ifo Business Surveys can be found in Becker and Wohlrabe (2008).

[13]We only use balance-sheet information from Hoppenstedt in our estimations.

three categorical answers.

References

Altshuler, R. and H. Grubert (2003). Repatriation Taxes, Repatriation Strategies and Multinational Financial Policy. *Journal of Public Economics* 87, 73 - 107.

Alworth, J. and G. Arachi (2001). The Effect of Taxes on Corporate Financing Decisions: Evidence from a Panel of Italian Firms. *International Tax and Public Finance* 8, 353-376.

Auerbach, A.J. (2002). Taxation and Corporate Financial Policy. In *Auerbach A.J. and M. Feldstein (ed.), Handbook of Public Economics*, Vol. 3, Amsterdam, 1251-1292.

Buettner, T. and G. Wamser (2007). Intercompany Loans and Profit Shifting - Evidence from Company-Level Data. CESifo Working Paper 1959, Munich.

DeAngelo, H. and R.W. Masulis (1980). Optimal Capital Structure under Corporate and Personal Taxation. *Journal of Financial Economics* 8, 3-29.

Desai, M.A., C.F. Foley and J.R. Hines (2004). A Multinational Perspective on Capital Structure Choice and Internal Capital Markets. *Journal of Finance* 59, 2451-2487.

Gordon, R. and Y. Lee (2001). Do Taxes affect Corporate Debt Policy? Evidence from U.S. Corporate Tax Return Data. *Journal of Public Economics* 82, 195-224.

Gordon, R. and Y. Lee (2007). Interest Rates, Taxes and Corporate Financial Policies. *National Tax Journal* 60, 65-84.

Graham, J.R. (1996b). Proxies for the Corporate Marginal Tax Rate. *Journal of Financial Economics* 42, 187-221.

Graham, J.R. (1999). Do Personal Taxes affect Corporate Financing Decisions? *Journal of Public Economics* 73, 147-185.

Graham, J.R. (2003). Taxes and Corporate Finance: A Review. *Review of Financial Studies* 16, 1075-1129.

Gropp, R.E. (2002). Local Taxes and Capital Structure Choice. *International Tax and Public Finance* 9, 51-71.

Hoenig, A., Mittelmeier, H., and A. Neudecker (2009). EBDC Business Expectations Panel and EBDC Business Investment Panel. Linkage of Ifo Survey and Balance-Sheet Data. Ifo Institute for Economic Research, Munich.

Jensen, M. C., and W. H. Meckling (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics* 3, 305-360.

MacKie-Mason, J.K. (1990). Do Taxes affect Corporate Financing Decisions? *Journal of Finance* 45, 1471-1493.

Mintz, J. and A.J.Weichenrieder (2005). Taxation and the Financial Structure of German Outbound FDI. CESifo Working Paper 1612, Munich.

Myers, S.C. (1984). The Capital Structure Puzzle. *Journal of Finance* 39, 575-592.

Myers, S.C. and N. Majluf (1984). Corporate Financing and Investment Decisions when Firms have Information Investors do not have. *Journal of Financial Economics* 13, 187-221.

Rajan, R.G. and L. Zingales (1995). What do we know about Capital Structure? Some Evidence from International Data. *Journal of Finance* 50, 1421-1460.

Weichenrieder, A. (2006). Steuern und die Empirie der Unternehmensfinanzierung. Working Paper, Frankfurt.