# Why is the corporate tax rate lower than the personal tax rate?<sup>+</sup>

by

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## Abstract

In many OECD countries, statutory corporate tax rates are lower than personal income tax rates. The present paper argues that this tax rate differentiation is an optimal tax policy if there are problems of asymmetric information between investors and firms in the capital market. The reduction of the corporate tax rate below the personal tax rate encourages equity financing and thus mitigates the excessive use of debt financing induced by asymmetric information. Our main theoretical result stands in marked contrast to the traditional view of corporate taxation and corporate finance theory, according to which there is a tax disadvantage to equity financing. More recent empirical evidence on this issue, however, is in line with our result.

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## 1. Introduction

One stylized feature of the tax systems in many OECD countries is that the corporate tax rate is lower than the (top marginal) tax rate on personal income.<sup>1</sup> On prima facie grounds, this tax wedge is hard to justify in economic terms. On the contrary, a corporate tax rate which is lower than the personal tax rate raises various problems. First, any divergence between corporate and personal tax rates creates incentives to shift taxable income from the higher to the lower taxed income category (Feldstein and Slemrod (1980)). One example is to grant employees stock options instead of wage payments if the corporate tax rate is lower than the top personal tax rate (Gordon (1998)). While, in practice, there are limits to the ability of individuals to minimize their tax burdens through income shifting, empirical evidence for the US indicates that income shifting does take place (Gordon and Slemrod (1998)). If income shifting involves real resource costs, this tax wedge also induces a welfare loss in addition to the loss of tax revenue for governments. A second potential problem is that low corporate tax rates create incentives for individuals to set up corporations as savings vehicles. Thus, an individual can save taxes by holding financial assets not personally but through a lightly taxed corporation. Again, this can be restricted in practice by various tax rules, but it is plausible that such rules (for example that corporations face tax penalties if their financial assets are viewed as excessive) will also involve some efficiency costs. Finally, differences between corporate and personal tax rates may distort the organizational choices of firms, i. e. whether to set up a business as a corporate or a noncorporate firm. Gordon and MacKie-Mason (1994) show that the effects of these tax wedges on the choice of organization involve an (albeit small) welfare loss.

Given these negative effects on efficiency and tax revenue, it is natural to ask why nonetheless many countries adopt a corporate tax rate which is low relative to the personal tax rate. Several reasons might help to explain this. One possible explanation is that a low corporate tax rate simply reflects the downward pressures of international tax competition. If capital is internationally mobile, an individual country might indeed choose a low corporate tax rate to restrict the outflow of capital while personal income is taxed at relatively high rates if the factors generating personal income like, e.g., labor are less mobile than capital. One implication of this argument is that tax rates on personal business or capital income should

<sup>&</sup>lt;sup>1</sup> See table 1. Further empirical evidence is discussed in section 5.

also be relatively low. In fact, the tax codes of many countries treat personal business or capital income differently than, e.g., labor income. For example, Germany taxes income from noncorporate businesses at the same rate as the income of corporations (which is lower than the top marginal personal income tax rate, see table 1) and also grants rather generous exemptions for personal capital income. Similarly, the dual income tax system in the Nordic countries contains specific provisions for personal income accruing from capital. On the other hand, the US tax code does not offer any relief for personal capital income. This is not surprising, given that the US probably faces less severe pressures from tax competition than the smaller European countries. But, this also indicates that other factors than tax competition play a role to explain relatively low corporate tax rates.

#### - Table 1 here -

A second explanation is that low corporate tax rates spur entrepreneurial activity. If entrepreneurial activity generates significant positive externalities along the lines developed in the "new growth literature", it might indeed be efficiency enhancing, other things being equal, to choose a corporate tax rate below the personal tax rate so as to induce more individuals to start new businesses. The resulting distortions of the organizational choices of firms as in the US provide an additional stimulus for entrepreneurial activity. In the initial phase of their life, when they are typically running losses, firms will choose a noncorporate status to benefit from the implicit subsidy through high personal tax rates. When they start to become profitable, they switch to corporate status (Gordon (1998)). While "new growth externalities" clearly provide another possible reason for choosing relatively low corporate tax rates this explanation is not without problems. First, it is hard to find a reliable measure for the extent and significance of these externalities. Second and perhaps more importantly, it is not clear whether a low corporate tax rate is really the best instrument to correct for externalities generating insufficient entrepreneurial activity. For example, one can think of a situation where the inefficiently low level of entrepreneurial activity largely concerns certain sectors like high-tech industries. A simple subsidy to the firms in these sectors may then be a more appropriate instrument than a low tax rate on corporate profits benefiting all firms in the economy. Moreover, a low corporate tax rate will also favor copy-cat firms potentially generating negative externalities (Gordon (1998)). Again, this calls for more targeted taxsubsidy policies than a simple across-the-board reduction in corporate tax rates.

In this paper, we explore a different explanation. Our starting point is that the difference between corporate and personal tax rates influences the financing decisions of firms. A relatively low corporate tax rate tends to favour equity financing while a low personal tax rate raises the attractiveness of debt financing. Recent empirical evidence for the United States (Graham (1999), MacKie-Mason (1990)) indicates that the financing decisions of firms are significantly affected by tax differences. Graham (1999) reports that, at the margin, debt financing is at a tax disadvantage relative to equity financing. In this paper, we argue that such a favorable tax treatment of equity (i.e. a relatively low corporate tax rate) can be explained as an optimal policy response to an underlying problem of asymmetric information in capital markets. We show that the optimal tax policy will always involve a corporate tax rate which is lower than the personal income tax rate. The reason is that asymmetric information gives rise to excessive debt financing in our model. The lower corporate tax rate corrects for this distortion by encouraging equity financing. Empirically, our analysis is probably most relevant for the situation of small and medium-sized firms, where problems of asymmetric information are likely to be most severe. Smaller firms typically rely much more on debt financing than larger firms (Gordon and Lee (1999)). Moreover, in the U.S. and many other OECD countries, small firms face significanfly lower corporate income and capital gains tax rates than larger firms.<sup>2</sup>

The basic approach of our theoretical analysis is inspired by Myers and Majluf (1984). In our model, the crucial informational asymmetry is between firms and potential investors who finance the firms' investment. This informational asymmetry gives rise to a "lemons problem" à la Akerlof (1970) that partly eliminates the market for equity financing. Since investors cannot observe firm specific productivity differences, profitable firms will use debt financing. Although a non-tax cost advantage of equity prevents the equity market from disappearing, the emerging financial structure of firms and the level of investment will be inefficient. Reducing the corporate tax rate below the personal tax rate then allows to increase equity financing and yields a welfare improvement. However, due to distortions of the overall level of investment, it turns out that the efficient extent of tax rate differentiation is limited.

 $<sup>^{2}</sup>$  Up to earnings of 50 000US-\$, the corporate income and capital gains tax tax rates are only 15%.

The rest of the paper is organized as follows. In section 2, we set up the basic structure of the model. In section 3, we analyze the equilibrium in financial markets. In section 4, we discuss the welfare effects of tax policies. In section 5, we discuss our findings in the light of empirical results on tax discrimination between personal and corporate income. Conclusions are given in section 6.

## 2. The Model

We consider a two-period model of an open economy. There is a representative consumer with the utility function  $W = U(C_1, C_2, L) + H(G)$ , where  $C_1$  and  $C_2$  denote first-period and second-period consumption, L is labour supply and G is a public good. We assume that labour is only supplied in period 2. In the first period, the consumer is endowed with income Y. In addition, he/she owns equity shares in a large number N of firms which yield income in period 2. The budget constraint in period 1 is given by

$$Y = C_1 + S \tag{1}$$

where S denotes savings. Savings can be invested in new equity issues of firms, debt issues of firms or in the world capital market where they earn the exogenous rate of return r. Arbitrage implies that all investments yield the same rate of return. Denoting the personal tax rate on (interest) income by t, the after-tax-return on savings is r(1-t).<sup>3</sup> In addition, the household earns the income Z from his initial equity holdings, net of taxes, plus labour income w<sup>n</sup>L, where w<sup>n</sup> is the net wage rate. C<sub>2</sub> is thus determined by

$$C_{2} = Z + (1 + r(1 - t))S + w^{n}L.$$
(2)

Consider now the firms in this economy. The modelling of the production sector in our model is inspired by Gordon and Bovenberg (1996) and Razin et al. (1998, 1999). There are N firms in the economy which are ex ante identical but differ ex post due to a random productivity shock. In period 1, a firm i invests  $K_i$  which yields a random output  $f(K_i, L_i) + (1 + \varepsilon_i)K_i$  in

period 2, where  $\varepsilon_i$  is a random variable with  $E\{\varepsilon_i\} = 0$ ;  $\varepsilon_i$  is assumed to be bounded from below such that  $\varepsilon_i > -1$ . Moreover, let  $f(K_i, L_i)$  be linear homogenous in  $K_i$  and  $L_i$ , such that  $f(K_i, L_i) = f_K K_i + f_L L_i$ , where subscripts denote partial derivatives. Furthermore, each firm is endowed with equity which is invested in a project yielding a safe output  $\overline{Z}$  in period 2. We assume that the net operating profit from this project is zero.  $\overline{Z}$  thus represents a tax free capital repayment of initial equity investment. One may note that, with these assumptions, the marginal productivity of labour is unaffected by the productivity shock  $\varepsilon_i$  and that the analysis abstracts from capital depreciation (in expected terms).

Investment, employment and financing decisions take place in period 1 but evolve in two stages. First, each firm chooses investment and employment before  $\varepsilon_i$  is known.<sup>4</sup> Since firms are ex ante identical the level of investment is the same across firms, i.e.  $K_i = K$ . The level of employment is therefore also the same across firms. Normalizing the number of firms (N) to unity, we get  $L_i = L$ . Suppose in addition that  $\varepsilon_i$  is independent across firms and that the number of firms is sufficiently large such that there is no aggregate uncertainty. Aggregate output of firms in period 2 then amounts to  $\overline{Z} + f(K, L) + K$ .

Given the levels of investment and employment, financing decisions take place at the second stage. At this stage, each firm knows its true value  $\varepsilon_i$ . However, this information is not revealed to outside investors. Investment can be financed by issuing either equity or debt.<sup>5</sup> Under equity financing, the firm is sold to outside investors who pay a price V<sub>i</sub> to the original owners and invest the amount K to cover investment expenditures. In return, outside investors receive the firm's after-tax revenue. With equity financing, corporate income subject to the corporate tax amounts to  $f(K, L) + \varepsilon_i K - wL$ , where w is the gross wage rate.<sup>6</sup> Denoting the corporate tax rate by  $\tau$ , after-tax corporate income (including the cash flow from the initial asset endowment) under equity financing thus amount to

$$\overline{Z} + K + (1 - \tau) (f(K, L) + \varepsilon_i K - wL),$$

(3)

<sup>&</sup>lt;sup>3</sup> The return on savings is certain due to the absense of aggregate uncertainty in the economy, (see below).

<sup>&</sup>lt;sup>4</sup> Since the marginal productivity of labour is independent of  $\varepsilon$ , assuming that the employment decision takes place at a later stage would not affect the results. <sup>5</sup> We assume that firms have no free internal funds to finance investment.

<sup>&</sup>lt;sup>6</sup> Note that K, like Z, represents a tax-free capital repayment.

which accrue to outside equity investors.<sup>7</sup> We assume that this after-tax income can be distributed to shareholders, e.g., through share repurchases without incurring any personal income tax liabilities. Suppose for convenience that, in addition, there is no capital gains tax or capital gains taxes can be avoided by appropriate deferral stategies.<sup>8</sup> Under these simplifying assumptions, eq. (3) gives the after-tax income of shareholders.

Consider now the case of debt financing. If the firm borrows the amount K, it has to pay the interest rate r. Although there is no aggregate uncertainty and lenders are therefore riskneutral,  $\hat{r}$  can be higher than r due to a default premium reflecting that some firms may go bankrupt and cannot repay their debts. Furthermore, we assume along the lines of the traditional theory of corporate finance (Gordon and MacKie-Mason (1990)) that debt financing involves some additional real resource costs relative to equity financing. These costs reflect the cost of potential bankruptcy and various monitoring and agency costs which arise in the presence of different groups of investors in a firm. For convenience, we assume that these costs are simply proportional to the total outstanding debt. In what follows, c denotes these costs per \$ of debt. In period 2, total debt liabilities of the firm equal  $(1+\hat{r})K$ . If the firm remains solvent, the firm's pre-tax cash flow is simply  $\overline{Z} + f(K,L) + \varepsilon_{i}K - \hat{r}K - wL$ . Since interest payments can be deducted from the corporate tax base, shareholders receive  $\overline{Z} + (1-\tau)(f(K,L) + \varepsilon_i K - \hat{r}K - wL)$ . If the firm is not able to repay its debt, i.e.  $\overline{Z} + f(K,L) + \varepsilon_i K - wL < \hat{r}K$ , the income of shareholders is zero, reflecting the limited liability status of corporations. Under debt financing, after-tax income of shareholders is thus determined by

$$\max\left[\overline{Z} + (1 - \tau)(f(K, L) + \varepsilon_{i}K - \hat{r}K - wL), 0\right]$$
(4)

As will be shown in more detail below, bankruptcies do not occur in equilibrium. Therefore, the default premium on debt equals zero. Perfect competition in the debt market then implies that  $\hat{r} = r + c$  and holders of debt securities earn, net of debt costs, the pre-tax rate of return r.

<sup>&</sup>lt;sup>7</sup> In our model, we simply consider a proportional corporate income tax, where  $\tau$  is the statutory and effective marginal (and average) tax rate. We thus disregard complications like favorable depreciation allowances and differences between average and marginal tax rates. We will return to these issues in section 5, where we discuss the empirical implications of our analysis.

## 3. Equilibrium Financing and Investment

We can now analyse the equilibrium in this economy. We recursively solve the model and start by deriving the equilibrium in the financial markets. We then study the investment decisions of firms.

## 3.1. The Choice between Equity and Debt Financing

Consider first the choice between equity and debt financing. If the firm is sold today, the original shareholders will receive  $V_i$  which can be invested in the world capital market at the after-tax interest rate r(1-t).<sup>9</sup> Alternatively, if the firm borrows the amount K, the original owners receive (4). If the firm pursues, as we will assume, the interests of its owners, it will choose equity financing if

$$[1+r(1-t)]V_{i} \ge \max\left[\overline{Z} + (1-\tau)[f(K,L) + \varepsilon_{i}K - \hat{r}K - wL], 0\right]$$
(5)

Note that a firm which becomes insolvent under debt financing will be sold in period 1. Therefore, if an equilibrium with equity financing exists, no (socially costly) bankruptcy occurs. For a solvent firm, condition (5) becomes

$$\left[1+r(1-t)\right]V_{i} \ge \overline{Z} + (1-\tau)\left[f(K,L) + \varepsilon_{i}K - \hat{r}K - wL\right]$$
(6)

Equation (6) determines a critical value  $\varepsilon^*$  where a firm is just indifferent between equity and debt financing. High productivity firms, that is firms with  $\varepsilon_i > \varepsilon^*$ , will prefer debt financing, while low-productivity firms with  $\varepsilon_i \leq \varepsilon^*$  choose equity financing. The underlying economic logic is that equity financing is particularly expensive if the firm has an above-average productivity since the equity market only rewards according to average productivity. The reader may note that these results differ in several respects from those in Myers and Majluf (1984). These differences and their empirical implications will be discussed further in section 5.

<sup>&</sup>lt;sup>8</sup> In the United States, capital gains taxes can be avoided if assets are held until death.

The firm's market value is determined by the break-even condition of equity investors. Given that only firms with  $\varepsilon_i \leq \varepsilon^*$  sell equity, outside investors conclude that the expected after-tax return on equity investment in firm i is  $\overline{Z} + K + (1 - \tau)[f(K, L) + \varepsilon^- K - wL]$ , where  $\varepsilon^- = E[\varepsilon|\varepsilon \leq \varepsilon^*]$ . Perfect competition between equity investors implies that the expected after-tax return on equity equals r(1-t). The break-even condition for equity investors is thus

$$\left[1+r(1-t)\right]V_{i} = \overline{Z} + \left(1-\tau\right)\left[f\left(K,L\right) + \varepsilon^{-}K - wL\right] - r(1-t)K.$$
(7)

Combining (6) and (7) yields

$$(\epsilon^* - \epsilon^-)(1 - \tau) = \hat{r}(1 - \tau) - r(1 - t)$$
 (8)

Recalling that  $\hat{\mathbf{r}} = \mathbf{r} + \mathbf{c}$ , we can rewrite (8) as

$$\varepsilon^* - \varepsilon^- = r(1 - \gamma) + c \tag{9}$$

where

$$\gamma \equiv \frac{(1-t)}{(1-\tau)}.$$

Eq. (9) is the crucial condition to determine the equilibrium value of  $\varepsilon^*$ . As in Gordon and Bovenberg (1996), we assume that  $\varepsilon^* - \varepsilon^-$  is a monotonically increasing function in  $\varepsilon^*$ . Given this, the l.h.s. of (9) will thus take on values in the interval  $[0,+\infty]$ .<sup>10</sup> Thus, there always exists an equilibrium value of  $\varepsilon^*$  such that (9) is satisfied with equality.<sup>11</sup> In addition, this equilibrium value of  $\varepsilon^*$  must be consistent with a positive price V<sub>i</sub> of the firm in (7). It is easy to verify that V<sub>i</sub> is positive if the initial equity  $\overline{Z}$  is sufficiently high. In what follows, we will assume that this condition is satisfied.

<sup>&</sup>lt;sup>9</sup> Recall that there is no capital gains tax.

<sup>&</sup>lt;sup>10</sup> The lower bound of  $\varepsilon^*$  is -1 such that  $\varepsilon^- = -1$ . For  $\varepsilon^* \to \infty$ , we have  $\varepsilon^- = 0$ .

<sup>&</sup>lt;sup>11</sup> This implicitly assumes that the r.h.s. of (9) is positive. As we will show below, the government will always choose  $\gamma < 1$  which suffices to ensure this.

So far, we have seen that, for given values of  $\gamma$  and c, low-productivity firms will be sold in the equity market, while firms with high productivity will rely on issuing debt.  $\varepsilon^*$  gives the value of  $\varepsilon_i$  where a firm (or, more precisely, its original owners) are just indifferent between equity and debt financing. How do taxes affect the equilibrium value of  $\varepsilon^*$  and, thus, the extent of debt and equity financing? Formally,

$$\frac{\partial \varepsilon^*}{\partial \gamma} = -\frac{r}{\left(1 - \frac{\partial \varepsilon^-}{\partial \varepsilon^*}\right)} < 0 \tag{10}$$

where  $1 - \frac{\partial \varepsilon^-}{\partial \varepsilon^*} > 0$ , follows from our assumption that the l.h.s. of (9) is a monotonically increasing function of  $\varepsilon^*$ . An increase in  $\gamma$  raises the tax cost of equity financing relative to that of debt financing and therefore raises the number of firms which choose debt financing. This impact of tax policy on the financing decisions of firms will play an important role in the following analysis.

#### **3.2. Investment and Employment Decisions**

The next step is now to analyse the investment and employment decisions of the firms at the first stage. The expected after-tax income of a representative firm is

$$Z = \overline{Z} + \int_{-1}^{\varepsilon^{*}} \left[ (1 - \tau) \left[ f(K, L) + \varepsilon^{-} K - wL \right] - r(1 - t) K \right] g(\varepsilon) d\varepsilon$$

$$+ \int_{\varepsilon^{*}}^{\infty} \left[ (1 - \tau) \left[ f(K, L) + \varepsilon K - \hat{r} K - wL \right] \right] g(\varepsilon) d\varepsilon$$
(11)

where  $g(\varepsilon)$  denotes the density function of  $\varepsilon$ .<sup>12</sup> The second term on the r.h.s. of (11) captures the return from an equity financed firm while the third term stands for the profits with debt financing. Maximising (11) over L leads to the simple marginal productivity condition

$$f_{L} = w \tag{12}$$

which reflects that wage costs can be deducted from the corporate tax base irrespective of financing decisions. Maximizing (11) over K yields the first-order condition

$$\Phi(\epsilon^{*})[(1-\tau)(f_{K}+\epsilon^{-})-r(1-t)]+(1-\Phi(\epsilon^{*}))(1-\tau)[f_{K}+\epsilon^{+}-\hat{r}]=0$$
(13)

where  $\Phi(\varepsilon^*)$  is the cumulative probability distribution of  $\varepsilon$ , i.e.  $\Phi(\varepsilon^*) = \text{prob}(\varepsilon \le \varepsilon^*)$ ;  $\varepsilon^+$  is the conditional expectation  $\varepsilon^+ = E[\varepsilon|\varepsilon \ge \varepsilon^*]$ .<sup>13</sup> This can be simplified to

$$\mathbf{f}_{\mathrm{K}} = \left[1 - \Phi(\varepsilon^*)\right]\hat{\mathbf{r}} + \Phi(\varepsilon^*)\mathbf{r}\boldsymbol{\gamma} \tag{14}$$

Eq. (14) shows that the expected cost of capital is a weighted average of the cost of debt and equity capital. Note that, for  $\gamma = 1$ , that is equal tax rates on personal and corporate income, (14) yields

$$f_{K} = r + [1 - \Phi(\varepsilon^{*})]c \tag{15}$$

Eq. (15) shows in a very simple way that the informational asymmetry in the capital market, which gives rise to socially costly debt financing, leads to underinvestment relative to the first best allocation. In a first-best allocation, there would only be equity financing and firms would set  $f_K = r$ .

How does tax policy now affect investment? Using (9), (14) can be written as

$$f_{K} = \hat{r} - \Phi(\epsilon^{*})(\epsilon^{*} - \epsilon^{-})$$
(16)

Differentiating (16), taking as given the value of L, yields

$$\frac{\partial K}{\partial \gamma} = -\frac{1}{f_{KK}} \left( \Phi'(\epsilon^*)(\epsilon^* - \epsilon^-) + \Phi(\epsilon^*) \left( 1 - \frac{\partial \epsilon^-}{\partial \epsilon^*} \right) \right) \frac{\partial \epsilon^*}{\partial \gamma} < 0.$$
(17)

<sup>&</sup>lt;sup>12</sup> Since there is no aggregate uncertainty, maximization of expected profits is consistent with maximizing utility of initial shareholders.

<sup>&</sup>lt;sup>13</sup> Note also that  $\Phi(\epsilon^*)\epsilon^- + (1 - \Phi(\epsilon^*))\epsilon^+ = E[\epsilon] = 0$ .

Eq. (17) shows that a change in  $\gamma$  affects the level of investment via its impact on the financing decisions of firms. As has been explained above, an increase in  $\gamma$  raises the tax cost of equity financing. If there is both debt and equity financing in the equilibrium, the overall expected cost of capital increases, which explains why investment declines.

Summarizing, the equilibrium in this economy is characterized by equations (9) and (16), which determine  $\varepsilon^*$ , that is the financial structure of the firms, and the level of investment (K) relative to employment (L) in equilibrium. More formally, (9) gives us  $\varepsilon^*$  as a function of  $\gamma$ , i.e.  $\varepsilon^* = \varepsilon^*(\gamma)$ , while (16) allows us to express K as a function of  $\gamma$  and L, i.e.  $K = K(\gamma,L)$ . Finally, for the following analysis, note that, due to the constant returns to scale assumption, we have  $Z = \overline{Z}$  in equilibrium. To see this, note that (11) can be written as

$$Z = \overline{Z} + \phi(\epsilon^*) \Big[ (1 - \tau) \Big[ f(K, L) + \epsilon^- K - wL \Big] - r(1 - t)K \Big]$$
  
+  $(1 - \phi(\epsilon^*)) \Big[ (1 - \tau) \Big[ f(K, L) + \epsilon^+ K - \hat{r}K - wL \Big] \Big]$ (11a)

Using  $f_L L = f(K, L) - f_K K$ , (11a) can be transformed into

$$Z = \overline{Z} + \left[\phi(\epsilon^*)\left[(1-\tau)\left[f_K + \epsilon^{-}\right] - r(1-t)\right] + (1-\phi(\epsilon^*))\left(1-\tau\right)\left[f_K + \epsilon^{+} - \hat{r}\right]\right]K$$
(11b)

The first-order condition for optimal investment in eq. (13) implies that the second term on the right hand side of (11b) vanishes, such that we have  $Z = \overline{Z}$ .

## 4. Optimal Taxation

In this section, we analyse the optimal tax policy. The distortion of the financial structure of firms caused by the informational asymmetry in the capital market raises the question of how tax policy should be designed, given that it has an impact on financing decisions. The effect of tax policy on financing decisions is important because market choices are inefficient in our model. An increase in equity financing (i.e. an increase in  $\varepsilon^*$ ) raises the average quality of equity. Since equity prices reflect average quality, there is a positive externality of equity financing, on the margin.<sup>14</sup> The market will therefore lead to an inefficiently low level of

<sup>&</sup>lt;sup>14</sup> We would like to thank Roger Gordon for suggesting this way of explaining the nature of the capital market inefficiency in our model.

equity financing. There is thus a strong argument for the government to encourage equity financing through its tax policy. Moreover, tax policy also has to finance the public good G using its distortionary tax instruments. The available tax instruments are the labour income tax, the tax on interest income and the corporate income tax. Formally, the problem of the government is to maximize the utility of the representative household,

$$W = U(C_1, C_2, L) + H(G),$$
 (18)

subject to the resource constraint for the economy, which can be written as

$$G + C_2 = f(K, L) + (1+r)S - (r + (1 - \Phi(\epsilon^*))c)K$$
(19)

The household's private utility  $U(C_1, C_2, L)$  can be expressed by the indirect utility function  $Q(r(1-t), w^n, Z)$ , with  $Q_1 = \lambda S$ ,  $Q_2 = \lambda L$  and  $Q_3 = \lambda$ , where  $\lambda$  is the marginal utility of second period private income. Moreover, note that, as has been shown above, aggregate income from the firms amounts to  $Z = \overline{Z}$ . Using (19), (2) and the individual labour supply function  $L = L(w^n, r(1-t), \overline{Z})$ ,<sup>15</sup> the government's problem can be reduced to maximizing

$$Q(r(1-t), w^{n}, \overline{Z}) + H(f(K, L) - (r + (1 - \Phi(\epsilon^{*}))c)K - w^{n}L + rtS)$$
(20)

over  $w^n$ ,t and  $\gamma$ . The first-order conditions are

w<sup>n</sup>: 
$$\lambda L + H' \left( \left( f_K - (r + (1 - \Phi(\epsilon^*))c) \right) \frac{\partial K}{\partial L} \frac{\partial L}{\partial w^n} - L + (w - w^n) \frac{\partial L}{\partial w^n} + rt \frac{\partial S}{\partial w^n} \right) = 0,$$
 (21)

t: 
$$-\lambda rS + H'\left(\left(f_{K} - (r + (1 - \Phi(\epsilon^{*}))c)\right)\frac{\partial K}{\partial L}\frac{\partial L}{\partial t} + (w - w^{n})\frac{\partial L}{\partial t} + rS + rt\frac{\partial S}{\partial t}\right) = 0,$$
 (22)

and

$$\gamma: \quad H'\left(\left(f_{K} - (r + (1 - \Phi(\varepsilon^{*}))c)\right)\frac{\partial K}{\partial \gamma} + \Phi'cK\frac{\partial \varepsilon^{*}}{\partial \gamma}\right) = 0.$$
(23)

<sup>&</sup>lt;sup>15</sup> In (20), we use the individual labour supply function to write capital demand as  $K = K(\gamma, L(w^n, r(1-t), \overline{Z}))$ 

The first-order condition for the firms'optimal investment implies

$$f_{K} - (r + (1 - \Phi(\varepsilon^{*}))c = \Phi(\varepsilon^{*})r(\gamma - 1).$$
(24)

Substituting (24) into (21)-(23) and making some rearrangements leads to

$$-(H'-\lambda)L + H'\left(r\Phi(\epsilon^*)(\gamma-1)\frac{\partial K}{\partial L}\frac{\partial L}{\partial w^n} + (w-w^n)\frac{\partial L}{\partial w^n} + rt\frac{\partial S}{\partial w^n}\right) = 0, \qquad (21a)$$

$$(H'-\lambda)rS + H'\left(r\Phi(\epsilon^*)(\gamma-1)\frac{\partial K}{\partial L}\frac{\partial L}{\partial t} + (w-w^n)\frac{\partial L}{\partial t} + rt\frac{\partial S}{\partial t}\right) = 0, \qquad (22a)$$

and

$$r\Phi(\varepsilon^*)(\gamma-1)\frac{\partial K}{\partial \gamma} + \Phi' cK \frac{\partial \varepsilon^*}{\partial \gamma} = 0.$$
(23a)

It immediately follows from eq. (23a) that

$$(1-\gamma) = \frac{c\Phi' K}{r\Phi(\epsilon^*)} \frac{\frac{\partial \epsilon^*}{\partial \gamma}}{\frac{\partial K}{\partial \gamma}} > 0.$$
(25)

Eq. (25) shows that the optimal tax structure in this model unambiguously implies  $\gamma < 1$ , i.e.  $\tau < t$ . The optimal tax policy thus sets the tax rate on corporate income below the tax rate on personal income from savings. The reason for this discrimination is reflected in eq. (23a). The first term on the l.h.s. of (23a) captures the effect of a change in  $\gamma$  on the level of investment (K) while the second term reflects the impact on the financing decisions of firms. The economic forces determining the amount of tax discrimination between the two types of income are best explained by considering a reduction in  $\gamma$  (i.e. a reduction in  $\tau$ , holding constant t), departing from a situation with non-discrimination ( $\gamma = 1$ ). At  $\gamma = 1$ , eq. (24) shows that  $f_K - (r + (1 - \Phi(\epsilon^*))c = 0$ . This implies that the first term on the l.h.s. of (23a)

change in the level of investment does not affect welfare. The second term on the l.h.s. of (23a) is negative. This reflects that the change in the financing behaviour of firms induced by the change in  $\gamma$  does affect welfare. If  $\gamma$  declines, more firms use equity financing. This raises efficiency since the social cost of debt financing exceeds that of equity financing. It is therefore always efficiency enhancing to set  $\gamma < 1$ .

Of course, the question arises whether there are factors limiting the desirable amount of tax rate differentiation in this model. That there are limits to tax rate differentiation can also be explained using eq. (23a). If  $\gamma < 1$ , the first term on the l.h.s. of (23a) becomes positive. This reflects that, with  $\gamma < 1$ , we have  $f_K - (r + (1 - \Phi(\epsilon^*))c < 0$  (see eq. (24)), i.e. investment exceeds the socially efficient level, given  $\epsilon^*$ . A further reduction of  $\gamma$  now gives rise to a welfare loss since the investment distortion increases. This shows that the optimal degree of corporate and personal tax rate differentiation trades off the costs of the distortion of investment against the benefit of raising the amount of equity financing in the economy.

#### 5. Discussion of the results

In this section, we will further work out the implications of our model and will discuss our results relative to the existing literature on the effects of taxes on corporate financial decisions. We have already mentioned that our analysis of the financing decisions of firms leads to results which differ somewhat from those in Myers and Majluf (1984). In our model, high quality firms choose debt financing whereas low quality firms prefer equity. One empirically testable implication of our analysis is that a firm which issues debt will experience an increase in the price of its equity. No such price increase is predicted by Myers and Majluf (1984).

In terms of policy implications, the main insight of our theoretical analysis is that optimal tax policy will choose a corporate tax rate which is lower than the personal income tax rate. As was mentioned in the introduction, this result is broadly in line with the observed tax policy in many countries. However, several qualifications are warranted. To begin with, our theoretical analysis entirely abstracts from taxes at the shareholder level. In order to assess whether or not there is a tax advantage to equity relative to debt financing, as implied by our model, one clearly has to take into account the tax treatment of shareholders. Shareholder taxes vary considerably across countries. For instance, the United States fully taxes dividends at the personal tax rate and levies capital gains taxes. Other countries, like Germany and Canada, grant at least some kind of double taxation relief. In practice, it is often difficult to measure the effective marginal tax rate on equity income. For instance, while capital gains are in principle taxed in the U.S., there are deferral strategies which allow investors to considerably lower or even eliminate their capital gains tax liabilities.<sup>16</sup> Further complications arise due to non-linearities in the corporate tax code. Tax-loss carryforward and carryback provisions, which exist in most countries, and, e.g., the existence of the Alternative Minimum Tax in the U.S. add to the difficulties in calculating marginal tax rates on equity income.

Given this, what can we say about the relative tax advantage of debt versus equity financing? For the U.S., several studies suggest that, on balance, there is a tax advantage of debt relative to equity financing see, e.g., Gordon and MacKie-Mason (1990). This result supports the traditional theory of corporate taxation and corporate financing decisions according to which firms issue debt up to the point where the marginal tax advantage of debt financing is balanced by the marginal non-tax cost advantage of equity. Of course, these results stand in contrast to the implications of our model, which predicts that, other things being equal, there should be a tax disadvantage to debt financing.

However, more recent empirical studies on the tax costs of debt versus equity financing are more in line with the prediction of our model. In particular Graham (1999) reports that, at the margin, i.e. for the last dollar of financing, debt financing is actually at a tax disadvantage compared to equity financing.<sup>17</sup> Somewhat more indirect evidence can be found in Gordon and Slemrod (1998). These authors show that the tax differential between corporate and personal tax rates has a significant impact on the amount of reported corporate income. This indicates that, despite the possibility of double taxation at the shareholder level, the corporate status with the relatively low corporate tax rate is seen as tax advantageous by many taxpayers.

While these results provide some empirical support for our explanation of why the corporate tax rate is often lower than the corporate tax rate, there remain unresolved issues. For

<sup>&</sup>lt;sup>16</sup> One simple way to achieve this is to hold shares until death, see Klein (1999) for further discussion of this issue.

instance, in a study for the U.S., Graham (1999) reports a marginal tax disadvantage of debt financing, but his study also shows that, on average, there is a tax advantage to debt, despite the tax penalty implied by the taxation of interest income at the personal level. How does this fit into out theoretical analysis? In our model, firms can choose either debt or equity financing. This suggests that our model is best interpreted as an analysis of marginal financing decisions of firms. This interpretation is in line with Graham's results. Yet, the question remains why equity financing is on average at a tax disadvantage to debt. One possible explanation is the existence of pure profits. If the corporate tax base contains pure profits, standard optimal tax considerations suggest that, other things being equal, the tax on equity income should be relatively high compared to other distortionary taxes. In the context of our analysis, this suggests that the optimal tax schedule would be characterized by a relatively high average tax rate on equity income, where the high average rate has the function to extract economic rents, and a low marginal tax rate, which has the function to alleviate the problem of asymmetric information in the capital market.

One may also argue that informational asymmetries may not be a serious issue for large publicly traded firms, which have been monitored by the capital market for a long time. Informational asymmetries may be more relevant for the financing of small and medium-sized firms. If this is correct, our model would predict that small firms will rely more on debt financing than larger firms. In addition, we would expect that tax policy would use specific tax instruments to favor equity financing of small firms. Both predictions are broadly supported by the empirical evidence for the U.S.. Gordon and Lee (1999) show that small firms also face lower capital gains taxes and lower corporate tax rates than larger firms (see, e.g. Graham (1996) or Gordon and Lee (1999)).<sup>18</sup> Our analysis provides a rationale for this favorable tax treatment of small firms.

## 6. Conclusions

The motivation of the analysis in this paper is the observation that statutory corporate tax rates are lower than personal income tax rates in many countries. We have shown that this tax rate differentiation can be explained as part of an optimal tax policy if there are problems of

<sup>&</sup>lt;sup>17</sup> See Graham (1999), table 2, Panel B, p. 161. Note that this result is hard to reconcile with traditional theory, where problems of asymmetric information are not taken into account.

<sup>&</sup>lt;sup>18</sup> For earnings up to 50,000 US-\$, the corporate tax rate (and the capital gains tax rate) is only 15%.

asymmetric information between investors and firms in the capital market. The reduction of the corporate tax rate below the personal tax rate encourages equity financing and thus mitigates the excessive use of debt financing induced by asymmetric information. Our main theoretical result stands in marked contrast to the traditional view of corporate taxation and corporate finance theory, according to which there is a tax disadvantage to equity financing. More recent empirical evidence on this issue, however, is in line with our result.

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Country	Top Personal Income Tax Rate <sup>1</sup> (%)	Top Corporate Tax rate (%)
Austria	50(25)	34
Belgium	60.8(15)	39
Denmark	60	34
Finland	58(28)	25
France	56.8	33.3
Germany	53	45 <sup>2</sup>
Greece	45(20)	35
Ireland	48	38
Italy	58.9(30)	52,2
Luxemburg	50	32
Netherlands	60	35
Portugal	40(20)	39.6
Spain	56	35
Sweden	56(30)	28
UK	40	33
USA <sup>2</sup>	39.6	35

**Table 1** Statutory Corporate and Personal Income Tax Rates in Selected EU Countries and the U.S. (1997)

Source: Mennel and Förster (1997)

1 Rates in Brackets indicate reduced personal income tax rates for interest income.

2 Excludes state and local taxes.