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Capital Structure Decisions under the German Tax Code

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Capital Structure Decisions under the German Tax Code

Abstract

We consider the tax advantage of an increase in the firms leverage under the German tax code. The analysis is performed (i) for the case of a given investment and future dividend policy and (ii) to decide on the relative tax advantage of debt versus equity for funding new investments. We start with a more general model to derive simple conditions for a tax advantage of debt under a "classical" tax system. Additionally we show that under our assumption of a given future investment policy capital gains taxes do not matter for the capital structure decision. In the second part we include more particularities of the German tax code, i.e. the corporate tax in combination with the trade tax (*Gewerbesteuer*), the personal tax with a rebate for equity income (i.e. the *Halbeinkünfteverfahren*), and we account for the different treatment of short and long term debt under the trade tax.

Keywords: Capital structure, German Tax Code,

JEL classification: G32,

1 Motivation

Many publications consider the valuation of firms under a discriminatory tax code.¹ This literature takes the tax advantage or disadvantage of debt for a given capital structure into account. To value the given firm e.g. a weighted average cost of capital (WACC) depending on the capital structure, or an add on to the value of an all equity firm (in the APV-Method) is to be determined. We are instead interested in the tax consequences of a *capital structure decision*. That is, we ask whether shareholders gain if the firm increases its leverage or raises new debt instead of new equity to fund additional investments. We will derive simple conditions for a tax advantage of issuing new debt, given the future investment policy, i.e. under ceteris paribus conditions. To this end we first consider a pure leverage decision where neither the present nor the future investment policy of the firm is affected. This implies that new debt raised to increase leverage is to be poured out to shareholders. Furthermore, we hold the firm's dividends constant to concentrate on the effect of increasing leverage instead of considering a joint effect of increasing leverage and changing dividend policy on taxes. To hold the future dividends constant the firm has to issue new shares in the future to pay for net interest and redeem the new debt.

Secondly, we consider the external funding of additional investments in the firm (to generate growth). In this case, new debt or new equity is to be raised. To decide on the relative tax advantage of these alternatives, we will again insulate the future investment policy from the present financing mode.

Throughout our analysis we consider corporate taxes and personal taxes² on income. We start with a quite general tax code, and later on introduce some of the particularities of the German tax code. For example we consider the income tax

¹ See e.g. Kruschwitz & Löffler (2006) for a concise approach and further references.

 $^{^{2}}$ The fact that also personal taxes have to be considered in the theory of capital structure decisions seems to be generally accepted, at least since Miller (1977). Furthermore, e.g. Graham (1999) shows that personal taxes are an empirically relevant determinant of capital structure.

discount on dividends ("Halbeinkünfteverfahren"), corporate tax and trade tax ("Gewerbesteuer"), the different treatment of interest on short and long term debt in the trade tax base, and potential differences in the income tax rate of shareholders and other investors due to tax progression.

Of course, we are not the first to consider the capital structure decisions under taxes. Beginning with Modigliani & Miller (1963) the literature started analyzing corporate tax as a sole determinant of capital structure. But, at least since Miller (1977), the need to include personal taxes into the analysis seems to be universally acknowledged. The focus of Miller (1977) and the subsequent literature, e.g. DeAngelo & Masulis (1980), is the optimal capital structure in market equilibrium. The more direct approach of considering the consequences of a capital structure decision on shareholders wealth is first accomplished in King (1974), King (1977), Schneller (1980), Auerbach (1983), Mayer (1986), and many others. Recently, there seems to be less interest in this subject, except for the of course closely related literature on valuation of firms.

Even though the available literature seems to provide sufficient insight in the tax advantage or disadvantage of debt, we think our analysis worthwhile. First, we show that some of the available literature features improper violations of the ceteris paribus condition necessary to analyze the capital structure decision as such, or even contains mistakes. Secondly, to our knowledge, we are the first to show that capital gains taxes are irrelevant for the capital structure decision under rigorous regard of the ceteris paribus condition.³ This result is at odds with some of the existing literature. Thirdly, for lending we consider short term and long term debt with different interest rates (non-flat term structure), and an uncertain value of (long term) debt in the course of time due to interest rate risk. And, last but not least, we are not aware of an analysis of capital structure decisions considering the particularities of the current German tax code.

³ Of course, the value of firm depends on capital gains taxes. But, the decision to alter the capital structure or how to fund an additional investment does not depend on capital gains taxes, as we will show.

Since we ignore all determinants relevant for capital structure but taxes, our results should be interpreted carefully. If we identify a tax advantage of debt, other considerations may contradict the immediate implication that the firm should increase its leverage. Our analysis only points out in what direction capital structure decisions are driven by tax considerations.

2 The Model with a single Corporate Tax Rate

2.1 The Pure Leverage Decision

2.1.1 Assumptions

To illustrate our setting for the analysis we start with a simple tax code that omits some (but not all) of the more complex details of the German tax code. We assume that the firm has to pay corporate tax at a given rate of τ^{C} on profits, and its shareholders have to pay income tax at a rate of τ^{P} .

Shareholders' income tax rate applies to their income from holding equity, e.g. dividends. But, with the German tax code already in mind, we assume that only half of the dividends are taxable (*Halbeinkünfteverfahren*), so that the effective tax rate on dividends is $0,5\tau^{P}$.⁴ If shareholders have additional income in form of interest, they have to pay taxes at the total rate of τ^{P} .

Furthermore, shareholders may have to pay income tax on capital gains. But, under the German tax code capital gains are effectively tax free if realized not before one year after buying the shares. For a corporation holding shares, capital gains are always free of tax. To simplify our formal exposition, we firstly refrain from explicitly considering capital gains tax. But, we will show that including a tax on capital gains would *not* alter our results concerning the tax advantage of increasing leverage or using debt instead of equity, if the firm's investment policy is given, i.e. the ceteris paribus condition holds.

⁴ The more general approach would be to introduce a particular income tax rate on dividends that may differ from the general income tax rate.

We start with considering a quasi-one-period model. At the end of this period, in t = 1, the firm pays a dividend of $Div_1(s)$ to shareholders, depending on the state s. Ex dividend, the value of the firm's equity is $V_1^E(s)$. Since in t = 1 new equity shall be raised by selling a share of α , for a reason to become clear shortly, the old shareholders retain $(1-\alpha)V_1(s)$. Hence, in t = 1, their wealth from holding equity is

$$w_1(s) = (1 - 0, 5\tau^P) Div_1(s) + (1 - \alpha)V_1^E(s).$$
(1)

Of course, $V_1^E(s)$ depends on future dividends and thus on the firm's future investment policy. Since the firm's corporate tax reduces the cash flow available for dividends and/or reinvestments, $V_1^E(s)$ depends also on the corporate tax, which in t = 1 is:

$$T^{C} = \left(EBIT_{1}(s) - rD - r^{\Delta}\Delta D \right) \tau^{C}, \qquad (2)$$

where rD is the interest on existing debt and $r^{\Delta}\Delta D$ is the interest on additional debt to be raised eventually in t = 0

We now may consider the effect of an increase in the firm's leverage in t = 0. This shall be done under strict observance of the ceteris paribus condition. That is, the increase in leverage shall (i) not alter the firm's investment policy today or in future, (ii) nor its future dividend policy. If we allow instead for an alteration of the firm's dividend policy as a result of increasing leverage, we will observe a joint effect on taxes (to be considered in Ch. 2.2.2). Here, we start with the assumption that the dividend $Div_1(s)$ does *not* depend on raising any new debt in t = 0.

To hold the firm's investments in t = 0 constant we have to assume that any additional debt raised in t = 0 by the firm will not result in additional investments but will be poured out to shareholders. This may happen by repurchasing shares at current market value or by paying a special dividend.

To hold the firm's *future* investments *and* dividends constant, we have to assume that new shares are issued in t = 1 to repay principal and net interest of the new

debt raised in t = 0. Therefore, given the cash flow $CF_1(s)$, the investment $I_1(s)$, the firm's corporate tax, and dividend in t = 1, the following budget constraint must hold:

$$\alpha V_1^E(s) = I_1(s) - \left[CF_1(s) - Div_1(s) - \left(EBIT_1(s) - rD - r^{\Delta}\Delta D \right) \tau^C - (1 + r^{\Delta})\Delta D \right].$$
(3)

Repaying the new debt in t = 1 at face value, as we assumed in (3), implies that it is short term in the sense that it is due in t = 1. We henceforth write ΔD^s for the amount of new *short term* debt and $r^{\Delta s}$ for the appropriate interest rate and analyze its tax advantage in 2.1.2. The case of raising *long term* debt shall be considered in 2.1.3.

Obviously, the share α to be sold in t=1 to repay debt is increasing in the amount of new debt, ΔD^s . For a high cash flow, $CF_1(s)$, and a small new investment, $I_1(s)$, α may in principle also be negative. Then, the firm buys back some of its own shares, but less than if in t = 0 no new debt is raised.

In (3) we furthermore implicitly assumed that the new debt is riskless, and, that the firms pays taxes in any state s. We repeat these assumptions explicitly and discuss their implications later:

<u>Assumption 1</u>: New debt is free of risk. Hence, $r^{\Delta s}$ is the riskfree rate on short term debt.

<u>Assumption 2</u>: The firm's *EBIT* in t = 1 is always high enough to pay corporate tax, i.e.

$$\left(EBIT_{1}(s) - rD - r^{\Delta s}\Delta D^{s}\right) > 0.$$
(4)

Assumption 2 is less restrictive than it might seem since it is only important that paying interest saves on corporate tax.⁵ If the profit of period 1 is negative, the tax shield is not totally lost since the loss may be carried forward.

⁵ Kruschwitz *et al.* (2004) show that under this condition even the risk of insolvency has no influence on the firm's value.

2.1.2 Short Term Debt

Under the budget constraint (3), the old shareholders' t=1 wealth from holding equity (see (1)) becomes:

$$w_{1}(s) = (1 - 0, 5\tau^{P})Div_{1}(s) + (1 - \alpha)V_{1}^{E}(s)$$

= $(1 - 0, 5\tau^{P})Div_{1}(s) + V_{1}^{E}(s) - I_{1}(s) + CF_{1}(s) - Div_{1}(s)$ (5)
 $- (EBIT_{1}(s) - rD - r^{\Delta s}\Delta D^{s})\tau^{C} - (1 + r^{\Delta s})\Delta D^{s}.$

Obviously, this wealth is decreasing in the dividend $Div_1(s)$; at least if capital gains are not taxed.⁶ Therefore, we may conclude that the firm should not pay dividends. Of course, this conclusion at least presupposes that the firm can invest its free cash flow in projects with zero NPV after corporate tax or pay out cash via share repurchases without income tax burden for shareholders. Without referring to other arguments as e.g. costs of free cash flow⁷ we hence cannot explain within our model why the firm pays dividends. Even though, we take the dividend policy as exogenously determined and given.

To consider the effect of an marginal increase in the firms new *short term debt* on shareholders' wealth we have to take into account not only the effect on $w_1(s)$ from (5), but also the shareholders additional wealth position from the new debt poured out to them. In general, this payout may come in form of a special dividend or via repurchasing shares. Perhaps it results in additional taxes. Let $\beta \in [0,1]$ be the share of the payout to be taxed. If the payout comes as a special dividend, $\beta = 0.5$ under the German tax code, since only half of the dividends are taxed (*Halbeinkünfteverfahren*). Given the shareholders income tax rate τ^{P} they receive a net payment of $(1 - \beta \tau^{P}) \Delta D^{s}$ in t = 0. This can be reinvested at the

⁶ Green & Hollifield (2003) consider the personal tax advantage of debt resulting under the assumption that all payments to shareholders are made through share repurchases but realized capital gains have to be taxed. Therefore the income on equity is also not free of personal tax, but an advantage comes from deferring taxes until realization. They find that the resulting tax advantage relative to dividends reduces the cost of capital by approximately 0.8%.

⁷ See Jensen (1986).

market until t = 1, yielding a net payment of $(1 + (1 - \tau^{P})r^{\Delta s})(1 - \beta \tau^{P})\Delta D^{s}$. In total, shareholders' wealth in t = 1 is hence:

$$W_{1}(s) = w_{1}(s) + (1 + (1 - \tau^{P})r^{\Delta s})(1 - \beta\tau^{P})\Delta D^{s}$$

= $\left[(1 - 0.5\tau^{P})Div_{1}(s) + V_{1}^{E}(s) - I_{1}(s) + CF_{1}(s) - Div_{1}(s) - (EBIT_{1}(s) - rD - r^{\Delta s}\Delta D^{s})\tau^{C} - (1 + r^{\Delta s})\Delta D^{s} + (1 + (1 - \tau^{P})r^{\Delta s})(1 - \beta\tau^{P})\Delta D^{s} \right].$ (6)

Obviously, shareholders gain from an increase in leverage if:

$$\frac{dW_1(s)}{d\Delta D} > 0 \quad \forall s \quad \Leftrightarrow \tag{7}$$

$$(1 - \beta \tau^{P})(1 + (1 - \tau^{P})r^{\Delta s}) > 1 + (1 - \tau^{C})r^{\Delta s} \quad \Leftrightarrow \qquad (8)$$

$$\frac{(\tau^{c}-\tau^{P})r^{\Delta s}}{1+(1-\tau^{P})r^{\Delta s}} > \beta \tau^{P}.$$
(9)

Hence, the tax advantage of increasing leverage does not depend on $EBIT_1(s)$, the given dividend policy, $Div_1(s)$, or the initial level of debt. Notable is especially the irrelevance of the dividend policy for the result in (9). The reason is that we assumed that dividends are not changed after increasing the firm's leverage and hence income tax of all shareholders (old an new) does not change either.

If $\beta = 0$, i.e. pouring out the proceeds from raising new debt comes without any income tax, a necessary and sufficient condition for a tax advantage of short term debt is

$$\tau^C > \tau^P, \tag{10}$$

as probably would have been expected. Raising new debt and pouring out the proceeds to shareholders is only advantageous if the corporate tax rate exceeds the income tax rate of the current shareholders. Only then the firm saves more on corporate taxes than the shareholders have to pay on additional income from investing the proceeds in their private portfolio.

If $\beta > 0$, this condition (10) is only necessary but not sufficient. Then, the present value of the net tax savings (LHS of (9)) per unit additional short term debt must

exceed the income tax to be paid by shareholders per unit of poured out new debt (RHS of (9)). The only relevant income tax rate in (9) is still that of the firm's current shareholders.

It is now almost straightforward to conclude that <u>decreasing</u> leverage is advantageous if condition (10) does not hold. Not relevant is of course condition (9) because when leverage is decreased shareholders receive no payout of which a share of β may be taxed. The most simple way to decrease the firm's effective leverage is for the shareholders to buy new shares in value of ΔD^s and the firm investing the proceeds at the riskless rate $r^{\Delta s}$. Then, the firm earns an additional profit of $r^{\Delta s} \Delta D^s$ before corporate tax and hence has to pay $\tau^C r^{\Delta s} \Delta D^s$ more tax. Shareholders instead save income tax of $\tau^P r^{\Delta s} \Delta D^s$ if they fund the purchase of new equity in t = 0 with a reduction in other riskless investments. On balance, shareholders gain if

$$\tau^C < \tau^P. \tag{11}$$

If firm's debt is bought back by others than the current shareholders, an income tax rate different from the latter's may apply.

2.1.3 Long Term debt

Let us now consider under what conditions an increase in leverage by raising additional *long term debt* is advantageous. The main difference in this analysis compared to the preceding will be that the long term debt is not due in t = 1 and hence its value $V_1^{\Delta D}(s)$ at that time is uncertain, i.e. it depends on the state *s*. Due to this fact we will resort here a present value analysis.

To hold the firm's future dividend and investment policy constant, we again require an issue of new equity in t = 1 with

$$\alpha V_1^E(s) = I_1(s) - CF_1(s) + Div_1(s) + (EBIT_1(s) - rD)\tau^C + (1 - \tau^C)r^{\Delta t}\Delta D^t + V_1^{\Delta D},$$
(12)

where ΔD^{l} is the face value of new long term debt, an $r^{\Delta l}$ is the interest rate on this long term debt. $V_{1}^{\Delta D}$ is the market value of the new debt in t = 1; an uncertain value since it depends on the interest term structure in t = 1.

Under budget constraint (12) old shareholders' equity stake (see (1)) becomes:

$$w_{1}^{lev}(s) = (1 - 0.5\tau^{P})Div_{1}(s) + (1 - \alpha)V_{1}^{E}(s)$$

$$= (1 - 0.5\tau^{P})Div_{1}(s) + V_{1}^{E}(s) - I_{1}(s) + CF_{1}(s) - Div_{1}(s)$$

$$- (EBIT_{1}(s) - rD)\tau^{C} - (1 - \tau^{C})r^{\Delta t}\Delta D^{t} - V_{1}^{\Delta D}$$

$$= (1 - 0.5\tau^{P})Div_{1}(s) + V_{1}^{E}(s) - I_{1}(s) + CF_{1}(s) - Div_{1}(s)$$

$$- (EBIT_{1}(s) - rD)\tau^{C} - (1 - \tau^{PD})r^{\Delta t}\Delta D^{t} - V_{1}^{\Delta D} + (\tau^{C} - \tau^{PD})r^{\Delta t}\Delta D^{t},$$
(13)

were we introduced τ^{PD} as the income tax rate of the marginal lender in the market when adding zero in the last line of (13).

If the firm does not raise new debt in t = 0, shareholders' future wealth will be

$$w_{1}(s) = (1 - 0.5\tau^{P})Div_{1}(s) + V_{1}^{E}(s) - I_{1}(s) + CF_{1}(s) - Div_{1}(s) - (EBIT_{1}(s) - rD)\tau^{C}.$$
(14)

Shareholders gain from increasing the firm's leverage if the present value (*PV*) of there future wealth $w_1^{lev}(s)$ from (13), plus the net proceeds from new debt, exceeds the present value of $w_1(s)$ form (14). Net of personal income tax shareholders receive a payment of $(1 - \beta \tau^P) \Delta D^l$ from the proceeds of newly raised long term debt in t = 0.

Hence, increasing leverage is advantageous if

$$PV\left[w_1^{lev}(s)\right] + (1 - \beta \tau^P) \Delta D^l > PV\left[w_1(s)\right]$$
(15)

Since $w_1^{lev}(s)$ from (13) equals $w_1(s)$ from (14), except for the term $-(1-\tau^{PD})r^{\Delta l}\Delta D^l - V_1^{\Delta D}(s) + (\tau^C - \tau^{PD})r^{\Delta l}\Delta D^l$, we conclude that (15) holds if

$$PV\left[-(1-\tau^{PD})r^{\Delta l}\Delta D^{l}-V_{1}^{\Delta D}(s)+(\tau^{C}-\tau^{PD})r^{\Delta l}\Delta D\right]+(1-\beta\tau^{P})\Delta D^{l}>0 \quad (16)$$

To solve for the present value on LHS of (16) we first observe that the present value of $(1 - \tau^{PD})r^{\Delta l}\Delta D^{l} + V_{1}^{\Delta D}(s)$ must equal the amount of new debt to be raised

in t = 0, ΔD , for the marginal lender to break even. Furthermore, the net tax shield $(\tau^{C} - \tau^{PD})r^{\Delta I}\Delta D$ is by assumption free of risk so that its present value can be calculated by discounting with the riskless short term net interest rate $(1 - \tau^{PD})r^{\Delta s}$. Therefore, (16) simplifies to the following condition for a tax advantage of increasing the firm's leverage by raising new long term debt:

$$-\Delta D^{l} + \frac{(\tau^{C} - \tau^{PD})r^{\Delta l}\Delta D^{l}}{1 + (1 - \tau^{PD})r^{\Delta s}} + (1 - \beta\tau^{P})\Delta D^{l} > 0$$

$$\Leftrightarrow \quad \frac{(\tau^{C} - \tau^{PD})r^{\Delta l}}{1 + (1 - \tau^{PD})r^{\Delta s}} > \beta\tau^{P}$$
(17)

Condition (17) is quite similar to condition (9), the one for a tax advantage of short term debt. But, in the numerator on the LHS of (17) the net tax saving is based on actual paid long term interest rate $r^{\Delta I}$ instead of the short term rate. The short term rate is used as discount rate since the net tax saving accrues after one period. Furthermore, (17) differs from (9) in that the income tax rate of the marginal lender, τ^{PD} , instead of the shareholders' income tax rate, τ^{P} , is relevant. If both tax rates coincide, and $r^{\Delta I} > r^{\Delta s}$, the LHS of (17) exceeds the LHS of (8), implying a higher tax advantage of long term debt compared to short term debt.

2.1.4 Income Tax on Capital Gains

We now show that introducing taxes on capital gains does not alter our results from the preceding analysis. In this analysis we assume that long term debt is raised to increase the firm's leverage. The case of short term debt is similar but not explicitly considered here.

Shareholders may have to pay capital gains taxes if they sell their shares at a price above purchase price. Increasing the firm's leverage may result in higher share prices and hence in higher capital gains taxes. But, as we will show, this chance in capital gains tax will not alter an eventual advantage of increasing leverage.

Old shareholders future wealth from holding equity is given by (13)

$$w_{1}^{lev}(s) = (1 - 0.5\tau^{P})Div_{1}(s) + V_{1}^{E}(s) - I_{1}(s) + CF_{1}(s) - Div_{1}(s) - (EBIT_{1}(s) - rD)\tau^{C} - (1 - \tau^{PD})r^{\Delta l}\Delta D^{l} - V_{1}^{\Delta D} + (\tau^{C} - \tau^{PD})r^{\Delta l}\Delta D^{l}.$$

Let us assume that the new debt is poured out via repurchasing b shares at current market price K_0^{lev} , with $bK_0^{lev} = \Delta D^l$. If m is the number of shares before the repurchase, the price per share after pouring out the new debt will be

$$K_0^{lev} = \frac{PV\left[w_1^{lev}(s)\right]}{m-b} = \frac{PV\left[w_1^{lev}(s)\right] + \Delta D^l}{m}$$
(18)

Without the increase in leverage, shareholders future wealth $w_1(s)$ from holding equity is instead given by (14). Then, the current share price is

$$K_0 = \frac{PV[w_1(s)]}{m},\tag{19}$$

Let us now assume that shareholders' tax base for capital gains taxes is $K_{-1} < Min[K_0, K_0^{lev}]$. From selling a share in t = 0 after the firm has increased its leverage, the seller collects net of capital gains taxes

$$R_0^{lev} = K_1^{lev} - \tau^{CG} \left(K_1^{lev} - K_{-1} \right).$$
⁽²⁰⁾

Without the increase in leverage the proceeds from selling a share in t = 0 net of capital gains tax would be

$$R_0 = K_1 - \tau^{CG} \left(K_1 - K_{-1} \right)$$
(21)

Comparing both income positions shows that increasing leverage is advantageous even for those shareholders selling in t = 0 and having to pay capital gains taxes, if

$$R_{0}^{lev} > R_{0} \quad \Leftrightarrow \quad K_{1}^{lev} - \tau^{CG} \left(K_{1}^{lev} - K_{-1} \right) > K_{1} - \tau^{CG} \left(K_{1} - K_{-1} \right)$$

$$\Leftrightarrow \quad K_{1}^{lev} > K_{1}$$

$$\Leftrightarrow \quad \frac{PV \left[w_{1}^{lev}(s) \right] + \Delta D^{l}}{m} > \frac{PV \left[w_{1}(s) \right]}{m}$$

$$\Leftrightarrow \quad PV \left[w_{1}^{lev}(s) \right] - PV \left[w_{1}(s) \right] + \Delta D^{l} > 0.$$

$$(22)$$

Note that the capital gains tax rate cancels out. Hence, it is irrelevant for the capital structure decision.

Furthermore, we already know from the analysis in 2.1.3 that

$$PV[w_1^{lev}(s)] - PV[w_1(s)] = -\Delta D^l + \frac{(\tau^C - \tau^{PD})r^{\Delta l}\Delta D^l}{1 + (1 - \tau^{PD})r^{\Delta s}},$$
 (23)

and therefore shareholders gain form increasing the firm's leverage, i.e. condition (22) holds, if

$$-\Delta D^{l} + \frac{(\tau^{C} - \tau^{PD})r^{\Delta l}\Delta D^{l}}{1 + (1 - \tau^{PD})r^{\Delta s}} + \Delta D^{l} > 0 \quad \Leftrightarrow \quad \frac{(\tau^{C} - \tau^{PD})r^{\Delta l}}{1 + (1 - \tau^{PD})r^{\Delta s}} > 0.$$
(24)

$$\Leftrightarrow \quad \tau^{C} > \tau^{PD} \tag{25}$$

(24) is in fact the same condition as in (17) for $\beta = 0$. That is because we assumed here that the payout in t = 0 comes via repurchasing shares instead of dividends. Therefore, if any tax has to be paid on this payout, it is the capital gains tax already considered in (20). So only the simple condition (25) remains.

If the payout is instead as a special dividend, the price per share in t = 0 after this dividend is

$$K_0^{lev/Div} = \frac{PV\left[w_1^{lev}(s)\right]}{m}$$
(26)

and shareholders' income per share sold in t = 0 net of capital gains tax is hence

$$R_{0}^{lev/Div} = K_{1}^{lev/Div} - \tau^{CG} \left(K_{1}^{lev/Div} - K_{-1} \right) + \frac{(1 - \beta \tau^{P}) \Delta D^{l}}{m}$$
(27)

This wealth exceeds the net income per share from (21), i.e. with no increase in leverage, if

$$K_{1}^{lev/Div} - \tau^{CG} \left(K_{1}^{lev/Div} - K_{-1} \right) + \frac{(1 - \beta \tau^{P}) \Delta D^{l}}{m} > K_{1} - \tau^{CG} \left(K_{1} - K_{-1} \right)$$

$$\Leftrightarrow \quad (1 - \tau^{CG}) \left(K_{1}^{lev/Div} - K_{1} \right) > -\frac{(1 - \beta \tau^{P}) \Delta D^{l}}{m}$$

$$\Leftrightarrow \quad (1 - \tau^{CG}) \left(PV \left[w_{1}^{lev}(s) \right] - PV \left[w_{1}(s) \right] \right) > -(1 - \beta \tau^{P}) \Delta D^{l} \qquad (28)$$

$$\Leftrightarrow \quad (1 - \tau^{CG}) \left(-\Delta D^{l} + \frac{(\tau^{C} - \tau^{PD}) r^{\Delta l} \Delta D^{l}}{1 + (1 - \tau^{PD}) r^{\Delta s}} \right) > -(1 - \beta \tau^{P}) \Delta D^{l}$$

From this condition we see that the capital gains tax rate does not drop out in general. But, if the capital gains tax rate equals the effective tax rate o the dividend, $\tau^{CG} = \beta \tau^{P}$, which is actually the case in Germany, condition (28) equals that in (24) without any relevance of the capital gains tax.

2.2 Funding Growth with Debt or Equity

2.2.1 Given Dividend Policy in the Quasi-One-Period Model

The pure leverage decision might be seen as a mainly artificial case since in reality firms quite seldom perform a pure debt for equity or equity for debt swap. The more relevant case is probably that a given need for capital, e.g. to finance growth, has to be met by issuing new debt or new equity. As we will see, in this case the criterion for the debt versus equity choice is generally simpler.

Assume that the firm has to finance an additional investment of ΔI_0 in t = 0 with external fund, i.e. new debt or new equity.⁸ In case of new debt the firm has to raise $\Delta D = \Delta I_0$.

In case of new equity the firm has to sell a share of λ with

$$\lambda V_0^{Equity} = \Delta I_0 \quad (=\Delta D) \,. \tag{29}$$

⁸ We take the additional investment as given, ignoring the fact that the *optimal* volume of new investments depends on the cost of capital and hence on the financial structure. For a model with endogenous investments see e.g. Mayer (1986).

The old shareholders' wealth in t = 0 is therefore:

$$W_0^{NewEquity} = (1 - \lambda) V_0^{Equity} = V_0^{Equity} - \Delta I_0 = V_0^{Equity} - \Delta D.$$
(30)

Without loss of generality we may assume that in case of using new equity in t = 0, no further issue is necessary in t = 1, i.e. $I_1(s) + Div_1(s) + (EBIT_1(s) - rD)\tau^c = CF_1(s) \forall s$.

If new short term debt (due in t = 1) is used to finance the investment in t = 0 the firm has to issue new equity in t = 1 to repay the additional debt to follow the same future investment policy as in the case with an initial issue of new equity. Hence, it has to sell a share of α with

$$\alpha V_1^{Equity}(s) = (1 + r^{\Delta s}) \Delta D^s - \tau^C r^{\Delta s} \Delta D^s.$$
(31)

Old shareholders' wealth in t = 1 is therefore:

$$W_{1}(s) = (1 - 0, 5\tau^{P})Div_{1}(s) + (1 - \alpha)V_{1}^{Equily}(s)$$

= $(1 - 0, 5\tau^{P})Div_{1}(s) + V_{1}^{Equily}(s) - (1 + (1 - \tau^{C})r^{\Delta s})\Delta D^{s}$ (32)
= $(1 - 0, 5\tau^{P})Div_{1}(s) + V_{1}^{Equily}(s) - (1 + (1 - \tau^{PD})r^{\Delta s})\Delta D^{s} + (\tau^{C} - \tau^{PD})r^{\Delta s}\Delta D^{s}.$

This first two terms in the last line of (32) are in sum the total wealth from holding the firm's equity. Hence, the present value thereof is the current value of the firm's equity, V_0^{Equily} . The third term in the last line of (32) is the income on debt net of income tax of the marginal lender in the market. Its present value must equal the face value to make the lender break even. The last term, $(\tau^C - \tau^{PD})r^{\Delta s}\Delta D^s$, is free of risk, hence its present value can be calculated using the net interest rate $(1 - \tau^{PD})r^{\Delta s}$. The *present value* of shareholders future wealth $W_1(s)$ from (32) is therefore:

$$W_0^{NewDebt} = V_0^{Equity}(s) - \Delta D^s + \frac{(\tau^C - \tau^{PD})r^{\Delta s}\Delta D^s}{(1 + (1 - \tau^{PD})r^{\Delta s})}.$$
 (33)

Comparing (30) and (33) shows that funding growth with new debt is preferable to new equity if

$$\frac{(\tau^{C} - \tau^{PD})r^{\Delta s}\Delta D^{s}}{(1 + (1 - \tau^{PD})r^{\Delta s})} > 0 \quad \Leftrightarrow \quad \tau^{C} > \tau^{PD}.$$
(34)

This is in principle exactly the same criterion as in 2.1 for $\beta = 0$ (see (10)), as one might have expected. The only difference is, that we have to consider the income tax rate τ^{PD} of the marginal lender instead of the shareholders income tax rate τ^{P} . The reason is, that when funding growth with new debt instead of pouring it out to shareholders, the latter generate no additional interest income to be taxed at τ^{P} . The additional interest income accrues to the market. Hence, we have to compare the income tax rate implicitly used in valuation with the corporate tax rate.

If new *long term* debt is used to finance the investment in t = 0 its value in t = 1 is an uncertain $V_1^{\Delta D t}$. Again, we assume that the firm has to issue new equity in t = 1 to repay the additional debt to follow the same further investment policy as in the case with an initial issue of new equity. This share of α is given by

$$\alpha V_1^{Equity}(s) = (1 - \tau^C) r^{\Delta l} \Delta D^l + V_1^{\Delta Dl}.$$
(35)

Old shareholders' wealth in t = 1 is hence:

$$W_{1}(s) = (1 - 0, 5\tau^{P})Div_{1}(s) + (1 - \alpha)V_{1}^{Equity}(s)$$

$$= (1 - 0, 5\tau^{P})Div_{1}(s) + V_{1}^{Equity}(s) - (1 - \tau^{C})r^{\Delta l}\Delta D^{l} - V_{1}^{\Delta Dl}$$

$$= (1 - 0, 5\tau^{P})Div_{1}(s) + V_{1}^{Equity}(s) - (1 - \tau^{PD})r^{\Delta l}\Delta D^{l} - V_{1}^{\Delta Dl} + (\tau^{C} - \tau^{PD})r^{\Delta l}\Delta D^{s}.$$
(36)

This first two terms in the last line of (36) are, as in (32), in sum the total wealth from holding the firm's equity. Hence, the present value thereof is again the current value of the firm's equity, V_0^{Equity} . The third and forth term together is the now the uncertain t=1 wealth from holding long term debt, net of income tax. Irrespective of the risk in $V_1^{\Delta Dl}$, this position's present value is the face value of new debt if the marginal lenders breaks even. The last term, $(\tau^C - \tau^{PD})r^{\Delta t}\Delta D^t$ is likewise to the last term in (32). Its present value can be calculated using the net interest rate $(1-\tau^{PD})r^{\Delta s}$. Adding all up, we see that the *present value* of shareholders future income $W_1(s)$ from (36) is:

$$W_0^{NewDebt} = V_0^{Equity}(s) - \Delta D^l + \frac{(\tau^C - \tau^{PD})r^{\Delta l}\Delta D^l}{(1 + (1 - \tau^{PD})r^{\Delta s})}.$$
 (37)

Comparing this present wealth with shareholders' wealth when using new equity from (30) gives the same criterion as for short term debt: Funding growth with new long term debt is preferable if

$$\frac{(\tau^{C} - \tau^{PD})r^{\Delta t}\Delta D^{t}}{(1 + (1 - \tau^{PD})r^{\Delta s})} > 0 \quad \Leftrightarrow \quad \tau^{C} > \tau^{PD}.$$
(38)

The bottom line is same simple condition as in (34) where we considered the advantage of short term debt. But, since the net tax shield (the numerator on the LHS of the first condition in (38)) is based on the interest rate on long term debt instead of the short term rate as in (34), the scale of the tax advantage may be different. A further difference may result form differences in the treatment of interest on long and short term debt as a reduction of the firm's corporate tax base. This is in fact the case in the German tax code and will be considered in section 3.

2.2.2 Adjusting Dividends and Permanent Increase in Debt

So far we assumed a given dividend policy and a given investment policy even after t = 1. To cope with this ceteris paribus condition we had to assume that the total payments to lenders and shareholders after t = 1 are independent of the capital structure decision in t = 0. Therefore, we assumed that interest⁹ and principal of any additional debt raised in t = 0 will be paid from the proceed of an issue of new equity in t = 1.

But we may also consider the possibility of isolating the firm's future investment policy from the current capital structure decision by adjusting the dividends. Then, if the firm's future investments, $I_t(s_t)$, its $EBIT_t(s_t)$ and cash flow, $CF_t(s_t)$, shall be taken as given, the dividend $Div_t(s_t)$ decreases in the volume of new debt, ΔD , raised in t = 0:

$$Div_{t}(s_{t}) = CF_{t}(s_{t}) - I_{t}(s_{t}) - \tau^{C} EBIT_{t}(s_{t}) - (1 - \tau^{C})(rD + r^{\Delta}\Delta D).$$
(39)

⁹ Net of the reduction in corporate tax.

We ignore any amortization of (new) debt in (39) to contrast the analysis with the one in 2.2.1 where we assumed a payback of the new debt by issuing new equity in future. Here, we may simply assume that the new debt is raised by issuing a perpetual bond and hence increasing leverage permanently.

Given the budget constraint (39), we now consider whether the firm should raise new debt or equity in t = 0 to finance the investment of ΔI_0 in growth. That is, we consider the combined effect of a capital structure decision and a dependent adjustment in dividend policy.

In case of raising the new capital via issue of <u>new debt</u> in t = 0 the net income of the firm's shareholders in state s_t in t is

$$NI_{t}^{E(+\Delta Debt)} = (1 - 0.5\tau^{P})Div(s_{t}) = (1 - 0.5\tau^{P})(CF_{t}(s_{t}) - I_{t}(s_{t}) - \tau^{C}EBIT_{t}(s_{t}) - (1 - \tau^{C})(rD + r^{\Delta}\Delta D)).$$
(40)

If the firm raises the new capital via issue of <u>new equity</u> in t = 0 instead of new debt, the net income of the firm's shareholders (old and new) in state s_t in t is:

$$NI_{t}^{E(+\Delta Equity)} = (1 - 0.5\tau^{P}) Div(s_{t}) = (1 - 0.5\tau^{P}) (CF_{t}(s_{t}) - I_{t}(s_{t}) - \tau^{C} EBIT_{t}(s_{t}) - (1 - \tau^{C})rD).$$
(41)

Note that the net income after raising new debt (40) is smaller than after raising new equity (41), namely by

$$(1-0,5\tau^{P})((1-\tau^{C})r^{\Delta})\Delta D$$
(42)

in each period and state. Hence, the present value of equity must also be smaller when the firm raises new debt. The difference is the present value of the annual cash flow in (42):

$$V_0^{E(+\Delta Debt)} = V_0^{E(+\Delta Equity)} - PV\left(\left(1 - 0.5\tau^P\right)\left(\left(1 - \tau^C\right)r^A\right)\Delta D\right).$$
(43)

But, if new equity is raised in t = 0 to fund the new investment, old shareholders retain only a share of λ in the firm, such that

$$\lambda V_0^{E(+\Delta Equily)} = \Delta I_0 = \Delta D.$$
(44)

Therefore, new debt is advantageous to new equity if the old shareholders' share $1-\lambda$ in the firm's equity after issuing new equity in t = 0 is worth less than the firm's equity after raising new debt:

$$(1-\lambda)V_{0}^{E(+\Delta Equity)} < V_{0}^{E(+\Delta Debt)}$$

$$\Leftrightarrow V_{0}^{E(+\Delta Equity)} - \Delta D < V_{0}^{E(+\Delta Equity)} - PV\left(\left(1-0.5\tau^{P}\right)\left(\left(1-\tau^{C}\right)r^{\Delta}\right)\Delta D\right). \quad (45)$$

$$\Leftrightarrow 1 > PV\left(\left(1-0.5\tau^{P}\right)\left(\left(1-\tau^{C}\right)r^{\Delta}\right)\right).$$

The present value of the annuity $(1-0.5\tau^{P})((1-\tau^{C})r^{\Delta})$ has to be calculated with the long term interest rate r^{Δ} , net of tax of the marginal lender, τ^{PD} :

$$PV\left(\left(1-0.5\tau^{P}\right)\left(\left(1-\tau^{C}\right)r^{A}\right)\right) = \frac{\left(1-0.5\tau^{P}\right)\left(\left(1-\tau^{C}\right)r^{A}\right)}{\left(1-\tau^{PD}\right)r^{A}},$$
(46)

so that the condition for a tax advantage of debt from (45) becomes:

$$1 > PV\left(\left(1 - 0.5\tau^{P}\right)\left(\left(1 - \tau^{C}\right)r^{\Delta}\right)\right) \quad \Leftrightarrow \quad 1 > \frac{\left(1 - 0.5\tau^{P}\right)\left(\left(1 - \tau^{C}\right)r^{\Delta}\right)}{\left(1 - \tau^{PD}\right)r^{\Delta}} \tag{47}$$

$$\Leftrightarrow (1-0.5\tau^{P})(1-\tau^{C}) < (1-\tau^{PD})$$
(48)

This criterion¹⁰ differs from that in 2.2.1 (see (38)) because we considered here an adjustment in the firm's future dividends. Raising new debt today results in lower

¹⁰ This is identical to the well known condition for a positive gain form leverage in Miller (1977), p. 267, even though he does not consider the decision to fund an additional project with debt or equity and hence has to assume that interest is deductible under the personal income tax. Closer to ours is therefore the analysis in King (1977), where our condition (47), with reversed inequality (for an advantage of issuing new shares), can already be found; see King (1977), p. 96. In the almost identical analysis in King (1974), p. 27, he obtains a different result because, there, he assumes that in case of debt financing dividends in t = 1 are reduced not only to pay for the net interest but also the principal of the additional debt raised in t = 0. In King (1977) and our analysis a reduction in dividends in case of debt financing is assumed only for paying the net interest. King (1977) assumes that the principal is repaid by an issue of new shares in t = 1. We assume instead a perpetual bond or repaying debt with new debt, leading to the same result as in King (1977)

dividends in total, compared to issuing new equity, and hence saves on income taxes on dividend. That's why the LHS of (48) is smaller than it would be under the assumptions of constant dividends, i.e. in (38).

Only if dividends are tax free ($\tau^{p} = 0$) condition (48) degenerates to (38). This is of course equivalent to not paying any dividends but buying back shares to pour out free cash flow free of tax.

2.2.3 Introducing Income Tax on Capital Gains

To consider the effect of capital gains on our results assume that the price per share *before* the additional investment in t = 0 is K_{-1} , and the number of outstanding shares is *m*.

If new debt is raised to fund the investment, the value of equity in t = 0 is $V_0^{E(+\Delta Debt)}$, and the price per share is

$$K_0^{E(+\Delta Debt)} = \frac{V_0^{E(+\Delta Debt)}}{m}.$$
(49)

If instead *n* new shares are issued to fund the investment the value of equity in t = 0 is $V_0^{E(+\Delta Equity)}$, the price per share is

$$K_0^{E(+\Delta Equity)} = \frac{V_0^{E(+\Delta Equity)}}{m+n}.$$
(50)

With the budget constraint $nK_0^{E(+\Delta Equity)} = \Delta I_0$ it follows from (50)

$$K_0^{E(+\Delta Equity)} = \frac{V_0^{E(+\Delta Equity)}}{m} - \frac{\Delta I_0}{m}.$$
 (51)

Let us now consider the proceeds from selling a share in t = 0 if capital gains taxes have to be paid on $K_0^{E(+\Delta Equity)} - K_{-1}$. If the firm had raised new equity, the net proceed is

$$R^{+\Delta Equity} = K_0^{E(+\Delta Equity)} - \tau^{CG} \left(K_0^{E(+\Delta Equity)} - K_{-1} \right).$$
(52)

If the firm raised new debt instead the net proceed is

$$R^{+\Delta Debt} = K_0^{E(+\Delta Debt)} - \tau^{CG} \left(K_0^{E(+\Delta Debt)} - K_{-1} \right).$$
(53)

Comparing (52) and (53) shows that debt is advantageous relatively to equity if

$$R^{+\Delta Debt} > R^{+\Delta Equity}$$

$$\Leftrightarrow \quad \left(1 - \tau^{CG}\right) K_{0}^{E(+\Delta Debt)} + \tau^{CG} K_{-1} > \left(1 - \tau^{CG}\right) K_{0}^{E(+\Delta Equity)} + \tau^{CG} K_{-1} \qquad (54)$$

$$\Leftrightarrow \quad K_{0}^{E(+\Delta Debt)} > K_{0}^{E(+\Delta Equity)}.$$

Note that the capital gains tax rate drops out. And, when we substitute the share prices from (49) and (51), we are back at the same criterion as in (48):

$$K_{0}^{E(+\Delta Debt)} > K_{0}^{E(+\Delta Equity)}$$

$$\Leftrightarrow \frac{V_{0}^{E(+\Delta Debt)}}{m} > \frac{V_{0}^{E(+\Delta Equity)}}{m} - \frac{\Delta I_{0}}{m}$$

$$\Leftrightarrow V_{0}^{E(+\Delta Debt)} > V_{0}^{E(+\Delta Equity)} - \Delta D \qquad (55)$$

$$\Leftrightarrow V_{0}^{E(+\Delta Equity)} - PV\left(\left(1 - 0.5\tau^{P}\right)\left(\left(1 - \tau^{C}\right)r^{\Delta}\right)\Delta D\right) > V_{0}^{E(+\Delta Equity)} - \Delta D$$

$$\Leftrightarrow (1 - 0.5\tau^{P})\left(1 - \tau^{C}\right) < 1 - \tau^{PD}.$$

Therefore, introducing capital gains tax does not alter the results from before.

3 The Model with German Corporate Tax and Trade Tax

3.1 Corporate taxes in Germany

In this chapter we consider how the results from the preceding analysis have to be modified if we take a closer look at the particularities of the German tax code. The main simplification in chapter 2 was the assumption of only one constant corporate tax rate. In fact, a German firm has to pay corporate tax (*Körperschaftsteuer*) and municipal trade tax (*Gewerbesteuer*) with different bases and a deductibility of trade tax from the corporate tax base.

Tax base for the trade tax in year t is (approximately) $EBIT_t$ minus all interest on debt, plus half of the interest on long term debt,

$$EBIT_{t} - r^{s}D_{t}^{s} - r^{l}D_{t}^{l} + \frac{1}{2}r^{l}D_{t}^{l} = EBIT_{t} - r^{s}D_{t}^{s} - \frac{1}{2}r^{l}D_{t}^{l},$$
(56)

if positive, with:

- D_t^s short term debt
- r^{s} interest on short term debt
- D'_t long term debt
- r' interest on long term debt

Given the effective trade tax rate τ^{Gew} , the trade tax T_t^{Gew} in t is

$$T_t^{Gew} = Max \left(0, EBIT_t - r^{Ds} D_t^s - \frac{1}{2} r^{Dl} D_t^l \right) \tau^{Gew}.$$
(57)

Tax base for corporate tax is the firm's profit minus trade tax, i.e. *EBIT*, minus total interest, minus trade tax: $(EBIT_t - r^s D_t^s - r^l D_t^l - T_t^{Gew})$. Given the corporate tax rate, τ^{Kst} , and the trade tax, T_t^{Gew} , the corporate tax is hence¹¹:

$$T_t^{KSt} = Max \left(0, EBIT_t - r^s D_t^s - r^l D_t^l - T_t^{Gew} \right) \tau^{Kst}.$$
(58)

Consistent with assumption 2 in chapter 2 we assume that profits are always positive, so that the firm always pay trade tax and corporate tax:

Assumption 3:

$$EBIT_t(s_t) - r^s D_t^s - r^l D_t^l > 0 \quad \forall t, s_t.$$
⁽⁵⁹⁾

Then, the firm's total tax in *t* is:

¹¹ In Germany no such thing as a tax credit exist, which plays a major roll in DeAngelo & Masulis (1980).

$$T_{t}^{Kst} + T_{t}^{Gew} = \left(EBIT_{t} - r^{s}D_{t}^{s} - r^{l}D_{t}^{l} - \left(EBIT_{t} - r^{s}D_{t}^{s} - \frac{1}{2}r^{l}D_{t}^{l}\right)\tau^{Gew}\right)\tau^{Kst} + \left(EBIT_{t} - r^{s}D_{t}^{s} - \frac{1}{2}r^{l}D_{t}^{l}\right)\tau^{Gew}$$
$$= \left(\tau^{Kst} + \tau^{Gew} - \tau^{Gew}\tau^{Kst}\right)\left(EBIT_{t} - r^{s}D_{t}^{s}\right) - \left(\tau^{Kst} + \frac{1}{2}\tau^{Gew} - \frac{1}{2}\tau^{Gew}\tau^{Kst}\right)r^{l}D_{t}^{l}.$$
(60)

To simplify the presentation we define:

$$\left(\tau^{Kst} + \tau^{Gew} - \tau^{Gew}\tau^{Kst}\right) \equiv \omega^{Es} > 0, \qquad (61)$$

and

$$\tau^{Kst} + \frac{1}{2}\tau^{Gew} - \frac{1}{2}\tau^{Gew}\tau^{Kst} \equiv \omega^l > 0, \qquad (62)$$

and henceforth write for the total tax on the corporate level:

$$T_t^{Kst} + T_t^{Gew} = \omega^{Es} \left(EBIT_t - r^s D_t^s \right) - \omega^l r^l D_t^l.$$
(63)

Obviously, total tax on the corporate level decreases in the level of short and long term debt. Increasing the short term debt or the long term debt by one unit reduces the firm's taxes by $\omega^{Es}r^s$ or $\omega^l r^l$, respectively.

3.2 The Pure Leverage Decision

We know form 2.1 that increasing leverage with *short term debt* is advantageous, given the firms investment policy and future dividends if

$$\frac{(\tau^{c} - \tau^{P})r^{\Delta s}}{1 + (1 - \tau^{P})r^{\Delta s}} > \beta \tau^{P}, \qquad (\text{see (9)})$$

if τ^{c} is the corporate tax rate and hence the marginal tax saved by paying interest on short term debt. We furthermore know from 3.1 that in Germany interest on short term debt reduces the sum of corporate and trade tax by ω^{Es} . Thus the relevant criterion for a tax advantage of short term debt in Germany for the pure leverage decision is:

$$\frac{(\omega^{Es} - \tau^{P})r^{\Delta s}}{1 + (1 - \tau^{P})r^{\Delta s}} > \beta \tau^{P} \quad \Leftrightarrow \quad \frac{\left(\left(\tau^{Kst} + \tau^{Gew} - \tau^{Gew}\tau^{Kst}\right) - \tau^{P}\right)r^{\Delta s}}{1 + (1 - \tau^{P})r^{\Delta s}} > \beta \tau^{P}.$$
(64)

With $\beta = 0$, the case most favorable for increasing leverage, condition (64) simplifies to

$$\tau^{K_{St}} + \tau^{Gew} - \tau^{Gew} \tau^{K_{St}} > \tau^{P}.$$
(65)

As a numerical example consider the actual corporate tax rate $\tau^{KSt} = 0.26375$ (including the add on tax "Solitaritätszuschlag") and a trade tax rate of $\tau^{Gew} = 0.1667$.¹² Then, for $\beta = 0$, short term debt is advantageous if

$$0.3865 > \tau^P$$
. (66)

So, increasing leverage is not always advantageous. Since the maximum income tax rate in Germany definitely exceeds the critical value from (66), increasing leverage may not pay under the most comprehensive *ceteris paribus* condition considered here.

Less advantageous is an increase in debt, of course, if shareholders have to pay additional income tax on the proceeds from raising new debt, i.e. $\beta > 0$. With e.g. $\beta = 0.5$ condition (64) holds only if $0.0337 > \tau^P$. Therefore, income on debt must be almost free of tax to generate a tax advantage of debt.

If raising new *long term debt* is considered to increase leverage, we know from 2.1 that this is advantageous if

$$\frac{(\tau^{C} - \tau^{PD})r^{\Delta l}}{1 + (1 - \tau^{PD})r^{\Delta s}} > \beta \tau^{P}.$$
 (see (17))

Since long term debt reduces taxes on the firm's level in Germany by ω' per unit of interest, the relevant criterion for a tax advantage of long term debt under the German tax code is:

¹² This effective rate is less the typical nominal rate, because the trade tax is deductible as a cost from its own tax base. The effective trade tax rate is 16.67% for a nominal rate of 20% (i.e. for a "*Hebesatz*" of 400% and the "*Steuermesszahl*" of 5%).

$$\frac{(\tau^{Kst} + \frac{1}{2}\tau^{Gew} - \frac{1}{2}\tau^{Gew}\tau^{Kst} - \tau^{PD})r^{\Delta t}}{1 + (1 - \tau^{PD})r^{\Delta s}} > \beta\tau^{P}.$$
(67)

Even if the term structure of interest rates is flat, $r^{\Delta t} = r^{\Delta s}$, and $\tau^{PD} = \tau^{P}$ this condition (67) differs from the one for a tax advantage of short term debt, see (64) The reason is that the marginal tax shield of interest on long term debt differs from that of short term debt under the German tax code

$$\omega^{l} < \omega^{Es} \quad \Leftrightarrow \quad \tau^{Kst} + \frac{1}{2}\tau^{Gew} - \frac{1}{2}\tau^{Gew}\tau^{Kst} < \tau^{Kst} + \tau^{Gew} - \tau^{Gew}\tau^{Kst}.$$
(68)

Therefore, long term debt is *c.p.* less advantageous.

Let us consider our numerical example for the special case with $\beta = 0$. Then, condition (67) holds if

$$0.3251 > \tau^{PD}$$
. (69)

Compared to (66) this may be a more demanding condition, for the reason given in (68).

With $\beta > 0$, the tax advantage of long term debt depends also on the long and short term interest rates. If we assume for our numerical example again $\beta = 0.5$, $r^{\Delta s} = 0.05$, $r^{\Delta l} = 0.075$, and moreover $\tau^{P} = \tau^{PD}$, condition (67) holds if $\tau^{P} = \tau^{PD} < 0.0407$. This is not very likely.

3.3 Funding Growth

3.3.1 Constant Dividend Policy

From 2.2.1 we know that issuing new debt is preferable to an issue of new equity to fund investments in t = 0 under a given dividend policy, if

$$\tau^{C} > \tau^{PD}$$
, (see (34) or (38))

irrespective of whether debt is long term or short term. Only the particularities of the German tax code lead to a difference in the assessment of long or short term debt. For long term debt we have to implement the compounded tax rate ω' in

place of τ^{C} , or $\omega^{Es} > \omega^{l}$ in case of short term debt. Hence, long term debt is advantageous to equity if

$$\omega^{l} > \tau^{PD} \quad \Leftrightarrow \quad \tau^{Kst} + \frac{1}{2}\tau^{Gew} - \frac{1}{2}\tau^{Gew}\tau^{Kst} > \tau^{PD}, \tag{70}$$

and short term debt is advantageous to equity if

$$\omega^{Es} > \tau^{PD} \quad \Leftrightarrow \quad \tau^{Kst} + \tau^{Gew} - \tau^{Gew} \tau^{Kst} > \tau^{PD}$$
(71)

The reason for the tax advantage of short term debt being higher than that of long term debt is the difference in deductibility of long and short term interest from the trade tax base. Long term debt is discriminated in this respect.

We already calculated ω^{l} and ω^{Es} for the tax rates given in the numerical example in 3.2. For $\tau^{KSl} = 0.26375$ and $\tau^{Gew} = 0.1667$, we get $\omega^{l} = 0.3251$ and $\omega^{Es} = 0.3865$. Hence, if

$$0.3865 > \tau^{PD} > 0.3251, \tag{72}$$

raising short term debt has a tax advantage compared to issuing equity, but long term debt has not.

3.3.2 Adjusting Dividends and Permanent Increase in Debt

If the firm raises debt to fund investments in t = 0 instead of equity and reduces future dividends by the net interest payments to hold future reinvestments constant, we know from the analysis in 2.2.2 that debt is advantageous if

$$(1-0,5\tau^{P})(1-\tau^{C}) < 1-\tau^{PD}.$$
 (see (48))

Considering the German tax code we have to substitute ω^l for τ^c in this condition if the debt is long term (a reasonable assumption for the setting). Hence, the condition for a tax advantage of long term debt in Germany is

$$(1-0,5\tau^{P})(1-\omega^{l}) < 1-\tau^{PD} \Leftrightarrow$$

$$(1-0,5\tau^{P})\left(1-\tau^{Kst}-\frac{1}{2}\tau^{Gew}+\frac{1}{2}\tau^{Gew}\tau^{Kst}\right) < 1-\tau^{PD}.$$

$$(73)$$

Given our realistic corporate tax rates, $\tau^{KSt} = 0.26375$ and $\tau^{Gew} = 0.1667$, this condition becomes:

$$(1-0.5\tau^{P})(1-0.3251) < 1-\tau^{PD} \iff \tau^{PD} - 0.3375\tau^{P} < 0.3251.$$
 (74)

Let us further assume that $\tau^{PD} = \tau^{P}$, then using debt instead of equity leads to a tax advantage if:

$$\tau^{P} < 0.4907$$
. (75)

Since the maximum income tax rate is 42%, and, including *Solidaritätszuschlag*, the effective tax on income is $1.055 \times 42\% = 44,31\%$, (75) holds for sure.

4 Summary

We considered the tax advantage of an increase in the firm's leverage in a quite general setting and furthermore analyzed this capital structure decision under the German Tax code.

If we hold the firm's investment policy and future dividend policy constant (the most comprehensive *ceteris paribus* condition), the advantage of increasing leverage does not only depend on the corporate tax rate, the tax rate on income from debt, but also on the tax treatment of the payout to shareholders from the proceeds of new debt. Of course, the higher the tax burden on those payouts, the less advantageous is an increase in the firm's leverage. If the payout can be completely shielded¹³ from tax, increasing leverage is advantageous if the corporate tax rate exceeds the income tax rate to be paid on income from debt. The relevant income tax rate in this case is the one of the firm's current shareholders. We furthermore showed that capital gains taxes are *not* relevant for the leverage decision.

¹³ This includes the case with a tax on the payout in form of a special dividend which is compensated by the effect of a decrease in share prices leading to decreasing capital gains taxes.

Under the current German tax code, we found, that increasing leverage with short (long) term debt is advantageous if the income tax rate is *less* than 38.65% (32.51%) if no taxes have to be paid on the proceeds from new debt. The critical value for the income tax rate decreases with tax on the proceeds from new debt, e.g. to only 3.37% in case of a regular income tax on half of the proceeds from new short term debt poured out to shareholders.

We also considered the decision to fund new investments today with new debt or equity (funding growth instead of increasing leverage for a given firm). But, to decide on the relative advantage of debt or equity we had to hold the *future* investment policy constant. We may also insulate the firm's future dividend policy from the current decision on how to fund the investment by assuming that in case of debt financing the principal and interest on that new debt will be repaid by a future issue of new equity (non permanent new debt). In this case, debt financing is preferable to equity if the corporate tax rate exceeds the income tax rate of the marginal investor in the debt market. Again, under the German tax code, the comprehensive corporate tax rate to be considered depends on whether the firm plans to raise short or long term debt. For short term debt to be advantageous compared to equity, the income tax rate must not exceed 38.65%, for long term debt the critical value is 32.52%. The difference in the values is due to the privilege of short term debt in the trade tax code (the Gewerbesteuer). The numbers are the same as in the case of the pure leverage decision, but note that here we have to compare the income tax rate of the marginal investor in the debt market with this critical values when considering funding growth with debt or equity, instead of the income tax rate of the firm's current shareholders when considering the pure leverage decision.

If any debt raised to fund growth shall not be repaid in the nearer future, the firm has either to decrease future investments or future dividends compared to the case of funding growth with new equity, since it has to pay more interest. We also analyzed this debt/equity choice under the assumption of constant future investments but smaller total dividends in case of debt financing. For this case, the relative advantage of debt depends on the corporate tax rate, the income tax rate of the firm's shareholders, and the income tax rate of the marginal investor in the debt market. Again, capital gains taxes are *not* relevant for the capital structure decision. For the German tax code we found that debt is always advantageous, considering the adjustment in dividends, if we make the simplifying assumption of just one single income tax rate.

Of course, our results are to be interpreted very carefully since we considered taxes as the only relevant factor for the capital structure decision. Other aspects, e.g. resulting from agency problems, may partly compensate a tax advantage or disadvantage of debt. But, we think it worthwhile to know for sure first, if there is a tax based advantage or disadvantage of debt, when taking into account other aspects in the complex capital structure decision.

5 References

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